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CLADOGRAMS & PHYLOGENETIC TREES

Originally Created by Kim Foglia Revised with Permission

Please Note: Although you are encouraged to work as a table, each student will write up this lab individually in his/her lab notebook. The lab is due on Monday, 3/16. The lab write-up includes:

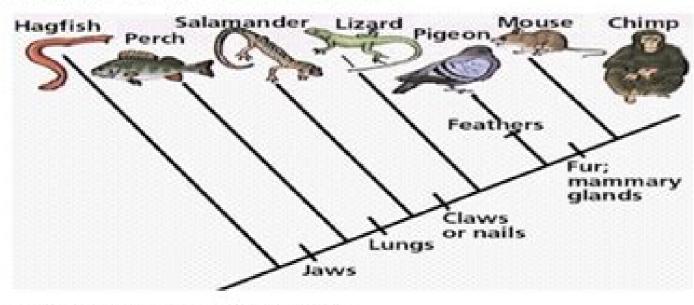
- Title Parts A-D
- Complete tables, construct diagrams, answer questions as directed
- Please note: Complete sentences are not required for Parts A-D.
- Lab Analysis Complete sentences required

Introduction

Cladistics is the study of evolutionary classification. Cladograms show evolutionary relationships among organisms. Comparative morphology investigates characteristics for homology and analogy to determine which organisms share a recent common ancestor. A cladogram will begin by grouping organisms based on a characteristic displayed by all the members of the group. Subsequently, the larger group will contain increasingly smaller groups that share the traits of the groups before them. However, they also exhibit distinct changes as the new species evolve. Further, molecular evidence from genes which rarely mutate can provide molecular clocks that tell us how long ago organisms diverged, unlocking the secrets of organisms that may have similar convergent morphology but do not share a common recent ancestor.

Part A - Cladogram Analysis

Refer to the following cladogram to answer the questions below in your lab notebook.



- 1. Which organisms in the cladogram have fur and mammary glands?
- Which organsims in the cladogram have jaws?
- 3. Based on the cladogram, which shared a common ancestor most recently ... a mouse & a lizard or a mouse & a perch?
- 4. Which two organisms would you expect to have a closer matching DNA sequence for a gene that is not under selective pressure in nature ... hagfish & pigeon or hagfish & salamander?

10

Another Example:

Characters	Sponge	Jellyfish	Flatworm	Earth- worm	Snail	Fruit fly	Starfish	Human
Cells with flagella	х	х	x	x	х	x	х	×
Symmetry		×	x	x	x	х	x	x
Bilateral symmetry			x	x	X	x	X	x
Mesoderm				х	х	x	х	x
Head develops first				x	x	x		
Anus develops first							X	x
Segmented body				×		×		
Calcified shell					x			
Chitinous Exoskeleton					Ĩ.	x		
Water Vascular system							x	
Vertebrae								Х

How to Make a Cladogram

Objectives: The student will learn how a cladogram illustrates an evolutionary hypothesis and makes predictions about evolutionary events. (i.e. the scientific method). The student will learn how cladograms depict relationships between taxa. and represent a "family tree" of life. The student will learn him to construct a cladogram. from morphological data-

Backgrounds

Cladiograms are diagrams which depict the relationships between different groups of tara called "clades". By depicting these relationships, cladegrams reconstruct the evolutionary history (phylogeny) of the taxa. Cladegrams can also be called "phylogenes" or "trees".

Cudograms are constructed by grouping organisms together based on their shared. derived characteristics.

Examples

Owen these characters and taxa

Secure	This con-	District	Engage	Microsc.
September 1	1000	1000	- X	3
HOMEON .			0.81	3.5
Banks .	_			
STATE OF THE PARTY.			1.0	1.5
Acres .	1			100
Charles .	All December	and Charles the second		Acres de Arres

Draw a Venn diagram. Start with the character that is shared by all the taxa on the outside. Inside each box, write the taxa that have only that set of characters.



Convert the Vern diagram into a diadogram like so:

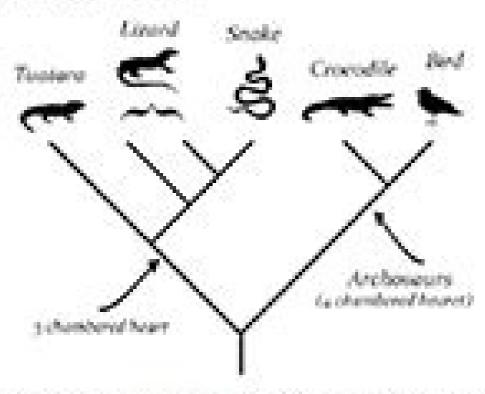


Market.

What is a Cladogram?

A cladogram is a diagram that shows relationships between species. These relationships are based on observable physical characteristics. Cladograms show the relationships in a graphic that looks like a tree, with branches connected to a common ancestry. Each branch represents a new distinct trait that was not seen in the group lower on the tree. These distinct traits are called derived characteristics.

The groups on the diagram are organized into diades, each clade shares distinct traits. For example, in the cladogram shown, birds and crocodiles are grouped into a diade called archosaurs, which share characteristics such as a 4 chambered heart and socketed teeth.



 Examine the cladogram above and suggest a trait that licards and snakes share, but is not shared by individuals of other groups.

Activity 1: Create an Animal Cladogram

2) For each animal shown, list as many characteristics as you can. You can also include traits that aren't apparent from the photo, such as reproductive strategies or unique behaviors. Try to come up with traits that are shared by multiple animals and at least one trait that is unique for each animal.





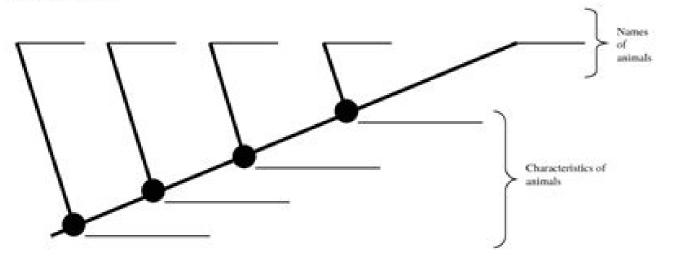
Life's Family Tree

Part 1: Complete the Cladogram - (reference online activity 15-4 "build a cladogram" -

Derived characters	Monkey	Bony Fish	Lizard	Shark	Kangaroo
Lungs					
Vertebral column					
Placenta					
Bony skeleton					
Hair				1	

a) Is the information in the cladogram above based on fossils, anatomy, molecular biology, or embryology?

<u>Part 2: Make a Phylogeny</u> – Use the information from the cladogram above to complete the phylogeny below.



a) Where on this "evolutionary tree" would you include humans?

b) Which characteristic is the most "primitive" versus one which is most "derived?"

It is standard practice to screen embryos in order to select only healthy embryos to implant into the mother. A cladogram showing bats, sharks, and dolphins are mammals (see Figure 5.17). In order to be approved, various safeguards have been put DoinChallenge yourself exercises 5 and 6, place to prevent this potato from mixing with conventional potato plants. telophase I Figure 3.17 The stages of meiosis I. This method is very labour intensive because it is done one protoplast at a time. • • Applications and skills: Application: Rosalind Franklin and Maurice Wilkin's investigation of DNA by X-ray diffraction. With two alleles, three different genotypes are possible, which can produce two different 'strengths'. For example, a gene can be introduced to make soybeans resistant to the herbicide glyphosate. CHALLENGE YOURSELF 41 Look at the diagram of the gene therapy for SCID (Figure 13.36) and learn the steps. A positive feedback loop leads to further increases in temperatures over time: warmer temperatures over time: warmer temperatures over time: warmer temperatures over time temperatures over time. Cause Primary A sequence of 20 possible amino acids to produce a polypeptide chain. This is the first step of repolarization because it separates many of the sodium and potassium ions on different sides of the membrane. As you recall, the surface area where oxygen and carbon dioxide is exchanged is between the small air sacs (alveoli) and capillary beds. • Construct a similar graph showing volume percentage change. Make sure you understand where the back of the eye is, and the direction from which the light is coming. Biologists use the term trophic level to indicate how many organisms the energy has flowed through. A detailed explanation of cell parts and their functions will then follow. Be sure to memorize the following: (1) overproduction of offspring; (2) variation within the population, as a result of meiosis, sexual reproduction, and mutations; (3) struggle for survival, those individuals best fit for their environment tend to survival better; and (5) reproduction, those who survive can pass on their genes to the next generation. 587 13 Option B: Biotechnology and bioinformatics Production Mylar balloon of biogas in a small-scale fermenter. This creates an even larger surface area for water and mineral ion absorption. 19 What is an example of a negative feedback loop in the menstrual cycle? Research on how drugs affect the brain has allowed medications to be developed that improve the lives of people with biochemical imbalances. Here are three examples of food chains from three different ecosystems. However, scientists studying shore crabs now have a new hypothesis. Nerve cells communicate with each other using molecules. 430 To help you decide whether or not a trait shows continuous variation, imagine a questionnaire to record phenotypes. 5 Using what you know about the functions of life, explain why the paramecia moved in the ways you observed. The two cell types largely involved in water transport are tracheids and vessel elements (see the photo). True electricity is a flow of electrons down a conductor; this is not the nature of an action potential. The developing spermatozoa need nutrients during this period of differentiation, and thus each remains attached to cells in the seminiferous tubules known as Sertoli cells. Instead, an enzyme called RNA polymerase separates the two DNA strands. • Gathering data from fishermen: data should be gathered from several sources to cross-check the fishermen: data should be gathered from several sources to cross-check the fishermen: data should be gathered from several sources to cross-check the fishermen: data should be gathered from several sources to cross-check the fishermen: data should be gathered from several sources to cross-check the fishermen: data should be gathered from several sources to cross-check the fishermen: data should be gathered from several sources to cross-check the fishermen from several sources the fishermen from several sources to cross-check the fishermen from several sources to cross-check the fishermen from several sources to cross-check the fishermen from several sources the fishermen from sev attached to the promoter region for a particular gene, the process of transcription begins. As practice, find the standard deviation of each raw data set above before you read on. Because hypertension typically develops over a period of years, it is best to monitor your blood pressure regularly and look for any increasing trend. Polyploidy refers to the situation in which a cell contains three or more sets of chromosomes (3n, 4n, and so on): • 3n = triploid • 4n = tetraploid. A portion of the placenta is shown on the left, with the umbilical blood vessels within the umbilical cord stretching from the placenta is shown on the left, with the umbilical blood vessels within the umbilical cord stretching from the placenta is shown on the left, with the umbilical blood vessels within the umbilical cord stretching from the placenta is shown on the left, with the umbilical blood vessels within the umbilical cord stretching from the placenta is shown on the left, with the umbilical blood vessels within the umbilical cord stretching from the placenta is shown on the left, with the umbilical blood vessels within the umbilical cord stretching from the placenta is shown on the left, with the umbilical cord stretching from the placenta is shown on the left, with the umbilical cord stretching from the placenta is shown on the left, with the umbilical cord stretching from the placenta is shown on the left, with the umbilical cord stretching from the placenta is shown on the left, with the umbilical cord stretching from the placenta is shown on the left, with the umbilical cord stretching from the placenta is shown on the left, with the umbilical cord stretching from the placenta is shown on the left. heated debates. Try identifying the organisms shown opposite using the key in the following example. Anton van Leeuwenhoek, also Dutch, greatly improved the Jansen compound microscope in the 1600s. The folding of the cerebral cortex during the human embryo takes place during the last 3 months of development. • Arthropoda: this phylum includes insects, spiders, and crustaceans, among others. Should we therefore conclude that small birds, whose brains are comparatively larger in relation to their size compared with larger animals, are more intelligent than humans? Hopefully, you have begun to view all sciences as a process, or perhaps a way of 'knowing'. 6 Write the word equation for the condensation reactions that would produce a triglyceride lipid from its four molecular subcomponents. • There is a delay between the arrival and passing on of a stimulus at the atrioventricular node. Another example is that a giraffe's neck is well adapted for reaching leaves high up in trees. • The transgene is the target gene (for example the gene for resistance to glyphosate). Series B, Biological Sciences, 166 (1002), pp. 1 2 3 donor mother 4 udder cell unfertilized egg 5 6 7 remove nucleus cultured udder cell from the udder was collected and cultured. Guidance Students should be able to deduce whether or not a man could be the father of a child from the pattern of bands on a DNA profile. Scroll down to PUBMED. 3 Compare and contrast Gram-negative and Gram-positive bacteria. Most animals have to move, which requires much more energy than a stationary plant needs. The differences are most likely due to chance. When the atria are in diastole and the ventricular valve closed 3 left atrioventricular valve c Should we believe everything they say? Some mucous membrane tissue is lined with cilia. For example, the abdominal muscles and intercostal muscles and occur in the mitochondrion. • Differentiation involves the expression of some genes and not others in a cell's genome. Please don't memorize this. Research and explain the difference between thin layer chromatography and paper chromatography. What criteria are used to determine whether these criticisms are valid or not? Table 9.4 A comparison of monocots and dicots Monocots Based on phylogeny (evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history), many biologists are now using three groups of angiosperms: • the magnoliid complex (magnolias and laurels) • the monocots evolutionary history hist while other countries have no requirements at all. This image shows myosin with 'heads' on both sides. A TEM of a cell from the mesophyll region of a leaf. • Identify and count the number of individuals of the chosen species found inside the borders An example of an easily identifiable plant to use for the fieldwork lab; in this case the plant is yarrow. One way to release the chemical energy from organic compounds is to digest the food, another way is to burn it. Its effect is to modulate the activity of GABA, which is the main inhibitory neurotransmitter. Steroid hormones do enter the target cell and bind to a receptor protein in the cytoplasm, whereas peptide hormones interact with a receptor protein on the outside of the plasma membrane of a target cell. long wavelength energy 205 04 Ecology How greenhouse gases heat the atmosphere If Earth had no atmosphere, the heat radiating from low albedo objects on its surface would simply radiate back into space, and at night we would see temperatures plunge to ones similar to the extremely cold temperatures on the Moon. One objective of science fiction as an art form is to warn society of what might happen in the future if we are not careful. Either the taxon can be moved up or down the hierarchy (family to subfamily, for example), or from one family to another. The leaves are usually source regions because they are the major organs of photosynthesis. Amphibians (b) Can produce an amnion. . Experts in various fields of study use this idea of accumulated change over time. However, the final evidence involving enzymes and fragments was published by a team that included Rejii Okazaki and Tsuneko Okazaki. Both the left and right sides of the heart work synchronously as a double pump. Is it based on well-substantiated facts? PCR is a way of ensuring that enough DNA for analysis can be generated. Notice the difference in the number of resistant rats before the first pesticide application and after the application. 343-344 (Roman C, Muhlbauer and Feng Li 1999), Copyright 1999. Researchers already knew that input from the right visual field is received by the left hemisphere, and input from the left visual field is received by the right visual field is received by the right visual field is received by the right hemisphere. The idea of cloning often provokes strong negative reactions from the left visual field is received by the right visual field is received by the r The study is ongoing, but the early results are promising. There comes a tipping point beyond which the differences outweigh the similarities and the two populations in question can no longer freely reproduce together. • Proteins travel out of the nucleus and modify the shape of the synapse. The result is a 6-carbon compound called citrate. If oxygen is present, pyruvate enters the mitochondria and aerobic respiration occurs. In 2009 swine flu, or influenza A, caused a global pandemic. Some endocrine glands occur in pairs, such as the pancreas. Students should understand that there is a continuous but variable supply of energy in the form of sunlight but that the supply of nutrients in an ecosystem is finite and limited. If there has been a significant enough difference in two separated populations and they can no longer interbreed, a speciation has occurred. In theory, that means that any two dogs from anywhere in the world can mate and have puppies that will grow up and be able to mate with any other dogs, and have more puppies. We have not measured all the metals there are in the world to see if they expand. • Two pyruvate molecules are present at the end of the pathway. Animal models respond in similar ways to humans when addicted. This reduces the surface tension of the moist inner surface of alveoli, and prevents the sides of the alveoli from sticking to each other. • Transferrin is attached to a luminescent quantum rod. Genetic modification can be used to overcome environmental resistance to increase crop yields. Look at the graph and answer the guestions. CHALLENGE YOURSELF Use Figure 13.32 to review what you have learned about analysis of microarrays. • Diastolic pressure: the bottom number measures the pressure in the arteries when the heart muscle is resting and refilling with blood. It is so natural to us that we don't even think about it unless, for some reason, we are without it. For example, during exercise, your heart rate cannot increase or return to its resting heart rate without the nervous system and the circulatory system interacting. • They are characteristically small in size, usually between 1 and 10 µm. 297 06 Once a company in situations where the product does lead to poor health? Summary of photosynthesis In summary, the process of photosynthesis includes the light-dependent reactions. A computer keeps track of where each human gene is located on the plate. Genotype - The symbolic representation of the pair of alleles possessed by an organism, typically represented by two letters. As long as our skin remains intact, we are protected from most pathogens that can enter living tissues. Plant hybrids can often lead to just such qualities, including bigger grains, fruits, or vegetables, as well as hardier plants that can respond more favourably to the application of fertilizer. Also, some of the energy from hydrogen ion movement is used to transport pyruvate into the mitochondria. (Total 5 marks) 6 Outline ideas about the pace of evolution according to gradualism and punctuated equilibrium. For example, the induced-fit hypothesis of enzyme catalysis proposes that an enzyme changes shape as the substrate enters the enzyme's active site. In electron micrographs of myofibrils, the darkest areas are where both actin and myosin are found together. There are 31 pairs of spinal nerves. • Application: Antigens on the surface of red blood cells stimulate antibody production in a person with a different blood group. It transfers its polypeptide chain to the new tRNA, which moves into the now exposed A site. • The zone of elongation is where cells are enlarging in size, corresponding with the G1 phase of the cell cycle. Or have you ever watched a video recording of something you experienced and thought to yourself, 'That's funny, I don't remember it being like that: my memory of that event is very different'. • Application: Evaluation of evidence and the methods used to obtain the evidence for health claims made about lipids. Angelman's syndrome is diagnosed from well-recognized abnormal patterns on an electroencephalogram (EEG). (Total 4 marks) Answers Full answers to all exercises and practice questions can be found in the eBook. Two electrons are required to reduce NADP+ fully to NADPH. Is it fair to compare heights of humans from different parts of the world? Brain-imaging studies have been carried out that indicate there may be slight differences in the diagnosis is usually based on behaviour alone. William Harvey was also responsible for much of the early knowledge of a branch of biology that we now call embryology. For the 3 to 5 template strand, the new DNA strand is formed as described above. Application: Causes and consequences of jaundice. 27 Name the genes. The basic procedure and findings are shown here. surface. Norway therefore cooperates closely with other nations on mutual assistance in the Copenhagen Agreement. Early studies of neonicotinoid pesticides suggested that they were relatively safe from an ecological viewpoint. It will be interesting to discover whether the yeast will reach the carrying capacity of the environment that you design. Genetics and evolution NATURE OF SCIENCE Richard Dawkin's book The Greatest Show on Earth provides some examples of modern-day rapid change in a species. Why are they important to the major function carried out by phloem? Haemophiliacs lack a functional clotting protein called antithrombin III. This means energy must be used, so ATP is required. In order for this to be a controlled experiment, two levers must be available, one that gives the substance and one that does not (we want to be sure the animal is not just pushing the lever randomly). For example, Lepus arcticus is the scientific name for the Arctic hare; both terms come from Latin. Many species of these plants are cultivated in gardens for their decorative flowers (an example is shown in the photo on page 247). Functional magnetic resonance imaging (fMRI), positron emission tomography, MEG) and other technologies have unravelled the many brain changes that take place in response to rehabilitation strategies and drugs. But this graph alone cannot prove that birds of prey cause the reduction in numbers of partridges. In an example like this one, where the two samples is the same, the degree of freedom is 2n - 2. The liver can repair itself if damage is not too severe, but long-term alcohol abuse can be fatal. Exercises 5 Describe three physical methods of introducing recombinant DNA into plants. Extracellular Figure 1.20 Stage 2: ATP attaches to the protein. Because the scientist John Dalton had red-green colour blindness, the condition is sometimes referred to as Daltonism and people who have it are said to be Daltonian. Phosphorous is not very abundant in the biosphere and there is not a substantial atmospheric pool of phosphorous as there is for carbon and nitrogen. In addition to activating pepsin, the highly acidic environment of the stomach is the ideal pH for the enzymatic activity of pepsin. 167 03 Genetics Practice questions 1 What conclusion can be made from the following evidence from an analysis of DNA fragments? A scanning electron micrograph (SEM) of H. It is common to see multiple ribosomes going through the process of translation on a single mRNA strand. NATURE OF SCIENCE Use models of the relative space human body parts occupy on the somatosensory cortex and the motor cortex. Applications and skills: Application between animal size and the development stage of the young at birth for other mammals. The doctor is looking for metabolites that are biomarkers that indicate disease. 329 07 Nucleic acids origin of replication parental (template) strand daughter (new) strand Replication begins at a bubble opened by helicase. tUse the formula to determine population size. This gene may be involved in causing skin cancer. The problem is, one part of the cycle takes millions of years and the other part, the burning of fossil fuels, is very rapid. • Recognition is the association of a physical object or event with something already experienced. The populations in Delaware showed no significant difference in growth from other populations in Delaware showed no significant difference in growth from other populations of the liver Understandings: The liver removes toxins from the blood and detoxifies them. This concept should stimulate your brain. As already mentioned, in the 19th century the famous French scientist Louis Pasteur showed that bacteria could not spontaneously appear in sterile broth. In both situations, radioactive material was leaked out into the environment and the zones around the

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reasons for the failure to control the disease. Left: Frog embryo showing cells, to vibrate. More often than not, the carcinogen enters the lungs in cigarettee. • The fluid in the cochlea causes special cells, called hair cells, to vibrate. More often than not, the carcinogen enters the lungs in cigarettee.
smoke, although other fumes and substances have been known to be the carcinogen. This is explained by the idea of increased molecular collisions. Lysosomes show little internal structure. (a) Why do the erythrocytes shown not have the characteristic shape of a bi-concave disc? DNA contains both introns and exons. To understand this
let's consider what happens when there is a problem with the system. This intermediary molecule is called messenger RNA (mRNA). Z-line myosin fibres are relatively thick with head-like structures, and actin is relatively thin. If a sperm cell containing an X chromosome fertilizes
an ovum, a female is produced. For some pathogens, such as bacteria, there are chemicals called antibiotics that can work against the living bacterial cells but do not affect our body cells. 234 In the photo of plover eggs, the colours and speckles act as effective camouflage, making these eggs difficult to spot by predators. (b) In Figure 2.53, why does
the denaturing of enzymes and other proteins at high temperatures dramatically lower the rate of photosynthesis? Although it is possible for some organisms to adapt to changes in their environment within their lifetimes, this is not the kind of adaptation referred to in evolution. Next, look at the organism to see if the particular characteristic
described in the first line (a) is present in the organism. Hydrogen bonds link the two nitrogenous bases together: two hydrogen bonds link adenine and guanine. Phagocytes typically contain many lysosome organelles, in order to digest chemically whatever has been engulfed. The elongation phase
Figure 7.15 A peptide bond, shown in red in this figure, forms when water is given off. Brazil and the USA have been innovators in this practice, and it is a way of cycling carbon that depletes fewer fossil fuel reserves. Nuclear envelopes form around each of the four haploid cells, preparing them for cytokinesis. The role of the small intestine in
digestion and absorption As an example of what happens as ingested foods move through the small intestine, let's see how starch is digested and how its monomers are absorbed. 28 Optimal prey choice can increase chances of survival and thus the ability to pass on your genes. There is no compartmentalization within the cytoplasm because there are
no internal membranes other than the plasma membrane. It is in this region that the organelles are found. Some, but certainly not all, of the covalent bonds in the glucose are broken during this series of reactions. Stabilizing selection 3. The cells of this outer ring begin to divide and fill in the 'wound' area left by ovulation, and I follic A light
micrograph showing a human ovary section. blind spot axons of ganglion cell layer followed by and behaviour cone cell ganglion cell layer followed by any section. Since the every section is a function of the retinal followed by any section. Since the every section is a function of the retinal followed by the function of the 
facilitated diffusion, the highest percentage is reached. The medulla oblongata then sends impulses back to the glandular cells of the stomach to continue (and increase) production of HCl and pepsinogen. The bonding between single
nucleotides to produce a long chain is controlled by specific enzymes. 6 7 8 She goes back to the doctor and gets the same antibiotic. Such materials are called radio markers. The difference between the expected phenomenon is having
an effect on the data. As well as colour blindness and haemophilia, more examples of sex-linked traits in humans and other animals include: • Duchene muscular dystrophy • white eye colour in fruit flies • calico-tortoiseshell fur colour in cats. coli, it inhibits the first enzyme in the pathway and isoleucine will not be synthesized. The axon is the centre
beige area, and the myelin sheath is the surrounding yellow and green area. rib cage gets smaller rib cage expands air exhaled air inhaled lung diaphragm contracts (moves down) diaphragm relaxes (moves up) Inspiration Expiration Ex
showing that the two different genes are linked. The number of levels is limited by how much energy enters the ecosystem. This mould grows on carbon-rich substrates such as glucose and starch. Skill: Drawing half-views of animal-pollinated flowers. This makes this cDNA red. and Cox, M. However, there are specific regions that show significant substrates such as glucose and starch.
variation. Hence the alleles for making a short neck are not found in the giraffe population. There are three major examples of nucleic acids in nature. Each square has multiple copies of a single gene. 2 What product would have received the energized electrons if DCPIP had not been added? If the actual length of the subject of the image is 5 µm,
what is the magnification of the image you are looking at? The embryo, called a blastocyst at this stage, will then implant in the highly vascular tissue of the endometrium. B To reduce intermediates in the Krebs cycle. Notice how the two examples above are good illustrations of how we can use a scientific theory to explain observed phenomena
Values close to 1 reveal that there is a strong correlation between the x- and y-values. The plant cells are transformed, meaning that the new DNA of interest is added to the embryo begin about this time. 13 Draw a two-dimensional
representation of a tRNA, labelling the 3 and 5 ends, the anticodon, and the point of attachment. 15, p. This is known as cell cloning because all the daughter cells of these mitotic divisions are capable of producing the same antibody. Shorter wavelengths of light have greater energy within their photons than longer wavelengths.
Cholesterol helps to regulate membrane fluidity and is important for membrane stability. What counts as knowledge for an evolutionary biologist, and how is that the protein 'opens up' and digestive (hydrolytic) enzymes are able to more easily access the peptide
bonds between adjacent amino acids. The chemical energy in these organic compounds can be measured in calories or kilocalories, which we see listed on food packaging. Jenner took a small amount of pus from a cow's cowpox wound and inserted it into a small incision on the arm of an 8-year-old boy. et al 2004), Copyright © 2007, John Wiley and
Sons. The result is that the temperature inside the greenhouse is warmer than outside. 284 bacterium carrying DNA vector with cloned normal ADA gene genetically disabled retrovirus cloned ADA gene at Reinfuse the ADA gene containing T cells back into
the SCID patient: genetically altered T cells produce ADA As you can see from Figure 13.36, the same procedures that have been mentioned already were used for the first gene therapy. Application: Use of nucleotides containing dideoxyribonucleic acid to stop DNA replication in preparation of samples for base sequencing. If this is the case, make
sure to allow as much recovery time between tests as possible. Guidance Details of the metabolic pathways of cell respiration are not needed but the substrates and final waste products should be known. 15 Observe the three amino acid sequences below showing amino acids 100 to 116 in one of the polypeptides that makes up haemoglobin. Skills
Analysis of the falsification of the Davson-Danielli model that led to the Singer-Nicolson model. trans face (shipping side of Golgi apparatus) $\footnote{\text{Vesicle leaves}}$ the trans side of Golgi apparatus with modified contents. Thus the relatively low pressure exerted by the atria in combination with the passive flap valves within the supply veins means that no
heart valve is necessary where the blood enters each atrium. D Energy is recycled by the decomposers back to the producers. With drug addiction, dopamine receptors are constantly stimulated. It is interesting to think about why these two substances have such very different phase change temperatures. If the grasshopper dies and is not eaten,
detritivores and decomposers will use its available energy. When looking at unfolded DNA with an electron microscope, you can see what looks like beads on a string. Mercury can leach thetosoil and water from the places where Scan into unclear read text mercury-containing products have been dumped. Molecular biology We can now use all of this
information to construct a simple, yet accurate, drawing of DNA. • Cloning humans • Eugenics • Genetic engineering of crops • Finding a cure for cancer. • The proximal convoluted tubule selectively reabsorbs useful substances by active transport. These bile salts are added to bilirubin to make the substance bile. The tRNA has a 5 and a 3 end, like
all other nucleic acid strands. • Skill: Analysis of results from experiments involving measurement of respiration rates in germinating seeds or invertebrates using a respirometer. Like pyruvate, lactic acid molecules are 3-carbon molecules are 3-carbon molecules are 3-carbon molecules are 3-carbon molecules.
a genome. The importance of oxygen and carbohydrates are clear. If the results of hundreds of similar crosses were calculated, the number would probably be very close to 25%. (d) Repeat this procedure so that you have data for 40 organisms. • Use a microtitre plate with a known antigen (gold) attached to each well. In our sample there is no
outlier. You will recall that proteins have an ability to change their three-dimensional shape under certain circumstances. Their hydrophilic region will be exposed to the water solutions on either side of the membrane. The ultimate effect is to increase the glucose concentration in the blood or, to put it more simply, to increase blood glucose (see
Figure 6.23). 7 On the next day, repeat steps 3 and 4. Thus we say that the two strands of the double helix are antiparallel and complementary to each other. Somewhere in the three-dimensional shape of the enzyme is an area that is designed to match a specific molecule known as that enzyme's substrate. • Figure 2.38 represents the results
obtained. There are also rules about how to use the names and properly cite them in research papers. You may have experienced the pain involved in a 'muscle cramp' when an electrolyte imbalance occurs after strenuous exercise. Some of these plants are being studied for use as the next generation of biofuel. elegans would have six chromosomes.
and, likewise, that all cells in humans would have 46. 4 Draw a Punnett grid. Even though scientists have found exceptions to the central dogma, the basic idea, that genetic information flows in this general direction, has not been invalidated. Memorization phase crude template matched to song heard exact template Motor phase song output
hears own song song matched to template sings more or less accurate copy of song heard 540 After hatching, there is a memorization phase. It may be because the biofilm is such a mix of organisms many resistant strategies have been developed. Try your best to make it to scale.
When proteins enter the stomach, they are in their three-dimensional fibrous or globular molecular shapes of this type of molecular shapes of the secondary, tertiary, and quaternary shapes of this type of molecular shapes of the secondary, tertiary, and quaternary shapes of this type of molecular shapes of this type of molecular shapes of the secondary, the type of molecular shapes of the secondary shapes of the seconda
sunlight Sun A B plant shoot or stem Figure 9.18 The effect of sunlight on a stem shoot. In the fourth stage, the microorganism required to produce the biogas (methane) is an archaean. To become more confident in your understanding of the chloroplasts, obtain some electron micrographs of chloroplasts from several different plants. When the atria
are in systole and the ventricles are in diastole left atrium aorta 3 left atrioventricular valve open 75 2 left ventricle Figure 6.8 Blood pressure readings in mm Hg when both chambers are in diastole (rest). small female snakes 100 50 0 16 18 20 22 time/mins 24 26 relative concentration/% LeMaster and Mason 2002 large female snakes 100 50 0 16
18 20 22 time/mins 24 26 LeMaster and Mason 2002 (a) Using the graph for large female snakes, state the relative concentration of the unsaturated lipid corresponding to the peak at 26 minutes. There are 20 different amino acids in polypeptides synthesized on ribosomes. Researchers in the lab would not be able to determine the genotype of any
particular fly in the jar just by looking at it. Can you find as many parts in the eyes with vision, truly seeing something means interpreting the signals that arrive at photoreceptors in the eyes. There are two main anaerobic pathways, which will be discussed here separately: alcoholic
fermentation and lactic acid fermentation. In effect, the only way to produce an albino is for each parent to donate one a. As a result, the single chromosome comprises two sister chromatids side-by-side and joined in the middle at the centromere (see Figure 3.15). After studying the brains of eight other patients with similar disorders and finding the middle at the centromere (see Figure 3.15).
same lesions, Broca described this area of the brain in the left hemisphere as the language centre. RRHHThe ribosomes catalyse the formation HNCCN COH of peptide bonds between adjacent amino acids that are brought to the OOH peptide bonds between adjacent amino acids that are brought to the OOH peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that are brought to the OOH of peptide bonds between adjacent amino acids that 
only part of this sketch that is specific to the small intestine is the villi, used for absorption. 6.6 Hormones are used when signals need to be widely distributed. Figure 13.16 Representation of a transgene. End-product inhibition prevents the cell from wasting chemical resources and energy by making more of a substance than its specific to the small intestine is the villi, used for absorption.
needs. Or are they being used to support the argument that more food aid needs to be sent? Imagine a graph with scientific knowledge on the y-axis and time on the x-axis. In humans, the larynx (voice box) is at the top of the trachea. The legal description of brain death is 'that time when a physician(s) has determined that the brain and brainstem
have irreversibly lost all neurological function'. • Muscle fibres contain many myofibrils. This bacteria uses quorum sensing to cooperate and form biofilms in the lungs. If you prick your finger on a needle, the pain receptors respond to the injured tissue. Some bacteria, e.g. Pseudomonas denitrificans, remove nitrates and nitrites, and put nitrogen
gas back into the atmosphere. The boxed areas shown are the R-groups of the amino acids. Reversible competitive inhibition may be overcome by increasing the substrate concentration. The story of the blue tits in Britain provides some clues about this process of learning and forgetting. Theory of knowledge Limits of perception 774 774 You cannot
speak of the ocean to a well frog ... • Eukaryote chromosomes are linear DNA molecules associated with histone proteins. One way is to force the gene into the patient's cells using a virus to deliver it. The same phenomenon can be seen in the sex of human children. Most cells can be up to 100 micrometres (µm) in size. C H OH 59 02 Molecular
biology Here are the completed molecular diagrams of another three molecules that you need to learn to draw from memory. Little by little, insects, then birds, then small mammals, moved in. III What would happen to the changes in energy if this reaction was controlled by an enzyme? Certain species of foraminifera microfossils, for example, can
reveal temperature changes via slight changes in the communication is involved with cell control and reproduction. However, there
are 457 11 Animal physiology ragweed pollen B plasma cell B cells B plasma cell B cells B plasma cell B cells produce IgE antibodies vesicles containing histamine IgE molecules bind to mast cells second exposure to same allergen bonds to IgE on mast cells mast cell second exposure to same allergen bonds to IgE on mast cells mast cell second exposure to same allergen bonds to IgE on mast cells mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to same allergen bonds to IgE on mast cell second exposure to IgE on mast cell second exposure to IgE on mast cell second exposure to IgE on IgE 
11.3 An allergic reaction to an allergen. Few errors (mutations) occur, which is stunning given the huge numbers of the nucleotides that are replicated. In 90 minutes? The chloroplast Some people refer to the chloroplast as a photosynthetic machine. However, there are two sources of possible change in the genetic makeup of bacteria: • mutations
(as seen in Section 3.1) • plasmid transfer. For these two animals, explain why it would have been a disadvantage to have kept all 5 digits. Each carbon atom is numbered in the reactants. • What will my first baby look like? You will be expected to be able to draw the following molecules from memory: • alpha-D-glucose • beta-D-glucose • ribose • an
unnamed saturated fatty acid • a generalized amino acid. At the other end of the spectrum are vertebrate animals that live in desert regions. • In IB exams, boxes are provided for drawings. Another recent finding has allowed scientists to determine the effects of plant hormones on gene expression. This is because methane can be broken down into
other molecules, whereas carbon dioxide is not very reactive and so can stay in the atmosphere for much longer. In addition, g sometimes gets inherited with L, as seen in the recombinants in Figure 10.18. Condensation and hydrolysis reactions in biochemistry are so common that you will encounter information concerning those two types of
reactions throughout your study of biology. When the embryo reaches the endometrium, it has already divided mitotically many times and is a ball of about 100 cells. Skill: Annotate diagrams of the male and female reproductive system to show names of structures and their functions. You might like to refresh your memory of this because, as we
discuss aerobic respiration, which occurs in the mitochondrion, we will refer to parts of this organelle. Usually, a capital letter represents the dominant allele and the lower case letter represents the mitochondrion, we will refer to parts of this organelle. WDMA MDMA and serotonin You may be asked to evaluate data showing the impact of MDMA (ecstasy) on serotonin and dopamine
metabolism in the brain. For example, proteins from a dead organism are broken down into ammonia (NH3) and, in turn, ammonia can have its nitrogen converted into useful nitrates (NO3-) by bacteria. Exocrine gland ducts lead to two general locations of the body. Plaque is composed of lipids, cholesterol, cell debris, and calcium. Each half goes
into a new cell. Remember that compare and contrast means to give similarities and differences between two or more items, referring to both of the endometrium, it is rapidly running out of stored nutrients (yolk). • The receptor on neurone 2 is activated by the serotonin
How much will the course of human evolution be effected by such screening practices? This may not be the only explanation; perhaps there are others. In addition, if populations mix as a result of immigrations, there will probably be a change in allele frequencies. Immature neurones migrate to a final location. Humans. 25 Innate behaviour
increases the chances of survival and reproduction of offspring. C During anaphase I. Three codons have no complementary tRNA anticodon: these are the stop codons. 15 Suggest a reason why glucose does show up in the urine of a person who has diabetes and is not currently receiving treatment for the condition? 

Applications and skills:
Application: Some athletes take growth hormones to build muscles. They found a cluster of compounds related to imidazolopiperazine that is showing great promise. After testing, he confirmed that the crystals were urea.
dioxide. Make sure you practise the drawings that you will be expected to be able to produce in an exam. Debate about genetically modified food is raging. Possible examples are dandelions, docks, and yarrow, but the choice will depend on where you live and when you carry out the lab. Surprisingly, even in the group taking the placebo, there are
usually patients who report that they feel better. In animal models with primates, it has been shown that improvement can be made with intervention. It tells us that, in the exponential phase, natality is low. Koala, camel, human. 15 Compare and contrast the Pseudomonas and the Pseudomonas and the Pseudomonas and the primates, it has been shown that improvement can be made with intervention. It tells us that, in the exponential phase, natality is low.
fatty acids types from the least to the most healthy: saturated fatty acid; unsaturated fatty acid; trans fatty acid; trans fatty acid. Without a sufficient supply of vitamin D and/ or the mineral calcium, it is possible to develop rickets, a disease that leads to deformities in the bones. CHALLENGE YOURSELF The mechanism of breathing is based on the inverse
relationship between pressure and volume (see Figure 6.13). Wood is not the only fuel of biological origin that can be burned: many people living in non-industrialized areas of the world use biomass in the form of animal dung as a source of energy. Notice the difference between anaphase I of meiosis and anaphase during mitosis: instead of the sisternation of the s
chromatids of a single replicated chromosome being pulled apart the way they are in mitosis, the bivalents in meiosis are separated so that each homologous chromosome is pulled to opposite ends of the cell. However, they may use cells to perpetuate themselves. This system is likely to change as more information is analysed. (2) (c) Outline the type
of behaviour that the experimental group demonstrates. 6 Describe how an fMRI is used to identify the role of different brain parts. This is just a small part of the protein is composed of two polypeptides. • Apart
from organisms such as certain types of sharks, cockroaches, and ferns, the majority of living organisms today have no similar form in the fossil record. When the buttle tops to get to the cream; the robins did not. Nerve impulses are
haem group within each. The smells used for the graph shown were baby powder, chocolate, cinnamon, coffee, mothballs, peanut butter, and soap. 23 Why does that make sense? Since the model of DNA was proposed in the early 1950s, DNA research has provided us with great advances, including the ability to detect tendencies for certain diseases
in many organisms, the development of more productive plants and animals to feed a greater number of the world's population, and even the ability to attack certain types of cancer by allowing chemotherapies to be tailored to a specific organism's genetic makeup. From the example of the saltmarsh grass in the Nature of Science box, it is possible to
see that, within a species that has a wide geographical distribution, there can be measurable differences in DNA. The reason for millions of spermatozoa will ever reach the location of the secondary oocyte. Pancreas secretes glucagon into
the bloodstream. 7.1, p. In other words, we have a high level of goodness-of-fit between the theoretical model and the values obtained, and we do not need to worry about the deviation from the expected values, which might be because of unseen and unexpected factors. Figure 8.17 shows oxidative phosphorylation. Early theories were mostly
concerned with phospholipids forming a bilayer with proteins, forming thin layers on the exterior and interior of the bilayer. • Carefully remove the plant and its root system from the soil. • Specialized tissues can develop by cell differentiation in multicellular organisms. Whatever the reason, if a gene pool is modified and the allele frequencies
change, we know that some degree of evolution has happened. Look at the graph and answer the following questions. Although Darwin himself eventually adopted the phrase 'survival of the fittest', the idea of evolution by natural selection is more complex than that. Make sure your instructor checks your set-up before you begin. Thus it acts on the
cholinergic synapses of the body and the brain to cause a calming effect. Evolution and biodiversity But make no mistake, although these two mechanisms for increasing variety (meiosis and sexual reproduction) rely on chance, it would be unfair to conclude that all of life is just a game of chance. Some neurotransmitters are inhibitory. Poindexter, UT
Medical School 739, R.A. Longuehaye 617r, Ria Novosti 155t, 712, Richard R. A family's daily routine involved a significant amount of physical activity to care for the crops and animals. J., Fitzpatrick, D. For this to happen, an article undergoes a peerreview process, which means several scientists working in the same field read the article before it is
published to make sure the methodologies and findings are sound and honest. The following steps outline the method of gene therapy. The same arrangement would also be found in the oesophagus, stomach, and large intestine. Biogas can be stored and accumulated. When a value of C can be established for each species, then we can find the EO or
encephalization guotient: EQ = C/average mammalian value. C r2 = 0.63 or r2 = 0.63 
generally true for enzymes and their substrates: they are specific for each other. A barrier separating populations might be a mountain range or a body of water. Note that when there is great variety between one species and another within a taxon, a range of chromosome numbers is given. However, for other genes, the promoter may very well be on
the other strand. 346 The following table summarizes the four organizational structures of proteins. Answer: into lumpers and splitters. 11.15, p. The atmosphere plays a vital role in regulating the temperature of Earth's surface. Estimates suggest that the level of carbon dioxide in the atmosphere has increased by more than 35% compared with its
our bloodstream and in our body tissues is a different mixture of gases, and once again oxygen is just one component of that mixture. This requires energy. 3 Perform each test according to the directions in the soil test kit. (Total Total 1 mark) 8 Up to two additional marks are available for the construction of your answers. Antibodies are protein
molecules produced by plasma cell leucocytes in response to a specific pathogen. A Change of genetic code in the same species. Her doctor gives her an antibiotic to kill the bacteria. Much controversy about GRCs exists in the world community. Loss of their cubs causes all the females to move into oestrus within 2 weeks. Material not assimilated
Mountaineers who climb high peaks such as Mount Everest typically set up several base camps at increasing altitudes. • The Bohr shift explains the increased release of oxygen by haemoglobin in respiring tissues. 7 Death and excretion. Stem cell research and treatments Recently some very promising research has been directed towards growing
large numbers of embryonic stem cells in culture so that they can be used to replace differentiated cells lost as a result of injury and disease. The basic idea is to cut a few centimetres of stem from a healthy plant and place it into an appropriate medium either sticking up or having it lying flat. myoglobin 90 80 haemoglobin 70 60 50 40 30 20 10 0 0
20 40 60 80 pO2 /mm Hg 100 120 140 757 15 percentage haemoglobin saturation Comparison of adult haemoglobin foetal haemoglobin produced by a foetus is slightly different in molecular composition compared with adult haemoglobin foetal haemogl
It is these proteins that create the extreme diversity in membrane function. • Abnormal blood lipid levels significantly increase the risk of mortality from CHD. To learn more about internal versus external fertilization, go to the hotlinks site, search for the title or ISBN, and click on Chapter 11: Section 11.4. NATURE OF SCIENCE Contraceptive pills
containing relatively high levels of oestrogen and progesterone (sometimes simply referred to as the 'pill') have revolutionized birth control in many areas of the world. Angiosperms Any plant that has a flower is known as an angiosperm. Rhizobium associates with roots in a mutualistic relationship. Josh Huang, at Cold Springs Harbor Laboratory, in
an article published in the Journal of Neuroscience, described the behaviour of neurones making tentative connections with almost every available partner. One example is collagen, which plays a structural role in the connective tissue of humans. A Closed pupil B Open pupil brain brain The pathway of the pupil reflex is shown in Figure 12.13 and
described below. Often errors and misinterpretations of data are spotted when many people read a publication, and this pushes scientists to be more precise and to be better communicators. Restriction enzymes called endonucleases find and recognize a specific sequence of base pairs along the DNA molecule. 6 cytostome anal pore posterior
contractile vacuole Posterior end Paramecium and the functions of life *Safety alerts: Be cautious of sharp objects. 2 Once this activity has ended, remove the electrodes and add several small, but visible, pieces of hard-boiled egg yolk. The largest pool of P is in marine sediment. • NATURE OF SCIENCE Developments in scientific research followed
improvements in apparatus or instrumentation: the invention of the stethoscope led to improved knowledge of the workings of the heart. Biofilms are cooperative aggregates of microorganisms that stick to surfaces like glue. 

Application: Effects of HIV on the immune system and methods of transmission. 

Phosphorous can be added to the
phosphorous cycle by application of fertilizer, or removed by the harvesting of agricultural crops. Some of the hormonal changes are necessary for lactation. Used in this way for humans, a pedigree chart is similar to a family tree, complete with parents, grandparents, aunts, uncles, and cousins. Count a second field of view if time permits. 631 13
Option B: Biotechnology and bioinformatics REFERENCE: this tells you the names of the authors who have put information about this protein in the database. Improvements in technology have allowed researchers to do a better job in finding, identifying, and treating disease. When you have mastered this diagram, study the bottom diagram of the
contracted sarcomere and draw it so that the myosin aligns directly with the myosin of the first diagram. • DNA is a double helix made of two antiparallel strands linked by hydrogen bonding between complementary base pairs. How many times have you been told to 'eat up your vegetables'? Some larger cells also have infoldings or outfoldings to
increase their surface area relative to their volume. Causes and consequences of jaundice is a condition characterized by having too much bilirubin circulating in the bloodstream and thus within the body tissues. left cerebral hemisphere right cerebral hemisphere central cortex corpus callosum Each side of the cortex is divided into further
sections depending on the activity that it performs. Glucose is stored as glycogen in liver and muscle cells, and later can be reconverted back to glucose. Most of these reactions are being catalysed by enzymes. The myofibrils are where the contractile units called sarcomeres are found, dominated by the proteins actin and myosin. This can be
calculated with a special micrometre, or on a light microscope with a simple ruler. It should be exciting to think that you are the expert. Saprotrophs Organisms called saprotrophs live on or in non-living organic matter, secreting digestive enzymes and absorbing the products of digestion. We will need these sequences later when we explore sickle cell
disease. For example, the ABO blood type has three alleles and four possible phenotypes. The impulse does not travel in the opposite direction because neurotransmitter molecules cannot be released from the dendrite end of neurones, and the 'message' would simply stop at that point. A termite builds a characteristic mound. Diffusion cannot do this
thus active transport is required to pump ions to their resting potential positions. The same process happened for dozens of other species of moth. 31 The development of altruistic behaviour as acted upon by natural selection can benefit all individuals involved in the long term. • Skill: Use of a chi-squared test on data from dihybrid crosses. 8 Explain
how a population of insects could develop resistance to the insecticides sprayed on them. Whether organisms are extremely large, it is vital we understand their smallest functional units. • You will see a page that is only about HBB human. • You will see a page that is only about HBB human.
crosses involving unlinked autosomal genes. When you study a process such as how allergy symptoms develop, you do not know the process well until you can 'verbalize' the information without written guidance. Why can't IPCC just make up its mind and say that something is sure to happen? Kinesis is a movement in response to a non-
directional stimulus, such as humidity. 25 Explain when cytokinesis occurs within the cell cycle. Non-competitive inhibition involves an inhibitor that does not compete for the enzyme's active site. The pupil of your eye constricts (gets smaller) to protect the retina, caused by contraction of the circular muscles of the iris. The
ultimate example of emergence is a collection of inert (non-living) molecules that is capable, when functioning together, of creating a living entity that demonstrates the functions of life. Conversely, those areas of the world that are showing an increase in the number of people smoking are showing an increase in the incidence of lung cancer. • There
is no interference from the experimenter. Nitrogenous waste products and excretion The blood plasma of an animal is a constantly changing solution. These differences have arisen in just 30 generations. bird Figure 12.15 More intelligent animals have more highly developed cortical surfaces. There is one other way that genetic variation is also
promoted: fertilization. Before that, the drug could only be obtained from sweet wormwood plants. Spermatozoon) occurs within the testes. (c) What would the amino acid sequence be if the first cytosine of the mRNA molecule was
replaced with a uracil? The motor neurone is the thin filament coming in from above. The stimulant drugs given have some undesirable side-effects and uncertain long-term effects. Is the loss of life for some patients participating in trials necessary in order to find a cure? As we saw earlier in this chapter, homologous characteristics are ones derived
from the same part of a common ancestor. If a molecule affects an active site in some way, the activity of the enzyme may be altered. The alimentary canal begins with the mouth and ends with the anus. However, the use of invertebrates in such experiments has ethical implications. The percentage of reef cover by each type of algae was a measure of
their success. Choose one, and try to imagine someone saying to you, 'That's not true! How can you say that?' How would you respond to that person? Many doctors order further tests in order to confirm brain death. Look at the chart of EQ quotients (Table 12.4). In the pools of acidic water that can be found on these wetlands, certain types of
organisms can be found that are not found anywhere else, such as some species of aquatic beetles. All of these activities result in new knowledge that did not previously exist or a new skill that you did not originally possess. Median Simply put, the median is the number in the middle. The conformational changes and induced fit are the result of
changes in the R-groups of the amino acids at the active site of the enzyme, as the enzyme interacts with the substrates. Most drivers prepare for the test over 34 months by practising the routes on a moped. Protein-coding genes Within the DNA molecule of a chromosome are the single-copy genes that have coding functions.
Guidance Students should know at least one example of a benefit to living organisms of each property of water. Use your class data, if it is available, to determine whether the yeast has shown the sigmoid growth curve that would be expected based on the theory of population growth over time. Here is an example of
scientific knowledge in biology: 'The organelle in a plant cell that is responsible for photosynthesis is the chloroplast'. The result is a mass of abnormal cells referred to as a tumour. The best explanation at present for the movement of phloem sap is the pressure-flow hypothesis. For example, suppose the height of bean plants grown in sunlight is
measured in centimetres (cm) 10 days after planting. The regions of organization are called photosystems and include: • chlorophyll a molecules of organization are found throughout the text. Ribosomes can be seen with an electron microscope. Each acetyl-CoA molecule enters into a series of
reactions called the Krebs cycle. During periods of high stress or excitement, your adrenal glands secrete epinephrine into the bloodstream. • PSA for prostate cancer: tests for this biomarker look for elevated levels of prostates periods of high stress or excitement, your adrenal glands secrete epinephrine into the bloodstream.
to carry out the metabolism of each cell. This would change the composition and the structure of the resulting protein, in the same way that changing the shapes and compositions of some of the bricks used to build a house would change the structure of the resulting protein, in the same way that changing the shapes and compositions of some of the bricks used to build a house would change the structure of the resulting protein, in the same way that changing the shapes and compositions of some of the bricks used to build a house would change the structure of the resulting protein, in the same way that changing the shapes and compositions of some of the bricks used to build a house would change the structure of the structure of the structure of the structure of the bricks used to build a house would change the structure of the stru
proplastid. In this monohybrid cross looking at round peas versus wrinkled peas, Mendel expected a ratio of 3:1. 212 NATURE OF SCIENCE Climate change raises many issues about how science works. Psychologists have accused ethologists of ignoring the concepts of learning and motivation and placing too much emphasis on instinct. Seven of
these genes were examined in a hybridization experiment and three were found to be prostate specific. When the line intersect is at 0, the oxygen generated by photosynthesis is equal to the oxygen needed for cell respiration. The gene chip is spotted (marked) in precise locations with single strands of thousands of short, single-stranded, known DNA
in a grid-like pattern. • Substances can be hydrophilic or hydrophobic. DNA testing would clearly show that second cousins have a more distant common ancestor than siblings do. Two Dutch eyeglass makers, Hans Jansen and his son Zacharias Jansen, in the 1590s, produced the first compound microscope by putting two lenses together. Only
chemical energy can be used by the next trophic level (see Figure 4.2), and only a small amount of the energy is transformed into heat. Vascular tissue leading that an organism absorbs is converted into chemical energy is transformed into heat.
Where does the truth lie? They are not about the thing we want to know, they are about how we know it. Chillmaid 4b, 583b, 108 l, Mary Martin 46b, Matt Meadows 673, Medical Body Scans 761, Medical Images, Universal Images Group 760, Mehau Kulyk 278tl, Michael W. Because microorganisms are so metabolically diverse and have a fast
growth rate, they can be invaluable to us. Figure 6.3 Artwork showing the pancreas and pancreatic ducts leading to the plant, not just the stem. As you saw in Section 3.5 on genetic engineering, any gene from any organism
can be mixed and matched with DNA from other organisms to generate a certain protein. This is shown in the model below. • Add a colourless substrate. 342 Once initiation is complete, elongation occurs. (d) Which genus possesses characteristics that evolved more recently, Digitalis or Plantago? They are not carrying out respiration and have a low
metabolic rate. Analysis of zones of DNA markers such as the nuclear ribosomal internal transcribed spacer (ITS) region has revealed that the old classification system was not monophyletic, meaning the taxa did not share a most recent common ancestor. D During prophase II. This material has been developed independently by the publisher and the
content is in no way connected with or endorsed by the International Baccalaureate (IB). For example, a horse and a zebra, or a donkey and a zebra, can mate and produce offspring that are called zebroids. Many of these interactions are explained by the usually ephemeral (short-lived) attractions between either two water molecules or between water
and another type of charged atom (or ion). 3 Determine the gametes that the parents could produce. This jelly-like group of tissues, weighing 1.4 kg, produces our thoughts, feelings, actions, and memories. Polar and non-polar amino acids are important in determining the specificity of an enzyme. Plasmid DNA is not required by the cell under normal
conditions, but it may help the cell adapt to unusual circumstances. 13 Why are enzymes considered to be catalysts of reactions? Microorganisms growing in a biofilm are highly resistant to antimicrobial agents. In effect, the microscope revealed that there is an entire world of invisible organisms living throughout the biosphere. 343 07 Nucleic
acids Now that we have concluded our discussion of cellular protein synthesis, it would be helpful for you to summarize the major events in a table. The upper two arms contain identical binding sites for a single antigen. This is why variety is so important to natural selection. To determine whether an individual is AA or Aa, we have to look for
evidence that the recessive gene was received from an albino parent or was passed on to the individual's offspring. Figure 7.6 Semi-conservative replication fork bubble replication means that each parental DNA molecules are formed. They are
transposable elements, which means they can move from one genome location to another. The triplet bases of the mRNA codon form complementary base pairs with the triplet anticodon of the tRNA. Now average your the results. Examine Figure 8.6. 355 08 Metabolism, cell respiration, and photosynthesis Vmax A V Figure 8.6 Enzyme inhibition. In
other words, every natural event can be explained by the interactions between atoms and molecules. The adult form of animal cells is rarely haploid, but there are exceptions, for example male bee, wasp, and ant cells are haploid. two strands of the DNA that have not been unzipped yet 133 03 Genetics CHALLENGE YOURSELF 5 Scientists have long
rejected or accepted using the rules shown in Figure 10.23: c2 calculated < c2 critical < c2 critical < c2 critical shown in Figure 10.23. The rules for applying 2 values
However, you should always think critically about any definition: at first glance it may appear to be straightforward, but on closer scrutiny it can be cause for debate. Most of this research is centred on ageing and cancer. If you know how to answer genetics problems about sex-linked traits for the biology exam this year, you might not remember how
to do them next year without some more revision. We call this the visible portion of the spectrum. P P Figure 8.8 The second stage of glycolysis. Their low density is achieved by having hollow bones. For example, an organism that is well adapted to its environment is not guaranteed success, it simply has a higher probability of survival than another
that is less well adapted. Heat of vaporization is the amount of heat required to convert a unit mass of liquid into vapour with no increase in temperature. Let's end our discussion of this essential-to-life process by looking at a table showing the parts of the mitochondrion and how those parts allow cellular respiration. The problem is, each cell only
produces a relatively small number of antibodies in comparison with the massive infection that may be present in the body. Exercises 7 If you removed the apical meristem from a typical plant, what would be the effect on further plant growth? Also, the potometer must be assembled under water, again to prevent air bubbles in the apparatus. The goal
of GM crops is to overcome environmental resistance to increase crop yields. In other words, we regulate the pathway by changing the genes that control the pathway by changing the genes that control the pathway. 584 Archaea Eukaryote Eubacteria Figure 13.6 The three domains for classifying living organisms. If isoleucine is added to the growth medium of E. Some biologists call it the
transpiration- cohesion-tension mechanism, while others call it simply the cohesion-tension theory. Wöhler did not fully appreciate the meaning and consequences of his findings at the time, but, as it turned out, his published work was soon used as evidence that vitalism should be questioned as a scientific theory. The nutrients within the ovum are
collectively referred to as yolk. A GM plant has been modified with the introduction of a gene that does not normally occur in that species. 2 What part of the bacteriophage is actually inserted into E. H2O + Do you use cellulose in your life? The ECM allows cell-to-cell interactions, possibly altering gene expression and enabling the coordination of cell
actions within the tissue. Even if one generation of hybrids is produced, a second generation is highly unlikely. • The hypothalamus maintains homeostasis, coordinating the nervous and the endocrine systems. basal ganglia High concentrations of cannabinoid receptors are found in the areas of the brain shown in Figure 12.45. This shows how
important reabsorption is. Such fluctuations happened long before humans started producing excessive greenhouse gases. • The number of genes in a species should not be referred to as genome size as this term is used for the total amount of DNA. • Processes in spermatogenesis and oogenesis result in different numbers of gametes with different
amounts of cytoplasm. However, when it behaves as a predator and ingests a green alga, it switches its method of fulfilling its nutritional needs to one that uses sunlight to convert organic molecules, a process known as photosynthesis. Why? The ideal population is in dynamic equilibrium at the carrying capacity of the environment (the plateau on the
graph). Insisting that climate change is caused by human activity means that, to solve the producers make 10 000 kJ m-2 yr-1. Crop rotation involves hereditary molecules that can be passed to offspring. The sugar differs in the nucleotides of DNA and RNA. In an ecosystem, the producers make 10 000 kJ m-2 yr-1. Crop rotation is solve the producers make 10 000 kJ m-2 yr-1.
the process whereby a series of different types of neurotransmitters (NTs) are found in the brain: • fast-acting NTs, which have an effect on the target cell in hundreds of milliseconds or can take up to
a minute. 2.4 Proteins have a very wide range of functions in living organisms. This is how science grows and progresses and, without such a system, we would be intellectually stuck. There are four places where a match does not occur. 361, Copyright © 2009 Wiley, reproduced with permission of John Wiley & Sons, Inc.; Figure 11.32 adapted from
One such division separates cells into two groups: prokaryotic and eukaryotic cells. All domestic dogs are the same species Domesticated dogs are the same species can be incompatible blood just as if it was a virus or bacterium. Biopharming of antithrombin Transgenically derived
therapeutic proteins are necessary for genetic disorders such as haemophilia. Because of its high rate of metabolism, glucose is used up rapidly by neurones during mental activity. • The auxin and a receptor in the nuclei form a complex that activates a proton (hydrogen ion) pump. However, birds can also learn to improve the song they have
inherited. Light microscopes use light, passing through living or dead specimens, to form an image. In humans there are 23 pairs with more than 8 million possible orientations. The actual attachment of the amino acid and tRNA requires energy that is supplied by ATP. A metabolite is a product of a biochemical pathway. Is it widely accepted as being
true? The fields of wheat could be the start of a food chain that consists of field mice, snakes, and hawks. The sympathetic system increases both the heart and the stroke volume (the amount of blood pumped by the left ventricle in each contraction) of the heart and the stroke volume (the amount of blood pumped by the left ventricle in each contraction) of the heart.
the capillary bed. • 134 Producing four haploid nuclei The wast majority of cells in a person's body each contains 46 chromosomes. 472 Water The movement of salt ions out of the filtrate and into the tubule cells, intercellular fluid, and peritubular capillary bed, induces water to follow the same route by osmosis. Eventually it will cluster them on a
that is used for haemoglobin is Hb4. Is it a falsifiable idea? The centre of this process is the ribosome. For example, in the case of cystic fibrosis, let's call F the allele that leads to healthy production of mucus and f the allele for cystic fibrosis, let's call F the allele for cystic fibrosis, let's call F the allele that leads to healthy production of mucus and f the allele for cystic fibrosis. This is because the original double-stranded molecule had complementary pairs of nucleotides and it was the
complementary nucleotides that used the unzipped single-stranded areas as templates. The overall process of photosynthesis During the discussion on respiration, we considered the means by which the cell breaks down chemical bonds in glucose to produce ATP. These were eventually called cyclins. 4 Formulate a hypothesis as to why this is
occurring. In this chain, electrons pass from one carrier to another because the receiving molecule has a higher electronegativity and, therefore, a stronger attraction for electrone glands produce and secrete hormones. As
an axon is like a long fibre, these axons are sometimes referred to as myelinated fibres. • The Skinner box makes it easy to study operant conditioning. Figure 6.23 Negative feedback control of blood glucose level. The part of the brain that improved shoulder movement took over the movement of the hand. Enzymes are protein molecules that have a
specific shape into which a reactant(s) can fit, at a molecular location called the active site of the enzyme. The resulting 6C molecule then goes through a series of reactions in which two carbons are lost in the form of carbon dioxide. This is referred to as a net gain of two ATP minus the two ATP needed at the start). • Death rates
from CHD have fallen by 45% for people under 65 years of age in the last 10 years. coloured end product Microtitre plates. They are released into the cerebrospinal fluid and modulate the fast-acting neurotransmitters in the brain. The most visible structure with a microscope capable of high magnification is the chromosome or a molecule of DNA.
To obtain data for the chi-squared test, an ecosystem should be chosen in which one or more factors affecting the distribution, such as cytoplasm or blood plasma, the amine and carboxyl functional groups ionize, as shown in Figure 2.20. • • Applications and skills:
Application: Smallpox was the first infectious disease of humans to have been eradicated by vaccination. Slow movement is likely to keep the organism in the environment that it prefers. Two standard deviations from the mean (the dotted and the cross-hatched areas combined) contain about 95% of the data. Above a certain number would be
considered a positive drug test. The ends of the bones within the capsule are also coated with cartilage in order to cushion any bone-to-bone contact. Bacteria such as Pseudomonas denitrificans use NO3- instead of oxygen as the final electron acceptor. C. 8 length (in) Figure 14.42 Demographic 100 90 80 70 60 50 40 30 20 10 0 weight (lbs)
Harvesting strongly affects long-lived fish such as the black grouper, Mycteroperca bonaci, which lives to a maximum age of 33 years. The neurones of the brain try to form a synapse with any nearby target cell, and then attempt to test out the connection. Two microorganisms that are commonly used are a bacterium, Agrobacterium tumefaciens, and
 a virus, the tobacco mosaic virus. TMV. Absorbing the carbon dioxide allows an accurate measurement of oxygen exchange. The goslings imprinted on him and followed Lorenz around the farm. • Many different slow-acting neurotransmitters modulate fast synaptic transmission in the brain. 20 If microorganisms tolerate a water temperature ±15°C
that of ballast water, then what percentage of microorganisms sampled could tolerate that new environment? This technique takes away the role of chance because the experimenter knows exactly which pollen. 2 Seal a cover slip on each slide with a ring of petroleum jelly. Look again at the complete Krebs cycle (Figure
8.14) and note the following products that result from the breakdown of one glucose molecules of FADH2 • 4 molecules of FADH2 • 4 molecules of FADH2 • 6 molecul
difference in colour vision. The two resulting haploid cells are not even close to being equal in size. Dry chamber Control chamber Controls 10 30 20 Means of two trials and controls 5 15 10 10 Trial 2 5 15 10 10 Sums of two trials and controls 5 15 10 10 Trial 2 5 15 10 10 Sums of two trials and controls 5 15 10 10 Trial 2 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 10 Sums of two trials and controls 5 15 10 Sums of two trials and controls 5 15 10 Sums of two trials and controls 5 15 10 Sums of two trials and controls 5 15 10 Sums of two trials and controls 5 15 10 Sums of two trials and controls 5 15 10 Sums of two trials and controls 5 15 10 Sums of two trials and controls 5 15 10 Sums of two trials 3 Sum
(means) 6 Graph the mean values from the two trials. 351 08 Endergonic reactions are said to occur when the products of a chemical reaction have more energy than the reaction have more energy than the reactions are said to occur when the product, is released from the active
site. The behaviour was studied and recorded under three different water velocities (expressed in cm s-1). The type of reaction that breaks down complex organic molecules with the release of energy is called catabolism. Therefore, complementary strands mean different codons, different amino acids, and, finally, different proteins, 1982), p.392.
Copyright © 1982 by James L. The central nervous system (CNS) consists of the brain and spinal cord. The vessel was designed to mimic the shape of a leaf: thin and broad. This gene may be involved in prevention of skin cancer. Several spermatozoa gain access to the zona pellucida (a glycoprotein gel layer) surrounding the secondary oocyte and
release the hydrolytic enzymes contained in their acrosomes, an event simply called the acrosome reaction. The y-axis is quantitative, but the x-axis shows categories rather than incremental numerical values. In addition, some cells do not contain a nucleus and have no chromosomes to show, such as red blood cells. 1 A specific protein binds to three
intracellular sodium ions. The mean shows the central tendency of the data. Skill: Separation of photosynthetic pigments by chromatograph. 123 03 Genetics There is another international connection with the Human Genome Project in the sense that this project is a good example of scientists from all over the world working together. Biofilms are
very resistant to antimicrobial agents. Within the cytoplasm of the ovum are many small vesicles called cortical granules; they are located all around the interior of the plasma membrane.
evolution The fossil record is far from complete, but the science of breeding domesticated animals, for example cattle, horses, dogs, sheep, and pigeons, provides a good record of recent changes in heritable characteristics. Next the person is given a period of training: the musical note is sounded immediately before a hand is waved in front of his or
her eye. Discuss the limits of scientific knowledge. The simplest way to see a difference is to subtract the 'after' value, V1. Would it be a curve or would it be linear? Where do you stand in the debate about the nature of stem cell research? coli will significantly lower the cost of the drug. The image on page 285 shows blood
cells trapped in fibres of fibrin. Some of the carbon from the giraffe's body will go back into the atmosphere as carbon dioxide when the decomposers perform cellular respiration. Interestingly, all organisms, whether unicellular or multicellular, carry out all the functions of life. Foetal haemoglobin dissociates this oxygen only when it reaches the
respiring tissues of the foetus. If one of the plants died early and had a height of only 0.5 cm, it would be considered to be an outlier. Diagram of retina should include rod and cone cells, biopolar neurones, and ganglion cells. Seeds of
dicotyledonous plants usually contain the parts shown in Figure 9.22. Research is ongoing into the use of transferrin as a delivery vehicle for anticancer drugs. Urine and faeces, for example, contain 182 nitrogen compounds, which is why farmers often put animal manure on the fields where they grow crops. 3 Industrial nitrogen fixation. He has
called his research programme the 'rewalk' programme. 253 05 Evolution and biodiversity Mammals include animals such as foxes, hippopotamuses, squirrels, and camels, and came
humans This drawing shows a fat cell (adipocyte) becoming larger as lipids are stored in it. Homeostasis is a term used to describe the body's ability to maintain a stable internal environment. Skill: Measurement and interpretation of the heart rate under different conditions. Thanks to crossing over, G sometimes gets inherited with l. This
recognition is based on the protein molecules that make up part of the surface of all cells and viruses. Figure 9.23 Stages in the germination of a bean seed, Phaseolus vulgaris. Drugs can change synaptic transmission in the following ways (see Figure 12.43): • block a receptor for a neurotransmitter (the drug has a structure similar to
neurotransmitter) • block release of a neurotransmitter (when drugs have the same chemical structure as the neurotransmitter, they have the same effect but are not broken down as easily, so the effect is stronger
because they stay longer in the synapse) • block removal of a neurotransmitter from the synapse and prolong the effect of the neurotransmitter. • The ultrastructure of the glomerulus and Bowman's capsule facilitate ultrafiltration. 340 SECOND POSITION U C Phenyl alenine U Serine Lencine A G Tyrosine Cysteine Stop Stop A Stop Tryptophan G
FIRST POSITION Proline Arginine Glutamine A Isoleucine Asparagine Serine Lysine Alginine C THIRD POSITION Lencine U U Histidine C Table 7.4 The genetic code. The 5 ends of free RNA nucleotides are added to the 3 end of the RNA molecule being
synthesized. Thus each individual is said to have a unique proteome as well as a unique genome. • Incorporate the cloned gene into the virus that will deliver the gene • Remove cells from the patient that contain the defective gene. It could be argued that she's not hurting anyone and that it's lots of fun to have these sayings in our culture.
Guidance • Examples of stimulants are nicotine, cocaine, or amphetamines, Ecology Ecosystems The term abiotic refers to components of the environment that are non-living, such as water, air, and rocks, Primer T T Primer C G G T C G T A G A A G 5. Non-polar amino acids are found in the regions of proteins that are linked to the hydrophobic area
of the cell membrane. • Energy released by oxidation reactions is carried to the cristae of the mitochondria by reduced NAD and FAD. In photosystem II and Photosyste
function. Because THC mimics anandamide, it inhibits the neurones that anandamide inhibits, but there probably isn't an enzyme for breaking down THC in the synapse. This chemical reaction generates a small amount of heat in each of the grasshopper's cells. As it is released it can be absorbed by the roots of plants or washed into rivers. Some
marine mammals, such as whales, orcas, and dolphins, might resemble fish but are not, one reason being they have articulated bony fingers inside their fins. Turgor refers to the pressure in a cell that liquid exerts on the membrane and/or cell wall. • Once iron has been removed from the haem group, what remains of the molecule is called bilirubin or
bile pigment. • Next to the % is the Accession code for this gene, HQ166716.1. Click on the Accession code and a window will open that will give you lots of information about the gene. Notice how, unlike other 'tree' diagrams, there is no summit on this circular diagrams. By taking the acid-reducing drug(s) known as proton pump inhibitors (PPIs), the
resulting decrease in acid production allows the irritated tissues to heal. Sense organs are the windows to the brain. Thomas Hunt Morgan. But that would not be scientific because there is no evidence for it. The problem is that these two ions are on the opposite side of the membrane in relation
to where they need to be for the resting potential. • DNA replication is carried out by a complex system of enzymes. However, one problem discovered early on in stem cell research was that stem cells cannot be distinguished by their appearance.
steroid contamination fish species with lowered egg production and other species of animals with sex determination (breathing)? Human activities contribute to the production of other greenhouse gases. Appetite is the desire to eat. These proteins are
called conjugated proteins. Females are looking for males with the most riggered into action by the two pancreatic hormones, insulin and glucagon. The Rh protein was first discovered in rhesus monkeys, hence its name. A person's height,
for example, is determined by whether he or she inherits genes for tallness, but it also depends on the person's nutrition as he or she is growing. The protons follow the electrons to produce water. In the case of genetics exercises, the expected results would be the proportions of phenotypes as determined by a Punnett grid, such as 25%/50%/25% or
25%/75%, although it is important to use the actual numbers of offspring rather than percentages or ratios. In 1822, an American physician by the name of William Beaumont saved the life of a Canadian trapper who had suffered a shotgun wound at close range. All of this is necessary for that local area of the membrane to be ready to send another
impulse. For example, phosphorous forms part of ATP, RNA, DNA, and phospholipid molecules. For example, if pollen from a northern species of marsh grass was used to pollinate flowers from a southern population, and no seeds or fertile offspring were produced, a speciation would have taken place. Plants commonly known as figworts used to be
classified in the family Scrophulariaceae, and many of them have been used in herbal medicine. To do this, look in the left-hand column of Table 2, headed 'Degrees of freedom', then look across to the given t-values. These devices may work at a cellular level or at a whole-organism level. ovaries NATURE OF SCIENCE Hormones produced by your
thyroid need the element iodine for their structure. The amino acids are connected by peptide bonds Secondary Folding of the polypeptide chain into an -helix or a -pleated sheet. Write on or label the final drawing in black ink. 

Clotting factors are released from platelets. Table 9.4 shows differences in angiosperms based on morphological traits (see
also Figure 9.20). These animals are very restricted to living in only those environments to which they are iso-osmotically matched. The feedback control that is involved is called positive feedback. 2011), Copyright © 2011, with permission from
Elsevier; Table on page 765 adapted from Carbon dioxide transport and carbonic anhydrase in blood and muscle, Physiological Reviews, 80, 4 January, pp. D Two different species of a di
photosystems work together to bring about a non-cyclical electron transfer. When there is a higher concentration of a mineral dissolved in water outside the root cells. 130 percentage of prefeeding weight Food sharing appears to be altruistic. The iris
contains two sets of smooth muscle to open and close the pupil like the aperture on a camera. • An axon grows from each immature neurone in response to chemical stimuli. As a result, sexual reproduction is a much more powerful source of variation in a population because thousands of genes are mixed and combined. The conditions required for
nitrification are: • available oxygen (the reaction is aerobic) • neutral pH (preferred by the two bacteria). In contrast, because the light-coloured moths were being spotted and eaten, they could no longer pass on their genes to the next generation. When it is intense, ocean acidification leads to the
death of coral polyps and algae, and when they die the reefs are not built up anymore. Because it can be difficult to find a meal, 30% of bats in a cluster (group of bats) fail to find food in any given evening. All of the covalent bonds within methane are non-polar and so methane is a non-polar substance. Prokaryotic cells are much smaller and simpler
than eukaryotic cells. If the males of one population has a version of a courtship display that is significantly different from another population, the females may not find the males of the other population has a version of a courtship display that is significantly different from another population, the females may not find the males of the other population has a version of a courtship display that is significantly different from another population, the females may not find the males of the other population has a version of a courtship display that is significantly different from another population has a version of a courtship display that is significantly different from another population has a version of a courtship display that is significantly different from another population has a version of a court from another population has a version of a court from another population has a version of a court from another population has a version of a court from another population has a version of a court from another population has a version of a court from another population has a version of a court from another population has a version of a court from another population has a version of a court from another population has a version of a court from a version of a v
reflex arc should include the receptor cell, sensory neurone, and effector. The mosses, liverworts, and hornworts that make up the bryophytes do not produce flowers or seeds. These different forms allow for a single trait, such as the trait for the ability to see in colour, to have variants, in this example either colour or
grey-scale vision. As electrons are negatively charged and the nucleus of an atom (because of the protons) is positively charged, any electrons that are shared equally create a bond and, because the charges cancel, this is called a non-polar covalent bond. This provides the energy necessary for the chemical bonding of the nucleotides. They are
designed to be challenging and to make you think. To adapt or not to adapt? Just as you would not (or should not) file your history notes in your maths folder, so biologists do not put birds in the same category as mammals. • Genetically disable the virus so that it cannot affect other tissues. Glucose is a carbohydrate, the phospholipid molecules are
lipids, both insulin and the membrane channels are proteins, and DNA is a nucleic acid. (1) (b) Describe the effect of previous exposure to the odour on the flight of bees. 14 Explain why the primary level of protein organization determines the other levels. G0 is a non-growing state and certain cells stay in G0 for varying periods of time. One example
of cell exocytosis involves proteins produced in the cytoplasm of a cell. Golgi apparatus stores, modifies, and packages proteins. How is this a new paradigm of how paraplegics are viewed? The dried dung of domesticated animals such as cows can be burned and used for various purposes, including cooking. Figure 3.24 is a grid with the parents'
gametes. Transferrin only locates the cancer cells. Skill: Drawing molecular diagrams of glucose, ribose, a saturated fatty acid, and a generalized amino acid. light intensity distance to the light. Solutions When asked to differentiate between competitive and noncompetitive inhibition curves on a graph, look to see if Vmax is achieved
as the substrate is increased. Sunlight is the initial source of energy for all vegetation. 111-116 (Zimmer-Faust, Richard K. It most typically occurs in babies who are born prematurely because their livers are not yet capable of fully processing the bilirubin into bile. In Figure 3.31, showing a family that has cystic fibrosis, the parents James and Helen
are carriers (Ff). 4 Why is rickets (a disease cause by insufficient intake of vitamin D) unique to children? Pitocin is recognized by receptors of the uterus as oxytocin. In what ways might these metaphors be useful? THC binds to the same receptor as anandamide (sometimes called cannabinoid receptors). Overview of the respiratory system Our lungs
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act in concert with our heart and blood vessels to ensure that body cells are well supplied with oxygen and are able to give up carbon dioxide. The human body has no storage mechanisms for amino acids, so essential amino acids must be a part of your regular diet. The standard version of this gene (the standard allele) allows a person's mucus-

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producing cells to function properly, whereas an allele generated by a mutation of the CFTR gene causes cystic fibrosis. The nutrients stored within the ovum have been used for metabolism, not for growth. 2 Would any leaf from any plant have each of the pigments that are present in spinach or kale? Gap junctions are protein-lined channels that
allow direct transmission of the nerve impulse from cell to cell so that cells contract in unison. For a viral vector to work, it has to be genetically engineered so that it will not produce disease or spread throughout the body and infect other tissues. • The sensory neurones carry the impulse towards the spinal cord. Think about walking barefoot on
light-coloured cement on a hot and sunny day, compared with walking barefoot on black asphalt on the same day. Accessing is the retrieval of stored memories. Exercises 25 Explain why a blue object appears to be blue to the human eye. Although the two countries share a common genetic heritage, the geopolitical split at the end of World
War II has led to vast differences in the standards of living between them. The second principle continues to gain support today, because so far no one has been able to find any living entity that is not made of at least one cell. 70 Polyunsaturated fatty acids Polyunsaturated fatty acids have at least two double bonds in the carbon chain. Plants need
ATP for various biochemical processes, but the level is typically far lower than any animal needs. centromeres have divided and the chromatids have become chromosomes Figure 1.32 The cell is now in anaphase. • beer • soy sauce • many more. So, for the organism, this energy is 'lost'. (b) Explain how it is possible that now, in the 2000s, the
population is back to being light-coloured. Another series of experiments was carried out in the 1960s. Ribosomes occur in all prokaryotic cells and they function as sites of protein synthesis. The resulting fertilized ovum is now referred to as a zygote. Rather, they feed by pumping water through their tissues to filter out food. Those simple fertilized ovum is now referred to as a zygote. Rather, they feed by pumping water through their tissues to filter out food. Those simple fertilized ovum is now referred to as a zygote.
sugars can then be transformed into complex carbohydrates to make cellulose, to build up plant cell walls. Exercises 11 Describe the functions of the three types of RNA involved in the translation process. Many private clinics have opened in the last couple of decades that offer medical assistance for reproduction. hydrophilic phosphorylated alcohol
heads hydrophobic region of fatty acids hydropholipid molecules behave in two layers. The following table will give you an idea of what organisms provide good models for particular studies, and why. The degree of fat accumulation affects a person's
body mass index (BMI) and determines whether someone is obese, overweight, or neither. We talk about the energy needed to run our modes of transport. When a female child is born, her ovaries contain nearly a half million primary follicles. When energy is not available from ingested carbohydrates, lipids, or proteins, the body's metabolism begins a
series of reactions that digests body tissues for energy. In some brain-dead patients, a short reflex motion can still be exhibited if the hand or foot is touched in a certain manner. Ventilation maintains concentration gradients of oxygen and carbon dioxide between air in alveoli and blood flowing in adjacent capillaries. protein + (many) water (many)
amino acids 57 02 Molecular biology Condensation reactions are, in many ways, the reverse of hydrolysis reactions. How can we be sure that modern scientific studies are free from fudged data? • Fusion of a tumour cell with an antibody-producing plasma cell. A mouse expressing GFP under ultraviolet (UV) light. Look at the
bar chart and answer the following questions. Until fairly recently, the answer to that question was thought to be no. The data have been criticized, questions have been reiticized, questions to the photos of moths trying to rest or hide on tree trunks have been revealed as being
staged: they are of dead moths stuck to the trunks for the purpose of the photo. Primer ddG? Table 2.5 The functions of major polysaccharides 
stored in plants as starch, typically as starch granules in chloroplasts or in plant storage areas such as roots or root structures Glycogen Animals store excess glucose in this form. The glucose concentration in the hepatic portal vein ware
of what is going on in the outside world. This could be a possible topic for discussion in your biology class or TOK class. Oxidation and reduction In Chapter 2 the general processes of respiration and photosynthesis were discussed. Adenine should be shown paired with thymine, and guanine with cytosine, but the relative lengths of the purine and
pryimidine bases do not need to be recalled, nor the numbers of hydrogen bonds between the base pairs. The products of the light-dependent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are ATP and NADPH, which are needed to allow the light-independent reaction are needed to all
London taxi drivers have to pass an extensive test on 320 standard routes throughout the city before they can start working. The plasma membrane is largely composed of a type of lipid called a phospholipid. If the example was about plants that produce hundreds of seeds, the results could be interpreted in the following way: 50% of the offspring
should be Aa and the 50% should be aa. Going back to the question at the start of the chapter, about what you would bring to the Moon to live there, would you have listed decomposers? Other enzyme-catalysed reactions carry out the reverse: they convert small, simple molecules into a larger, more complex molecules. The efforts of these research
facilities may one day greatly increase the availability of food resources for the world's hungry human populations. (c) Identify the numbered arrow that indicates when bipedalism completely replaced walking on four legs. As soon as ventricular systole begins, the pressure inside the ventricle increases to be greater than that in the atrium, so the
atrioventricular valve closes to prevent backflow to the atrium (this creates the 'lub' sound that can be heard with a stethoscope). After a stroke resulting in weak hand movement in monkeys, the monkeys that did exercises with food rewards improved more rapidly than those that did not exercise. It works like this. When the antiqens entered your
bloodstream, they would cause antibodies to be produced that would give you immunity. This pathway also begins with glycolysis, and thus has a net gain of two ATP as well as generating two pyruvate molecules. It is true that the universal indicating that it is used in the vast majority of organisms on Earth) only encodes 20
The manipulation of genes raises some challenging questions. The variety in gametes comes mainly from the process of random orientation during metaphase I. Plasma proteins produced by the liver must also be secreted from hepatocytes. Answer the following questions. O C4 C1 nitrogenous base C3 C2 P Pentose Base It is important to note that in
the diagram circles are used to represent phosphates, pentagons are used to represent 5-carbon sugars (also called pentoses), and rectangles are used to represent nitrogenous bases. This theme is explored well in Syndey Lumet's 1957 film Twelve Angry Men. However, their main function If there is no compartmentalization within prokaryotic cells,
chemical reactions are not isolated from one another. After applying the pressure cuff to the upper arm and inflating the cuff, the systolic and diastolic pressures are given by a digital readout. This diagram of a section of DNA represents an amazing molecule that is capable of coding for all the major characteristics of the unbelievably large number of
organisms that have existed and that do exist on our planet today. The cholesterol molecules allow membranes to function is where cells become a functional part of the plant. A cladogram is a type of phylogenic tree in which 632 the lengths of the
edges do not represent evolutionary time. DNA sequencing was done on many species including foxgloves, and it was determined that some plants did not belong with the plantains. This process is driven by the energy from light and is called photolysis. If a diuretic
increases urine output, an antidiuretic would decrease urine output. • Antibiotics block processes that occur in prokaryotic cells but not in eukaryotic cells. This is the hormone that early pregnancy tests (EPTs) are designed to detect. • Skill: Recognizing and interpreting statistical significance. When protein molecules are placed into a temperature
environment that is higher than their physiological optimum, the increased molecular motion puts a great deal of stress on many of the relatively weak intra-molecular bonds. Thus we say that, for normally distributed data, 68% of all the values lie within ±1 SD from the mean. Photoreceptors Photoreceptors respond to light energy; they are found in
our eyes. Table 4.5 Opinions of climatologists and their critics Challenges from critics Possible responses from climatologists Climate change as a result of human activity is just a theory, not a fact. One such fluid is mucus, a thick, slippery, substance used in many parts of the body, including the lungs and intestines. In conditions lacking oxygen
(anoxic conditions), the decaying material started to form sludge, as some parts of the organisms' cells decayed while others did not. Proteins The last major component of cellular membranes comprises the proteins. From a biochemical viewpoint, what happens to each of these types of molecules upon digestion? The drug is called artemisinin
Genomics involves the science of sequencing, interpreting, and comparing whole genomes. 11.1 Antibody production and vaccination Understandings: The male elephant seal is an example of a marine mammal. 10.3 Gene pools change over time. Here is an example for SCID: virus corrected gene correct gene defective gene nucleus • Remove T cells
from patient • Clone normal gene for ADA • Disable retrovirus • Add retrovirus • Add retrovirus • Return T cell with normal ADA gene back to patient. B.5 Bioinformatics is the use of computers to analyse sequence data in biological research. The stems and leaves planted in the smaller pot will grow into a new plant. •
The negative control is a sample that is known not to contain the antibody being tested. 3 What role does the pancreas play in the digestive process? Relatively recent findings that have raised questions about cell theory include observations of striated muscle, giant algae, and aseptate fungal hyphae. Human physiology membrane projections called
microvilli that extend into the lumen of the intestine. It also allows the stem to grow longer and so increases exposure to light and carbon dioxide. • Chordata: these are the vertebrates, the animals that have a backbone. Interphase of the cell cycle in most cells is interphase. Increased serotonin in the synapse results in improved
mood. The affected red blood cells can get stuck in capillaries, so blood flow can be slowed or blocked, a condition that is painful for the sufferer. 20 Describe the two methods by which slow-acting neurotransmitters modulate fast synaptic transmission in the brain. Proposing a name for mythical creatures no one has ever captured, for example, is not
accepted. This can also be called the Pearson correlation coefficient. Below are some results from two different parts of the cytoplasm during meiosis ensures that one cell receives virtually all of the cytoplasm, nutrients, and organelles necessary to start a new
life. These reasons included the following. Birds are able to sing because of their vocal organ, called the syrinx. In aerobic cell respiration pyruvate is decarboxylated and oxidized, and converted into acetyl compound and attached to coenzyme A in the link reaction. the restaurant name with 'nutrition information' • the
company and snack name of one or more of your favourite snacks plus 'nutrition information' • other searches that you can think of that may or may not give you reasonably reliable information. But if that does not fit her data well, she could try other regression models that are not straight lines. Explain. An aid to remembering the difference between
diffusion and osmosis is 'H2Osmosis', linking the solvent water to osmosis. Human movement of P from terrestrial to fresh-water systems. We cannot change our genes but, in some cases, we can alter our environment to prevent or delay the onset of the disease. Figure 1.13 This is a drawing of the extracellular matrix of an animal cell. 

Guidance
Auxin is the only named hormone that is expected. Why is this of interest to geneticists? The walls and roof of a greenhouse are made of glass. en Figure 4.2 Energy flow and gy • Not all of an organism is swallowed as a food source, some parts are rejected and will decay. This does not happen in a random fashion. 2.3 Carbohydrates and lipids
Understandings: NATURE OF SCIENCE Evaluating claims: health claims made about lipids in diets need to be assessed. 

Application: Recognition features of Porifera, Cnidaria, Platyhelmintha, Annelida, Mollusca, Arthropoda, and Chordata. Here is a summary of the steps. DNA replication When Watson and Crick proposed their model for the
structure of DNA, they realized that the A-T and C-G base pairing provided a way for DNA to be copied. Be patient and eventually you will see a window with Protein Sequence 21 letters at the top. It can be used to discover genes or to determine the sequence of a gene. The word heritable means that the changes must be passed on genetically from
one generation to the next, which implies that evolution does not happen overnight. The sulfanilamide competes with the PABA and blocks the enzyme. Pitcher plants are adapted to living in waterlogged areas where nitrogen is lacking. 

Application: Causes and consequences of hypertension and blocks the enzyme.
thrombosis. • Stimulant drugs mimic the stimulation provided by the synaptic nervous system. GMO's are involved in controversy in different countries regarding whether 'GMO' should be put on food labels. This pinching off involves a change in the shape of the membrane. 12 Why does alcoholism lead to liver damage? One part shows autotrophic
use of energy and the other shows the heterotrophic use of energy. An example of a biotic factor is the cane toad that was introduced into Australia for biological control. The females can pass on the traits that lead to a shorter maturation time in the males. In the USA, this has led to the liberation of many individuals who had been sent to jail for
crimes they did not commit. Bowman's capsule beginning of proximal convoluted tubule Figure 11.15 Bowman's capsule is the site of the process called ultrafiltration. The worked example illustrates how you need to follow a certain number of steps so that the 2 test can help you determine whether your results are statistically significant, or whether
something unexpected is altering the results more than would be expected by chance. • Observers: direct observation on fishing vessels, in processing plants, and in fish markets can provide scientists with helpful data for improving the count of fish being caught sold and processed. • NATURE OF SCIENCE Developments in scientific research follows:
improvements in technology: gene sequencers are used for the sequencing of genes. Hormones are chemical messengers that usually have a physiological effect far from their gland of origin and thus are transported throughout the body by the bloodstream. Each chapter starts with a list of the Essential ideas from the IB biology guide, which
summarize the focus of each sub-topic. An alga makes its own glucose through the process of photosynthesis. • Application: Inheritance of cystic fibrosis and Huntington's disease. Generally speaking, the vast majority of cells in sexually reproducing organisms are diploid, and only the gametes are haploid. 223 05 Evolution and biodiversity Not a
single species of living lemur has been found anywhere else in the world. Forest fires release large quantities of carbon dioxide into the atmosphere. • When serotonin is depleted, the SERT receptors (vacuums) are empty. C O H N N H O C C H H C C H N H C O C H N H C O C H N H C O O H bond angles produce a pleated shape
Transthyretin occurs in the silk protein of spider webs. At the postsynaptic membrane, there is a receptor molecule, which is like the inbox of your email. This is the positive feedback loop of the menstrual cycle, specifically these two sets of hormones increasing because of the increase of the increase of the other(s). This example of 'accidental' discovery is common
in science. To figure out the length of one cell, divide the diameter of the field of view by the number of cells that cross the diameter of the field of view. This segment of the loop of Henle is permeable to water but relatively impermeable to salt ions. Having shared beliefs unites people and strengthens a sense of community and belonging. 198 Carbon
dioxide is produced when fossil fuels are used Just as we saw with methane previously, substances rich in hydrocarbons can be oxidized using oxygen gas from the atmosphere when they are burned. Study the material concerning nephron function and especially Figure 11.14, and then practise adding function labels to the various parts of the
nephron. Some ATP is generated directly during the Krebs cycle and some is generated indirectly through a later series of reactions directly involving oxygen. • There is only one scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method can scientific method that is universal throughout the world: only by following the same method that is universal throughout the world: only by following the same method that is universal throughout the world: only by following the same method that is universal throughout the world: only by following the same method that is universal throughout the same method that is universal throughout the same method that is universal throughout the same method throughout throughout the same method throughout throughout
excess of nutrients leads to obesity. One copy would be the copy your father gave you and the other would be the copy your father gave you. • A karyogram shows the chromosomes of an organism in homologous pairs of decreasing length. Some prokaryotes also have plasmids but eukaryotes do not. These subunits together equal 80S. During
pregnancy, increasing levels of prolactin result in the development of the milk-producing cells within the breast. Selective breeding of domesticated animals. • Energy losses between trophic levels restrict the length of food chains and the biomass of higher trophic levels. Isopods may respond to light as well, so the amount of light must be controlled
The defect in ADA results in a lack of the enzyme. The enzymes are all hydrolytic and carbohydrates. Steroid hormones bind to receptor proteins in the cytoplasm of the target cell to form a receptor- hormone complex. The reason for this is that we are born with the ability to produce the
enzyme lactase in our digestive tract. Testing urine for chemical composition When you visit the doctor, you may have to provide a sample of urine for testing. Although males typically experience a lower sperm count as they age, fertility has been documented in men as old as 94 years. • Veins collect blood at low pressure from the tissues of the body
and return it to the atria of the heart. • Sensation encoding: encoding: encoding of sensations such as touch, smells, and tastes. Follow classroom rules for use of microscope. The oxygen atoms that occur in the oxygen molecules on the reactant side of the equation are reduced. For humans, the number is 223 because there are 23 chromosomes in each gamete
One of the causes of the Great Famine in Ireland in the mid-1800s was that the potatoes had been produced asexually and were all clones, making them all susceptible to the same infection by a microorganism that causes potato blight. Most nuclei also include one or more dark areas called nucleoli (singular nucleolus). (i) Using a pencil, draw several
typical cells seen in the field of view. If the patient is missing all of the reflex responses and pupil responses, the evidence is clear that the brain will not recover. Normally, we would think that this is just part of a balanced cycle. Convert millimetre (mm) measurements to microns (micrometres; µm): 1 mm = 1000 µm 3 Observing and determining the
sizes of cells (a) You will now look at several types of cells. Look at Figure 10.24. Besides nuclear bombs, another source of radiation is nuclear power plants. Longer chain molecules are of interest to us because they contain more energy, and are important in the production of gasoline and jet fuel. Table 2.7 Selected organisms and their approximate
number of genes Common name of the organism Yeast (single-celled fungi) Approximate number of genes in the organism's genome 6 000 Drosophila (fruit fly) 14 000 Rice plant 51 000 Laboratory mouse 30 000 Domestic dog 19 000 Humans 20-25 000 No matter how many genes an organism has within its genome, all genes are the genetic code for
the possible polypeptides found within that organism, and all polypeptides are synthesized from the same monomers, specifically amino acids. For example, in humans, blinking is a reflex response. Figure 5.6 illustrates how one species can have various splits over time, creating a greater diversity between species. Pathogens are bacteria or viruses
that infect us and cause an immune response. 465 11 Animal physiology The role of troponin and tropomyosin during a muscle contraction A coloured SEM showing a neuromuscular junction. (5) (4) (Total 9 marks) 6 (a) Describe how water is carried by the transpiration stream. Autonomic and involuntary responses are referred to as reflexes.
Drawing of the fluid mosaic model. The production (or lack of production) of a particular enzyme can have a dramatic effect on the overall biochemistry of the cell. Such individuals are said to have better fitness. lung capillaries pulmonary artery right atrioventricular valve vena cava right atrium pulmonary vein right semilunar valve left semilunar
valve left atrium left atrioventricular valve aorta right ventricle body capillaries 741 15 Sometimes a faulty heart valve allows some blood to 'backflow'. But sexual reproduction is only possible thanks to meiosis. Molecules such as water and glycerol are small, uncharged polar molecules that can cross membranes fairly easily. If, after
separation by gel electrophoresis, the pattern of bands formed by two samples of DNA fragments are identical, it means that both most have come from the same individual. Thus birdsong has both inherited and learned components. Both layers have the phosphorylated alcohol end of the molecules towards the outside and the fatty acid tails oriented
towards each other in the middle. These databases allow scientists easy access to information. Peripheral is what is on the outside of the brain and the spinal cord. The answers: 200, 400, and 800, respectively. • Endocytosis (pinocytosis and phagocytosis): molecules are trapped in an invagination (infolding) of the membrane and pass through to the
other side of the membrane as a vesicle. centrosome The centrosome that attaches to microtubules the spindle. • The impulse travels much faster compared with an impulse in non-myelinated fibres, because the in/out ion movements characteristic of an impulse take time,
and saltatory conduction allows areas of the membrane to be skipped. Add more mud on top of that until the bottle is twothirds full. This single-celled organism has a tail-like flagellum for locomotion. • Type in carefully: patriciamarygallagher. The hydrogen ions that are produced because of the dissociation of carbonic acid must not be allowed to stay
in solution CO2 (enters erythrocyte) in either the erythrocyte cytoplasm or in the blood plasma. Should fossils be protected and conserved, or should they be considered as a commodity that can be bought and sold? 8 Explain the general function of an exocrine gland. There will be even less similarity when comparing a vertebrate with a non-
vertebrate. Anaerobic conditions facilitate the growth of denitrifying bacteria, which convert the nitrates needed by plants back to gaseous nitrogen. Some of the mammalian white blood cells (leucocytes) are capable of recognizing that set of proteins, and consider any cell with those proteins to be 'self'. This is the Bohr to dissociate oxygen in an
shift. One study has shown that bats are more likely to share food with others that have recently shared food with them. Figure 4.11 World deposits of crude oil. Dominant allele or a different one. It is a protective structure for the embryo. Where they
connect is called the neuromuscular junction. It took decades for Woese's proposal to be accepted, but the overwhelming evidence in Archaea's favour made it very difficult for opponents of the idea to argue against it. This membrane allows compartmentalization of the eukaryotic DNA, thus providing an area where DNA can carry out its functions
without being affected by processes occurring in other parts of the cell. posterior pituitary gland oxytocin milk ejection, secretion, and ejection. The diploid condition (2n) has been restored and a new life has been started. The
initiation phase The start codon (AUG) is on the 5 end of all mRNAs. Each codon, other than the three stop codons, attaches to a particular tRNA. The EEG measures brain activity in microvolts. To kill the resistant rats, a new pesticide must be used. • After you have drawn the picture, put on the labels. Here is the unbalanced chemical equation for
photosynthesis. Some axons extend beyond the neural tube neuron An axon that begins in the spinal cord and innervates a muscle in the foot can be as long as 1 m. Saturated fatty acids are called that because the carbons are carrying as many hydrogen atoms. In this fashion, the
impulse is conducted along the neurone from one adjacent area to the next, just like a wave. 248 Examples of plants you are probably most familiar with. What does that suggest to you about the size of the fish in the grouper population? Can it help the females' genes pass
on to the next generation? Phosphorylation of molecules makes them less stable. What knowledge issues are raised by this puzzling effect? 7.1 DNA structure and replication provided crucial evidence that DNA is a double helix. (The language
school papers. Skill: Experimental investigation of a factor affecting enzyme activity. This double-sided pump works every minute of every day of your life. Is it just a feeling, an intuition, a belief? O H arginine (Arg) C C N H O- H histidine (His) CH3 H O - H2O OH CH3 H CH3 CH O C C C N C H O H new covalent (peptide bond) H alanine 76 CH2 O
valine OH along nucleic acid molecules (DNA and RNA), and is directed by a ribosome. If you are facing an emergency, you need a quick supply of glucose and oxygen. Parents: Gametes: Offspring: XX XX Y XY In human females there are two X chromosomes. (3) (Total 4 marks) 2 Explain the Bohr shift of an oxygen dissociation curve during
gas exchange. The big danger with DVT is that all or a portion of the clot breaks loose and travels to a smaller vein, where a total blockage could occur. • Applications of life on their own. From these data, we can conclude that species B is exchange. The big danger with DVT is that all or a portion of the clot breaks loose and travels to a smaller vein, where a total blockage could occur.
more closely related to species A than species C is. $ Causes influx of Ca2+ "Increase of cAMP # PKA activated % Enhanced NT release Memory Eric Kandel and his co-workers continued experiments with Aplysia and discovered how the long-term process (memory) differs from the short-term process (learning). With a pencil and blank piece of
paper, attempt to redraw and label this diagram. (2) (Total 7 marks) 7 What sequence of processes is carried out by the structure labelled X during translation? Based on those structures they drew a diagram of relatedness called a phylogenic tree or dendrogram (see Figure 13.37). This also has a function during fertilization. 10.3 Gene pools and
speciation Understandings: A gene pool consists of all the genes and their different alleles, present in an interbreeding population. Proteins that serve as hormone-binding sites have specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that fit the shape of specific shapes exposed to the exterior that the exter
occlusion. When methane changes from its liquid phase (at its freezing point, -183°C), the change in phase is explained by the fact that methane no longer has enough molecular motion to exist as a liquid. Determinate growth means that growth mean
catalyse. myosin actin P i 2 Myosin heads are attracted to and attach to exposed binding sites of actin to form cross-bridges. Denitrification is not good for soils because it removes the beneficial nitrates needed by plants to make proteins. RNA polymerase has helicase-like activity as it plays a role in opening the DNA double helix. Evaluate the validity as it plays a role in opening the DNA double helix.
of your procedure. (b) How many cell membranes would an oxygen molecule have to pass through in order to diffuse from the alveolar air into an erythrocyte? DNA being unzipped one strand of DNA being pulled away from the alveolar air into an erythrocyte? DNA being unzipped one strand of DNA being 
pancreas releases hormones that reduce appetite. The disruption may affect agriculture in the future and raise food prices. Because of the hydrophobic region of the membrane, the hydrogen ions can only pass through the ATP synthase channel. • The cascade results in the rapid conversion of fibrinogen to fibrin by thrombin. (a) Using this
information and applying the Hardy-Weinberg equation, calculate the frequencies of the alleles D and d in each of the two countries. Whenever two water molecules are near each other, the positive end of another; this is hydrogen bonding. 341 07 Nucleic acids 3! amino acid attachment site 5! bases hydrogen bonds.
form stems Figure 7.14 The twodimensional clover-leaf structure of tRNA, with three loops. A sensor hooked up to a computer analyses the wavelength of the light and determines whether it represents an A, T, C, or G. The behaviour of UK bird lovers may have been the environmental factor that has made UK blackcaps so successful, when often
going to the wrong place can be deadly. It requires six inorganic carbon dioxide molecules to form one glucose molecules to form one glucose molecules by classifying them into different types. Which one is not open? This means that
lower amounts of energy are lost at each exchange. (a) Name two sister taxa. • The diagram of the nephron should include glomerulus, Bowman's capsule, proximal convoluted tubule; the relationship between the nephron and the collecting duct should be included. Both gametes are haploid. To illustrate this proximal convoluted tubule; the relationship between the nephron and the collecting duct should be included. Both gametes are haploid. To illustrate this proximal convoluted tubule; the relationship between the nephron and the collecting duct should be included. Both gametes are haploid. To illustrate this proximal convoluted tubule; the relationship between the nephron and the collecting duct should be included. Both gametes are haploid. To illustrate this proximal convoluted tubule; the relationship between the nephron and the collecting duct should be included.
consider a cell with four pairs of chromosomes (see Figure 10.7). We move out of the way when we hear a car coming. They are usually only partially hydrogenated and thus still contain one or more double bonds. Much of the evidence used to change the Davson-Danielli model was gathered with the use of the electron microscope. If there is an
increase in carbon dioxide (meaning low oxygen), the rate and depth of breathing are increased so that more oxygen is take in. In the 4th century BC malaria devastated the populations of the pathogen and the type of tissue the pathogen is damaging
Conversely, haemoglobin molecules that are carrying no oxygen molecules have the least affinity for oxygen. • • Guidance Archaea, Eubacteria, and Eukaryote should be used for the three domains. Overstimulation decreases the number of receptors, and the remaining receptors become less sensitive to dopamine. Artwork showing antibodies
binding to a flu virus. When a trait is more common in one sex than the other, the Chromosome, or both (see Section 3.4). There are nearly 5500 species of known mammals in the world, most of which have four limbs adapted for life on land
Roots, buds, stems, seeds, and fruits are all sugar sinks. The result was that he got all tall plants (see the last row of Table 3.4). ADA produces an enzyme that helps to metabolize another molecule, dATP. Behaviour is often tied to the peer group. An experimental group of bees had previous exposure to the odour, a control group had no previous
exposure. Also, if several competing organisms are trying to get food from the same food source, such as a tray or plate, you should not peck at your competition with your mouthparts.* In order to simulate natural selection between organisms obtaining food, design a lab in which some form of pinchers or clips are used as 'mouthparts' and a variety
of small objects are used as 'food'. Governments? How would this affect the chromatograph of these different leaves? However, his eyes were kept for study, and, a century and a half later, scientists used the tissue samples to identify the gene for colour blindness. Metabolism includes all the chemical reactions that occur within an organism. There is
disagreement within the scientific community about human-induced climate change. In some areas, there is evidence of steroid contamination affecting aquatic ecosystems. The pH of blood plasma is typically 7.4, making it very slightly alkaline. 17 01 Cells nuclear membrane rough ER ribosomes Figure 1.6 Smooth ER and rough ER. Recently, new
groupings have been emphasized because of a better understanding of the evolutionary development of the angiosperms. The chromosomes' centromeres lie on the plate. Neuroscientist Z. Over long periods of time, inorganic and organic sediments accumulate.
of their walls. 424, Copyright © 1987 by John Wiley & Sons, Inc. Figure 3.25 A Punnett grid with all the possible genotypes filled in. This M-phase-promoting factor phase is sometimes referred to as the synthesis phase. In addition to beneficial and harmful mutations, there are neutral mutations that do not have an effect on a species' survival. (b)
Scale bars are lines added to a microscope shows a section through an image under a microscope shows a section through anthers with the pollen in various stages of cell
division. So the number of organisms in the chain as well as the quantity of light available at the beginning will determine how long the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon to carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon bonds may be a double bond (resulting in a saturated fatty acid), or one or more of the carbon bonds may be a double bond (resulting in a saturated fatty acid).
in an unsaturated fatty acid). Because each muscle can only shorten in order to cause a single movement, muscles must work in pairs so that the opposite movement of the bone can also occur. • Skill: Monitoring of ventilation in humans at rest and after mild and vigorous exercise. In
other words, it acts as a promoter in these plants. There are also examples of allosteric interactions activating an enzyme rather than inhibiting it. • In glycolysis, glucose is converted to pyruvate in the cytoplasm. Study the diagram of a Paramecium to become familiar with this organism's basic structure. The spindle apparatus disappears. A method
of tracking is to use a reporting element such as green fluorescent protein (GFP) so that the product can be visualized. The first stage of photosynthesis is a set of reactions (see Figure 2.50). Are mutations good or bad for us? Carbon dioxide diffuses in the opposite
direction to the oxygen because carbon dioxide is produced as a result of mitochondrial respiration. Translation • translocation • translocati
Figure 7.1. Once the results of the Hershey-Chase experiment were made known, research involving genetics centred on nucleic acids and, especially, DNA. Evidence for which species are part of a clade can be obtained from the base sequences of a gene or the corresponding amino acid sequence of a protein. However, in darkness the conversion
back to Pr is very slow. If, on the other hand, all the offspring are tall, without exceptions, she can conclude that the tall plant is TT. ATP is the most common molecule used by cells when chemical energy is required. List the steps using numbers or bullets in your own words. The light grey area surrounding the lumen is plaque. • Frequently, important to the tall plant is TT. ATP is the most common molecule used by cells when chemical energy is required. List the steps using numbers or bullets in your own words.
discoveries are made 'accidently'. No single spermatozoon can accomplish the entire act of fertilization because it takes many spermatozoa to penetrate the follicle cell layer and a coating called the zona pellucida surrounding the secondary oocyte (see Figure 11.27). The width of the shells was measured in millimetres (mm). The pressure and heat
cause chemical transformations associated with lithification, which is the hydrogen atoms transformation of sediments into solid H H rock. • The two DNA molecules formed by DNA replication prior to cell division are considered to be sister chromatids until the splitting of the centromere at the start of anaphase. Today, many species have been
reclassified. Your models are wrong. See Figure 7.12. Often this occurs when a person has been sitting down for a long period of time, perhaps while travelling on a plane or in a car. (Total 1 mark) Affected female 3 Which of the following is an inherited disease that is due to a base substitution mutation in a gene? 'The eye is not a camera' is a good
example of a knowledge claim that can be explored and discussed after such an observation activity. Later in this section we will see how these numbers play out in a diploid situation where two chromosomes in each organism can carry a version of the gene. How can we know if the trend line's regression model is the best one for the data we
collected? Some people use the analogy of a zipper for this process. patrolling cell cleaning eating pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spreading pollen tending brood building comb percentage of time spent in each occupation resting spent in each occupation resting
of time the bee spent on cleaning on day 1. This means that they have diverse sources of carbon, which they use to build other molecules. People who smoke are craving a dopamine spike. (c) A waxy substance formed from accumulated lipids trapped in sediments at the bottom of oceans. If people are knowingly polluting and not doing anything to
reduce their carbon footprint, are they treated by society as cheaters? The first trophic level is occupied by the autotrophs or producers. Water moves from the vessels maintains a high water from the vessels maintains and the vessels maintains a high water from the vessels maintains and the vessels maintains and the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels maintains are not the vessels maintains are not the vessels maintains and the vessels maintains are not the vessels mat
vapour concentration in the air spaces of the leaf The vessel water column is maintained by cohesion and adhesion Cohesion involves the hydrogen bonds that form between water molecules. Oxytocin is a hormone produced by the hydrogen bonds that form between water molecules.
exhaust or fume hood, pair of homologous chromosomes prophase I at 2 3 4 Chromosomes become visible as the DNA becomes more compact. Figure 10.12 Crossing a white-eyed male with a redeyed female fruit fly. There is a need to balance the very great opportunities of this equator.
type of research with the potential risks. An example of this is that farmers have been cutting off the tails of sheep for many centuries and yet sheep continue to be born with long tails. The pill fools the female's body into acting as if it was pregnant, by keeping the levels of the two hormones most associated with pregnancy (oestrogen and
progesterone) high. More than one spermatozoon fertilizing an ovum is called polyspermy and results in multiple sets of chromosomes within the ovum. Remember from your study of genetics that an extra chromosome 21 (trisomy) is the cause of Down syndrome. The epidermis of human skin contains precursors that are able to synthesize vitamin D
when stimulated by the ultraviolet rays of the Sun. In 1972, Seymour J. As we have seen before with AA and Aa genotypes in Section of the enzyme 'lock'. • A total of four ATPs are produced: a net gain of two
ATPs. • Two molecules of NADH are produced. The first of these is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the alveolus, and the second is the single cell making up the structure of the second is the single cell making up the second is the single cell making up the structure of the second is the single cell making up the second is the single cell making up the second is the second is the single cell making up the second is the second
Molecular model showing the complexity of the protein components of muscle tissue. Individual cells are not shown. As an example, consider a cross involving a female carrier Aa crossed with a male albino aa. Mitochondrion mito
a hydroxyl group of the 3 carbon of deoxyribose and the phosphate group attached to the 5 carbon of deoxyribose. The structures of the male and female reproductive system are adapted for the productive system are adapted f
requirement of active transport mechanisms for adenosine triphosphate (ATP) partly explains why the epithelial villi cells contain mitochondria. The body has no way to store excess amino acids (those not needed immediately for protein synthesis). No trial-anderror learning is taking place. A Any individuals in a population can be selected entirely by
chance. By volume, the ovum (secondary oocyte) is the largest cell in most animals. The low end of this mutualistic relationship is referred to as a mycorrhiza; an example is shown in the photo below. Examples of exocytosis occur when: •
pancreas cells produce insulin and secrete it into the bloodstream (to help regulate blood glucose levels) • neurotransmitters are released at synapses in the nervous system. • The pituitary gland has two lobes, the posterior lobe and the anterior lobe. 36 Intracellular The sodium-potassium pump shows how important and active specific proteins are
in the active transport of particular substances. • Application: Evaluating claims that human activities are not causing climate change. Tree snails in Hawaii demonstrate this geographical isolation: one population lives on one side of a volcano and another population lives on the other side, and they never come into contact with each other. Formation
of the lagging strand involves fragments and an additional enzyme called DNA ligase (see Figure 7.8). Hz is the SI symbol for hertz. Smooth endoplasmic reticulum is ER without ribosomes. The pathway-engineered process will take about 3 months to produce the metabolite of interest, compared with the 15 months for the plant-based method. By a
modification of its genetic makeup, however, one bacterium is resistant to the antibiotic. This is the first cell of the new offspring. Factors that influence change in the sigmoid growth curve are: • abiotic • biotic • density independent. 5 01 Figure 1.1 Paramecium. The costs of
obtaining it from the plants are high and production is unstable. For example, if you want to catalyse one particular reaction, you need a pure enzyme, not a mixture as found in cells. In a young person, the endothelium of each artery is smooth, with no plaque build-up. This can be observed and documented because Aplysia has very few, but very
large, neurones that can be easily seen. The Krebs cycle is said to be a cycle because it is a series of chemical reactions that are added to the environment to speed up the rate at which natural biodegradation will occur. One type is
sensitive to red light, one type to blue light, and one type to green light The impulses from a group of rod cells pass to a single nerve fibre in the optic nerve (see Figure 12.24) Red-green colour blindness Normal vision uses the three classes of
cones, red, green, and blue, and is called trichromatic vision. Linked genes are usually passed on to the next generation from the mean! 2 standard deviations from the mean 0 68% x 95% 785 Mathematics, and information and communication
technology skills Standard deviation is used as an indication of how variable data are. Answer the following. To learn more about birds of paradise and their courtship behaviour, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: Section A.6. 27 The genetic basis of behaviour can change due to natural selection.
Analysis of cladograms to deduce evolutionary relationships. They may be of different sizes, and show varied morphology (shape), but the basic shape and position of the limb bones are the same. 24 Why would it be inaccurate to say that heavy exercise makes the blood more acidic? 1 2 3 4 5 236 A woman gets a bacterial infection such as
tuberculosis. 41 How can you convince recreational fisherman that this solution is necessary? Sometimes theories will be abandoned completely because of conflicting evidence. The policy has had reasonable success as a population control measure, but is resulting in a disproportionately high percentage of males in certain areas of China.
hippocampus Cocaine affects the synapses that use dopamine as a neurotransmitter. Scientists do not fully understand the role of anandamide, but it may play a role in memory functions. You might think that this does not make sense, but it does when you learn that each oxygen molecule that binds to haemoglobin changes the haemoglobin's shape in
a way that increases its affinity for another oxygen molecule. The causes for these ever-growing numbers are complex but the most obvious culprits are: • change in the types and quantities of food people eat • change in the types and quantities of food people eat • change in the amount of physical activity people do on a daily basis. Determine the degrees of freedom (d.f.) by taking the total number of
classes into which the data fall and subtracting 1. Peat is very dark in colour and only certain types of vegetation can grow on its surface, such as sphagnum moss. The diagram illustrates a very small section of DNA replicating. When an oil field is discovered and crude oil is
pumped out of the ground, it is sent to refineries to be separated into the various products that we use every day, using an apparatus called a fractionating tower. Molecular biology Alcoholic fermentation Yeast is a common single-cell fungus that uses alcoholic fermentation for ATP generation when oxygen is not present (see Figure 2.44). When the
end product is present in a sufficient quantity, the assembly line is shut down. control Pseudomonas + glycerol Pseudomonas + surfactant + inorganic salts Pseudomonas + surfactant + inorganic salts Pseudomonas + surfactant + inorganic salts Pseudomonas + surfactant Pseudomonas + surfactant Pseudomonas + surfactant + inorganic salts Pseudomonas + surfactant Pseudomonas 
(days) 5 Figure 13.20 The effect of various nutrients on the degradation of car oil left in soil by the bacteria Pseudomonas. Notice in Figure 2.43 that two ATP molecules are formed. Table 7.5 shows you just a few examples of proteins and their functions. 100 partridge
pairs against bird of prey sightings, with logarithmic scales on the x- and y-axes. Many different techniques were used as an attempt to clean up this environment. Deduce how similar species B, C, and D. A good example is a group of flowers called asters that were all formerly in a genus called Aster that comprised hundreds of species
distributed widely across geographical and temperature ranges at various forms of haemoglobin or myoglobin perform under various conditions. Explain how the bacteria are able to attach firmly to teeth such that the bacteria can only be
removed with scraping. 34 If an mRNA sequence is AAU AGG UAC ACG, what is the sequence on the DNA microarray for this? 344 The primary level of protein structure refers to the unique sequence on the DNA microarray for this? 344 The primary level of protein structure refers to the unique sequence on the DNA microarray for this? 344 The primary level of protein structure refers to the unique sequence on the DNA microarray for this? 344 The primary level of protein structure refers to the unique sequence on the DNA microarray for this? 344 The primary level of protein structure refers to the unique sequence on the DNA microarray for this? 344 The primary level of protein structure refers to the unique sequence of amino acids.
is an essential element in living systems. Scientists have constructed maps of SNPs. These maps point out the location of each SNP along the length of every human chromosome. Research this debate and trace the story's ups and downs. Adenine are double-ring structures known as purines. By depriving the animal of food, it would
gradually learn that pressing the lever would release a pellet of food into the feeding dish. Some digested molecules are absorbed into a system of your body called the lymphatic system. 

Guidance Limit the immune response to mammals. phosphate group O HO OH P ribose sugar or deoxyribose sugar O Figure 2.29 The first diagram 1 of 4 C5
represents the structure of a nucleotide showing bond locations. In a biogas fermenter the following process takes place, in this sequence, in the absence of oxygen: 1 2 3 4 liquefaction, the hydrogen and carbon dioxide acetic acid formation,
resulting in acetic acid, plus hydrogen and carbon dioxide methane formation (methanogenesis), the action of archaean bacteria on the products to produce methane. The y-axis of the graph represents the relative amount of oxygen used. Detritivores Some organisms eat non-living organic matter. You may recall that the spinal reflexes do not involve
the brain. You have had a decade or more of formal education, and even more years of life experience, giving you ideas in the form of knowledge, beliefs, and opinions. This failure to close the human posterior (caudal) neural tube at day 27 of development results in the condition of spina bifida. 

Microorganisms are used in bioremediation. This is
also sometimes referred to as DNA fingerprinting because there are some similarities with identifying fingerprints, but the techniques are very different. • Click on Real, next to Branch length. Experiments provide a test that shows cause. What knowledge issues does Goldacre's book raise about the highly competitive $600 billion pharmaceutical
industry? 782 Mean The mean is an average of data points. If there is no match, the suspect is probably not the person the police are looking for. Such an environment is found in body tissues that are actively undergoing cell respiration. MRSA infections are very difficult to treat and are becoming more and more frequent. Essentially, this viewpoints are very difficult to treat and are becoming more and more frequent.
says it is the sum of the parts that make up the complex system, the organism. • Application: Description of methods used to obtain cells for karyotype analysis, e.g. chorionic villus sampling and amniocentesis, and the associated risks. Figure 4.12 Formation of gas and oil. The overall equation is: light 6 CO2 + 12 H2O C6H12O6 + 6 H2O + 6 O2 369
08 Metabolism, cell respiration, and photosynthesis Water occurs on both sides because 12 molecules are consumed and 6 molecules are produced. Parturition is characterized by uterine contractions that begin at a relatively low intensity and occur infrequently. Figure 12.4 Scaffolding glial cells allow neurones to reach their final destination. There
have been some cases in recent history, however, that have revealed the potential dangers of nuclear power plants: Chernobyl in 1986 and Fukushima in 2011 are two such examples. In this case there are three references. In some animals, it is the job of the kidneys to filter and cleanse the bloodstream of molecules like urea
and other molecular wastes. It could be argued that the purpose of your cloning exercise is educational and not for profit, but still, it is best to consider the intellectual property issues involved before choosing your plant. Many animals, like insects, have another kind of skeleton called an exoskeleton. (Total 3 marks) 6 Blue crabs (Callinectus sapidus)
hunt clams in river streams. Apical meristematic tissue occurs in root tips and in other areas that allow lengthening of plant parts. Even the most frequently occurring autosomal recessive diseases only affect about 1 in 2000 people. 352 Metabolism, cell respiration, and
      tosynthesis Table 8.1 Anabolic and catabolic reactions Anabolic reactions Catabolic reactions Catabolic reactions Build complex molecules Break down complex molecules Are endergonic Are biosynthetic Are degradative Example: photosynthesis Example: cellular respiration Metabolic pathways Almost all metabolic reactions in or
by enzymes. (See page 797 for an explanation of what the chi-squared test is, how it works, and what the values for the degrees of freedom should be.) 179 04 Ecology 1 2 3 4 5 6 7 State the null hypothesis in this calculation. In Figure 7, we cannot rearrange the rectangles of the histogram so that the highest values are on the left and the lowest
values are on the right, as we could have done for the bar chart. However, typical suggestions range from about 5 to 30 minutes a day. 44-52 (Stanwell-Smith, D. Carbon dioxide and water vapour are the most significant greenhouse gases. Do shark eggs have a protective membrane (the amnios) around them? Another reason to preserve wetlands is
that pollen trapped in deep layers of the bogs thousands of years ago can provide evidence of what the climate was like in the past, giving us 'libraries' of biotic information. 87 labelled cDNA molecules (single stranded DNA molecules, a different
gene or probe is in each spot. Application: Causes of jet lag and use of melatonin to alleviate it. Different parts of the brain have specific roles The Boyal Society. How does generation 1 support this model? The letter n represents the
sample size (the number of measurements made), and in this case n = 15, 3 Create a list of steps that trace a single erythrocyte that begins in the capillary bed adjacent to an alveolus. • Go to www.pearsonhotlinks.co.uk/url.aspx?urlid=68729, or do an internet search for Ensembl. Nitrogenous waste excretion in insects Insects have an open
circulatory system. Some individuals are dichromatic vision defects; dichromatic vision is a variant of trichromatic vision. In contrast, the number of chromosomes at the end is only 2 (n = 2), because each 'pair' is not a pair anymore but rather a single representative from each pair. The nuclear membrane disintegrates
Note that viruses are not in this list because they are not alive and do not necessarily share a common ancestry with each other, two major conditions necessary to fit into this classification system (Figure 5.20 in the next section shows how the three domains are related.). A certain amount of communication is needed in order to get everyone to use
the new classification, 741-761 (Caughley, G. Most cells in the human body are diploid cells, and in such cells the nucleus contains a set of 23 chromosomes from the mother and 23 from the father. A similar phenomenon occurs when oxygen binds to haemoglobin. This results in shape changes of the protein, which causes inhibition of the enzyme.
Bees account for a significant percentage of plant pollination brought about by animals. All the bonds mentioned in the first three levels of protein structure are involved in this level. When a crab selects a mussel as prey, it must weigh up the cost compared with the benefits. Each of these glands produces one or more hormones that are secreted into
the bloodstream and are carried to target tissues within the body. 1 Two molecules of ATP are used to begin glycolysis. DNA run in opposite directions. Recently, micropropagation has been used to develop virus-free strains of existing plants. In addition, the female reproductive system ensures a suitable location for fertilization and provides an
environment for the growth of the embryo/foetus until birth. The fact that similar related species show multiples of eight chromosomes suggests speciation by polyploidy. These organisms are called autotrophs, and they synthesize their organic molecules from simple inorganic substances. 6 feeding 5 active transport of NO3! ions plants 9
denitrification 1 Mutualistic nitrogen fixation. Computer artwork showing an antibody attaching to a cell surface. 13 Do some research and find one solution that scientists might suggest in solving this problem. 1 Figure 5.14 shows how these four imaginary species could be related: 2 Often, such work by biochemists confirms what palaeontologists
have hypothesized about the ancestries of the fossils they have studied. Skills: Assess the nutrient content of a soil sample. Recall the reason why each cell needs to have only 50% of the parents' DNA: it is to enable gametes that meet with another gamete to form the next generation: 50% + 50% = 100% Although there are exceptions, notably with
plants, generally it is not advantageous to have more than 100% of the DNA needed to make the next generation. When preparing a cladogram, it becomes clear that birds share a significant number of derived characteristics with a group of dinosaurs called the theropods. This innate behaviour of synchronized oestrus cycle increases the chances of
survival and reproduction of offspring, carrying the genes of both the males and the females involved into the next generation. It is available to consumers in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, proteins, and lipids, but can also be absorbed in the form of carbohydrates, and lipids, but can also be absorbed in the form of carbohydrates, and lipids, but can also be absorbed in the form of carbohydrates, and lipids, but can also be absorbed in the form of carbohydrates, and lipids, but can also be absorbed in the form of carbohydrates, and lipids, but can also be absorbed in the form of carbohydrates, and lipids are also be absorbed in the form of carbohydrates, and lipids are also be absorbed in the form of carbohydrates, and lipids are also be absorbed in the form of carbohydrates, and lipids are also be absorbed in the form of carbohydrates.
Springer Science and Business Media; Figure on page 569 from Ethology: The mechanisms and evolution of behaviour, W. wet paper towel 3 Design a method for control of the variables. The young were reared by the scientist and the direction of their subsequent migration recorded. During their mating season, shore crabs congregate in certain
areas. Interphase includes three smaller phases: G1, S, and G2. B A ribosome that is synthesizing different proteins for secretion. (1) (Total 4 marks) C4 C6 C5 111 03 Genetics Essential ideas 3.1 Every living organism inherits a blueprint for life from its parents. A few years later Antonie van Leeuwenhoek observed the first living cells and referred to
them as 'animalcules', meaning little animals. Although angiosperms also produce seeds, they do not produce cones and they are not always pollinated by wind. State the phenotypes of the girls and boys. 

ADH controls reabsorption of water in the collecting duct. Specific cells have proteins (receptors) in their plasma membrane, cytoplasm, or
nucleus that allow them to receive different environmental stimuli. Record your results in the table. Hormone therapy As part of the IVF procedure, a woman must have eggs 'harvested' from her ovaries. Pathway engineering Remember the enzymatic pathways you studied which are necessary for cell respiration and photosynthesis? Note down the
observed values and decide what the null hypothesis will be. speciation split lineage of common ancestor. Papagianni 2007 tc 11s tc 30 s tc 40 s 60 40 20 0 0 20 40 60 80 100 120 fermentation time, hours 140 160 180 2 Look at Figure 13.5. Compare and contrast the results of
agitation time on citric acid production at 11 s, 30 s, and 40 s. The mechanism for this type of synapse is almost the same as a neurone-neurone synapse, although the end result leads to the muscle undergoing a contraction. This means that if an adverse change happened in the environment, such as a change in pH, if one bacterium is susceptible to
the change in pH and dies, they in fact all die because they all have the same vulnerability. Interacting can mean that one species relies on another for its habitat, as is the case for parasites living on or inside the bodies of other animals. So, just as not all energy gets passed on from one trophic level to the next, not all biomass gets passed on either.
When subjects are presented with seven common smells (a test frequently used by neurologists), the vast majority of 'normal' individuals can identify all seven smells correctly. Theory of knowledge Case study 6 A famous hoax: Piltdown Man 778 778 It's always exciting to find a fossil of a new species, especially if it is a hominid. In some cases the
units are the same, but they may be different. The AV node receives the signal from the SA node, delays for approximately 0.1 seconds, and then sends out another 'electrical' signal. The genetic engineering techniques used are the same as those we studied in Section 12.2, using Agrobacterium tumefaciens or tobacco mosaic virus as a vector to carry
the new gene into the plant. Because autotrophs make food that is often used by other organisms, they are called producers. Oxygen diffuses into the cell as a result. The sequence of the amino acids is determined precisely by the DNA, but the condensation reactions are virtually identical. PCR is a procedure that takes short segments of DNA and
amplifies them so that they can be identified. Slow-acting neurotransmitters modulate fast-acting neurotransmitters slow-acting neurotransmitters are sometimes called neuromodulators. Many of the foods we ingest have very large molecules that are too large to pass across any cell membrane. The plasmids replicate independently of the
chromosomal DNA. On the other hand, the Human Genome Project has shown that the small differences that do exist are important ones that give each person his or her uniqueness in terms of skin colour, facial features and resistance to disease, for example. An individual that reproduces sexually can produce huge numbers of possible combinations
of half the genetic material it possesses, thanks to meiosis. When processing your data for lab reports, calculating the standard deviation can help you to analyse the data. The secondary immune response may occur soon after the primary response, or occur months or years after it. Macrophages are large leucocytes that are able to change their
cellular shape to surround an invading cell through the process of phagocytosis. B Pr is converted by red light to Pfr, which acts as an inhibitor of flowering. Yeast cells are eukaryotic and do possess mitochondria. Organisms in water can move towards or away from food or other chemicals that are dissolved in their aquatic medium. Nutrient cycling
When organisms such as trees need minerals to grow and stay healthy, where do they get them from? So, would it be possible for this couple to have four children and all of them have a different blood group? In 60 minutes? Proteins are thought to 'float' in the lipid bilayer. After introducing the gene, the plant cell must be able to reproduce an entire
plant. CHALLENGE YOURSELF 2 Study Figure 12.7, then try to draw a picture of the brain without looking at it. Twenty 1-m2 guadrats represents 20 m2 of that surface, meaning that only 0.4% of the field was actually sampled. Vitamin A is essential for the light-sensitive cells in the retina to function properly. Following assessment by one or more
physicians, a patient who shows none of these functions can be pronounced 'brain dead'. • Lines from labels to parts on a drawing should be straight and flush out the highly toxic ammonia. index.php?lang=eng&modul= detail&id=178
Large-scale production of metabolites motor sterile seal pH pH controller acid-base reservoir and pump steam viewing point exhaust impeller cooling water out cooling water out cooling jacket culture broth sparger (air bubbles) cooling water in sterile air steam 580 harvest The need for penicillin means that there is a demand for large-scale production. Molecular
biology explains living processes in terms of the chemical substances involved. The process of chiasmata formation need not be explained. 744 In recent years, small portable defibrillators have become available and are routinely carried by all medical first responders. Unfortunately, the immune system cannot recognize which 'invaders' cause
disease (e.g., a virus) and which do not (e.g., a transplanted organ). What could be factors that stand in the way of this equal access? The degrees of freedom in this example is 28 because (2 × 15) - 2 = 28. As a result of natural variation, a few rats from the population on the farm are slightly different and are not affected by the poison. How do the
structures of this cell reflect the overall functions of the pancreas? 4 Draw and label a chromosome. (c) Cyanobacteria floating where there is sunlight. Natality will fall to zero and mortality to 100%. First published 2014 18 17 16 15 14 IMP 10 9 8 7 6 5 4 3 2 British Library Cataloguing in Publication Data A catalogue record for this book is available
from the British Library ISBN 978 1 447 95900 7 eBook only ISBN 978 1 447 95901 4 Copyright notice All rights reserved. 2.6 Structure of DNA and RNA understandings: The nucleic acids DNA and RNA understandings: The nucleic acids DNA and RNA understandings and RNA understandings are polymers of nucleotides. Type II diabetes is the most common form of diabetes; approximately 90% of diabetics have this type. Exercises 16
Explain the effect of denitrifying bacteria. When Paul Greengard first presented the idea that biochemical pathways were at the root of learning and memory, the scientific community met his ideas with much scepticism. 227 05 Evolution and biodiversity Is the peppered moth a good example of evolution? patterns be identified, such as musical
creativity or cruel intentions? How do these data contribute to our understanding of climate change? Phototropism means plant growth in response to light. Test cross - Testing a suspected heterozygote plant or animal by crossing it with a known homozygous recessive (aa). If an area is crowded with plants, it is essential for seedlings to grow towards
the sunlight so that photosynthesis can occur efficiently. A densely guard packed region of cylindrical cells occurs in the upper portion of the leaf. People born with two copies for standard discshaped cell have only disc-shaped cell and replaced
with DNA. (c) Count the number of individuals in each chamber every 5 minutes. A few robins could remove the tops, but it did not become a common behaviour in robin populations. 8 Putrefaction. During G2 this phase, the cell grows CDK and makes preparations CDK for mitosis, the M phase. These receptors help us maintain posture and balance.
How might this affect food availability around the world? These hormones are often referred to as releasing hormones, for example gonadotropin-releasing hormones and they consist of a 6-8-base pair seguence that is repeated up to hundreds of thousands of times. During the
daytime, especially on a warm sunny day, the rate of photosynthesis may be very high for a particular plant. Again, diet has an impact here, this time with the production of methane. It is positively chemotaxic to food that it likes to eat, such as raw liver (raw liver is similar to the dead fish in its natural habitat). Notice in Figure 3.13, from a single cell
on the left, four cells were produced on the right. • The released calcium ions flood into the sarcoplasm. Lysozyme destroys many bacteria. Over time, this might lead to speciation: a new species is formed from an old one. This usually involves an interaction with a repressor of a particular gene. Worked example The use of antibodies against antigens
is often classified as either passive or active immunity. Why aren't scientists talking more about this if it has such a potential to increase the greenhouse effect? They are given to patients suffering from bacterial infections. 8 Explain how folding has allowed the cerebral cortex to become more highly developed in humans than in other animals. A red-
eyed wild-type fruit fly, and a white-eyed mutant fruit fly. An understanding of inheritance enables farmers to breed their livestock selectively for specific characteristics. To measure blood flow to the brain, a radioactive isotope is injected into the bloodstream. Oxygen dissociation curve for human adult haemoglobin 100 percentage haemoglobin
saturation Option D: Human physiology 90 80 70 60 typical range of O2 partial pressure in body 50 40 30 20 10 0 756 0 20 40 60 80 pO2 /mm Hg 100 120 140 Notice the very steep S-shape of the graph. These reactions involve: • catabolic pathways • anabolic pathways • a
that the science of epigenetics challenges the idea that genetics is unchangeable during the lifetime of an individual. This section will look at how evolution works through natural selection. Blue alleles shown are from the male parent, red from the female parent. Bill Ward iii Contents Introduction 01 Cells 2 1.1 Cell theory, cell specialization, and cell
replacement 1.2 The ultrastructure of cells 12 1.3 Membrane structure 27 1.4 Membrane transport 31 1.5 The origin of cells 38 1.6 Cell division 40 02 Molecular biology 4 50 2.1 Molecu
transcription, and translation 89 2.8 Cell respiration 98 2.9 Photosynthesis 103 03 Genetics 112 3.1 Genes 113 3.2 Chromosomes 127 3.3 Meiosis 134 3.4 Inheritance 141 3.5 Genetic modification and biotechnology 156 04 Ecology iv vii 170 4.1 Species, communities, and ecosystems 171 4.2 Energy flow 184 4.3 Carbon cycling 191 4.4 Climate change
203 05 Evolution and biodiversity 216 5.1 Evidence for evolution 227 5.2 Natural selection 228 5.3 Classification of biodiversity 239 5.4 Cladistics 256 06 Human physiology 268 6.1 Digestion and absorption 269 6.2 The blood system 276 6.3 Defence against infectious disease 284 6.4 Gas exchange 291 6.5 Neurones and synapses 298 6.6 Hormones,
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homeostasis, and reproduction 307 07 Nucleic acids 322 7.1 DNA structure and replication 323 7.2 Transcription and gene expression 334 7.3 Translation 357 8.3 Photosynthesis 368 09 Plant biology 380 9.1 Transport in the xylem of plants 381 9.2
Transport in the phloem of plants 393 9.3 Growth in plants 398 9.4 Reproduction and vaccination 451 11.2 Movement 459 11.3 The kidney and osmoregulation 467 11.4 Sexual
reproduction 479 12 Option A: Neurobiology and behaviour 494 A.1 Neurobiology 560 v Contents 13 Option B: Biotechnology and bioinformatics B.1 Microbiology: organisms in industry 576 B.2
Biotechnology in agriculture 588 B.3 Environmental protection 600 B.4 Medicine 610 B.5 Bioinformatics 626 14 Option C: Ecology and conservation of biodiversity 682 C.5 Population ecology 696 C.6 Nitrogen and
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biology experience, through teaching and examining, curriculum review, moderating internal assessment, and leading workshops for teachers in different continents, has given us a unique understanding of your needs in this course. A fifth holds the animal's trunk and exclaims 'Elephants are like snakes.' None of the men is wrong but none is
completely correct. platelets adhere to damaged area chemicals which convert thrombin (enzyme) fibrinogen fibrin (forms mesh) When pathogens get past skin and mucous membranes Travel between farreaching areas of our world has increased tremendously in the last century. A leech, sometimes used for bloodletting procedures. The others have
been moved either north or south of their native state. Thus each haemoglobin consists of four globins, four haem groups and four iron atoms. In the fermenter, the enzymes of the prokaryotes and archaeans break down biodegradable materials such as plant products by anaerobic digestion (digestion without oxygen). 2.5 Enzymes Understandings:
Enzymes have an active site to which specific substrates bind. Gram staining Using a small-scale biogas digester such as this one in India, farmers can trap methane instead of letting it escape from rotting means are 131 and
130 cm, respectively. These amino acids create hydrophilic channels in proteins through which polar substances can move. This breakthrough was published in the journal Nature in April 2013. The outer membrane protects against the host defences. A Phosphorylation B Oxidation oxidation lysis phosphorylation lysis C Phosphorylation D Lysis
oxidation lysis oxidation phosphorylation (Total Total 1 mark) 8 Which is correct for the non-competitive inhibition of enzymes? 564 A number of strategies can exist for passing on genes. • Patients treated with a selected range of antibiotics respond well to treatment. • They are small peptides that bind to opiate receptors. Because of its hybrid
nature, it is sterile, so gardeners and farmers who want to grow this plant allow it to propagate vegetatively, which it can do because the bulbs can split and multiply underground from one year to the next. The production of oxygen was used to measure the bulbs can split and multiply underground from one year to the next. The production of oxygen was used to measure the bulbs can split and multiply underground from one year to the next.
that the air at high altitudes contains less oxygen by percentage than the air at sea level. Table 5.2 The classification of two species. • Although planet Earth has had extensive oceans for most of its existence of life on our planet).
In 2010, the Catholic Church formally apologized for Galileo's condemnation. • Glycerate 3-phosphate is reduced to triose phosphate is reduced to triose phosphate using reduced NADP and ATP. This is an extremely rare genetic condition called complete achromatopsia. The pancreas is the only gland that has both exocrine and endocrine functions. Table 13.2 compares the cell
wall structure of Gram-positive and Gram-negative bacteria. The trachea divides into the right and left primary bronchi. • Correct positioning of structures is essential. Thus they are a perfect indicator organism for the presence of human or animal waste products in water. Functional magnetic resonance imaging (fMRI) Functional magnetic
resonance imaging (fMRI) uses radio waves and a strong magnetic field, not X-rays. Give one answer, although there may be many. Binary fission Prokaryotic cells divide by a very simple process called binary fission. If no activity is detected, this is conclusive evidence of brain death. After all, uric acid production and secretion requires almost no
water loss. A male Carola parotia does a dance where his left flank feathers form a skirt. All of these objects are threedimensional. 6 Why is it necessary for veins to be relatively close together in leaves? 6.4 The lungs are actively ventilated to ensure that gas exchange can occur passively. 

Guidance 
Fertilization involves the acrosome reaction,
fusion of the plasma membrane of the egg and sperm, and the cortical reaction. 90 anosmics normal subject 80 70 60 frequency (%) 12 50 40 30 20 10 0 To learn more about the evolutionary link between an animal's movement and its inner ear, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: A.3. 528 0 1-2 3 4 number
correct 5 6-7 Anosmia is the inability to identify common smells. For example, in terrestrial ecosystems, fields of wheat might produce 1 tonne acre-1 yr-1 in one area of the world, whereas another area might produce 1 tonne acre-1 yr-1 in one area of the world, whereas another area might produce 1 tonne acre-1 yr-1 in one area of the world, whereas another area might produce 3 tonnes acre-1 yr-1 in one area of the world, whereas another area might produce 3 tonnes acre-1 yr-1 in one acre-1 yr-1 in one area of the world, whereas another area might produce 3 tonnes acre-1 yr-1 in one acre-1 yr-1 
promoted or inhibited Pfr reverts to Pr in the dark very slowly Pfr is able to stimulate flowering by activating specific genes of the shoot apex cells in a plant. • Angiosperm phylum includes all plants that make flowers and have seeds surrounded by a fruit. It was not. However, this fluid seemed to contain many contaminants
The dots are then joined with straight lines. One reason for studying dopamine is that almost all drugs that are addictive cause problems with dopamine signalling. 100 % Figure 5.1 The effect of time on the proportion of radioisotope present in material containing carbon-14. Myoglobin dissociates oxygen only when the oxygen partial pressure gets
very low, e.g. in actively respiring muscle tissues. 4 How does the active uptake of mineral ions from the soil by plant roots to absorb water? The pressure in the active uptake of mineral ions from the soil by plant roots to absorb water? The pressure in the active uptake of mineral ions from the soil by plant roots to absorb water? The pressure in the active uptake of mineral ions from the soil by plant roots to absorb water? The pressure in the active uptake of mineral ions from the soil by plant roots to absorb water? The pressure in the active uptake of mineral ions from the soil by plant roots to absorb water? The pressure in the active uptake of mineral ions from the soil by plant roots increase the ability of plant roots to absorb water? The pressure in the active uptake of mineral ions from the soil by plant roots increase the ability of plant roots increase the ability of
pressure are pascals (Pa) and kilopascals (Pa). Skill: Analysis of changes in the DNA methylation patterns. Why did these experiments fail to produce symptoms of scurvy? NATURE OF SCIENCE Molecular model of urea. Figure 7.8 At a replication fork, helicase separates the strands of the double helix and binding proteins stabilize the single
strands. • Separation of pairs of homologous chromosomes in the first division of meiosis halves the enzyme acteylcholinesterase and thus the receptor becomes permanently blocked. The organisms on Earth today represent much less than 1% of all life forms
that have ever existed. By watching which males mate with which females, animal breeders can see which characteristics the offspring will have. Phrenology The pseudo-science of phrenology were not, after all,
scientifically valid? The gene for the ABO blood type is represented by the letter I. Observations were made initially based on morphology. Glucose is absorbed by body cells. This bubble contains the antisense DNA strand, the RNA polymerase, and the growing RNA transcript (see Figure 7.11). The energy to create the glucose comes directly from the
ATP and hydrogen created in the first stage of photosynthesis. The target cells give chemical signals, e.g. CAM, to the neurone. 384 Stomata and guard cells NATURE OF SCIENCE Stomata can only be closed on a short-term basis. 5 You can be asked about the chi-square test in IB biology exams. 6 Suggest a reason that might explain the differences
Twenty amino acids are coded for. • Immobilized enzymes are widely used in industry. It is now obvious that many enzymes undergo significant changes in their conformation when substrates combine with their active site. 16 Why are heart cells so efficient at passing an electrical signal from cell to cell? Take the time to learn the basics of these two
reaction types. They must obtain their food (which is necessary for energy) from other organisms. In a random sample, there is always the chance that the sampling is not representative of the zone studied. To put it into its appropriate category, you would find currently existing taxa that contain similar organisms. The actual result is due to chance.
Each nucleotide that is added to the elongating DNA chain is actually a deoxynucleoside triphosphate (dNTP) molecule. exon DNA intron exon 2' exon Exon Exon DNA intron exon 2' exon Exon DNA intron exon 2' exon DNA intron exon Exon Exon DNA intron exon 2' exon DNA intron
mRNA splicing intron RNA mRNA 5' cap mature mRNA 3' poly-A-tail nuclear RNAs (snRNAs, pronounced snurps). Denaturation is frequently temporary, as in many instances the intra-molecular bonds will re-establish when the temperature
returns to a suitable level. $ When a stimulatory neurotransmitter bonds to a receptor, Na! diffuses into the postsynaptic neurone. Which state is the station in, and why did scientists decide to put the station there? Under the chemical stimulation of FSH and LH, the somewhat randomly arranged follicle cells and oocytes take on a cellular
arrangement known as a Graafian follicle. 6 Distinguish between artificial selection and natural selection. Each contains four polypeptide chains held together in a quaternary structure. Organisms consisting of only one cell carry out all functions of life in that cell. Here is another difficult issue that raises ethical concerns: because a karyogram can be a contain to the contains four polypeptide chains held together in a quaternary structure.
used to determine whether the future baby is a boy or a girl, some parents use this to choose whether they will have the baby. This was certainly the case for the species of mammals that took over the habitats abandoned by dinosaurs 65 million years ago. The good feeling is then replaced by depression. The findings of the IPCC state, 'The largest
contribution to total radiative forcing is caused by the increase in the atmospheric concentration of CO2 since 1750.' The term 'radiative forcing' means the difference between the energy to maintain their body
temperature. It was adopted by Charles Darwin in relation to evolution. What experiences have you had that give you insight concerning these issues? One of the most common of these new technologies is in vitro fertilization (IVF). Looking at Figure 12.20, you can see that the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field, shown in NATURE OF SCIENCE Look at the optic nerves from the left field of the left field of the optic nerves from the left field of the left field of 
the diagram of a cross-sectional map of the primary somatosensory cortex (Figure 12.19). 31 01 Cells Diffusion is one type of passive transport. (i) Calculate the power of magnification of the image. 2 Explain why decomposers are so important in nature. A portal system of circulation (like the hepatic portal system described here) is when
blood travels through two capillary beds before returning to the heart to be re-pumped. When the biomass of Penicillium has reached a sufficient level, it is placed in the batch fermenter (see Figure 13.3). Figure 15.8 Sinusoids are the venule from hepatic portal vein capillary beds of the liver, but their structure and action are different from capillary
beds found elsewhere in the body. If cellular ATP levels are low, the acetyl CoA enters the Krebs cycle. A: We are all the same. This bacterial infection persists for many years. This strand is copied during transcription to form the RNA transcript. "Vesicle entering
cis side of Golgi apparatus. Use Figure 12.42 along with the bulleted points below it to see the effect of extra serotonin in the synapse. Oxygen is needed to turn ammonia into nitrites by bacteria in the soil, e.g. Nitrosomonas. Computer artwork showing a mammalian embryo at a stage called the blastocyst. A male of the same species swims above
where the eggs were deposited and releases a fluid called milt. These structures may be found free in the cytoplasm or they may be attached to the surface of ER. These elements were first found by Barbara McClintock in 1950; in 1983, she received the Nobel Prize for her discovery. 751 15 Option D: Human physiology The relationship between the
hypothalamus and the anterior pituitary works differently (see Figure 15.19). Named examples of fatty acids are not required. The way of producing ATP in glycolysis is called substrate-level phosphate group is transferred directly to ADP from the original phosphate-bearing molecule.
comparison of DNA. Repetitions make sure there are no errors. Eukaryotic cells range in diameter from 5 to 100 µm. It must allow you to collect measurable data. 441 10 Genetics and evolution A waterway or mountain range can physically separate two populations, causing geographical isolation. This is an example of positive phototropism. The two
most common ways that HIV is spread from person to person is by having unprotected sex with an infected person, and by using a hypodermic needle that has previously been used by someone who is HIV-positive (HIV+). We can take this further. Common stimuli for plant tropisms include chemicals, gravity, touch, and light. There is a category of
cells that only contain 23 chromosomes in total: the sex cells, also called gametes. In a similar sort of way, the catabolic and anabolic pathways mentioned earlier are also closely associated with one another. 2 Coastal fisheries records show extensive loss of biodiversity along coasts, with the collapse of about 40% of species. F2 refers to the second
filial generation and they are the offspring of the F1 generation. The four mice that were not injected within a day. Accepting the null hypothesis is a way of saying 'Yes, there is a high probability that any deviation from the expected values can be attributed to chance'. Obviously, it is not possible to isolate yourself from every
possible source of infection. The light-independent reaction involves the Calvin cycle (see Figure 8.23), which occurs in the stroma of the chloroplast. Identify the offspring that represent recombinants. Polar and non-polar amino acids Amino aci
 possible causes of mutations, genetic diseases and cancer An artist's conception of how DNA can be damaged by radiation. Hybridoma cells can be formed that produce antibodies specific for HCG. Heart muscle needs a rich supply of oxygenated blood to maintain its non-stop action. Many people also monitor their own blood pressure at home with
 the use of digital sphygmomanometers. Training for some sports is often done at high-altitude locations in order to take advantage of some of the possible acclimatization adaptations, such as increased haemoglobin and numbers of erythrocytes. This behaviour is called an operant. • Fusion of gametes from different parents promotes genetic
variation. The growth cone of the axon has a receptor called a CAM-specific receptor, so that when a CAM and its receptor recognize each other, chemical messaging takes place within the neurone. 1 2 3 4 5 6 7 8 A specific antigen type is identified (e.g. a particular cold virus). Cutting and pasting DNA The 'scissors' used for cutting base sequences
are enzymes. This number is in line with other ape species that are the closest species to humans, genetically speaking. This means that their blood is sometimes outside the blood vessels in one or more body cavity. The centrosomes move towards the opposite poles of the cell as a result of lengthening microtubules. Implantation of the blastocyst in
the endometrium is essential for the continuation of pregnancy. In the case of a causal relationship, one factor causes another; there must be a scientific process or mechanism connecting the factors with one another. For example, if the ELISA test is used for drug screening in the workplace, there is a relevant cut-off number for positive and negative
tests. 26 How many genes in this microarray are turned off in the cancer cell? Sympathetic is when you are in 'sympathy' with your fear of a lion chasing you. However, there is evidence that many of the nest mates of bats, for example, are not relatives. This is also true for the first daughter and the last son. Some different types are: • complete
flowers, which contain all four basic flower parts, the sepals, stamen, and carpel • incomplete flowers, which only have stamens, and no carpels • carpellate flowers, which only have carpels, and no carpels • carpellate flowers, which only have stamens, and no carpels • carpellate flowers, which only have carpels, and no carpels • carpellate flowers, which only have stamens, and no carpels • carpellate flowers, which only have stamens, and no carpels • carpellate flowers, which only have stamens.
The plumule is the shot tip and includes the epicotyl and its two developing leaves. • Skill: Use of a database to determine differences in the base sequence of a gene in two species. Then the scientists asked the same person to pick up a spoon with his or her left hand. But which strand of DNA is copied? Genetic counsellors can analyse the karyogram
and tell the parents about any chromosomal anomalies such as Down syndrome. It can mean that one species provides vital substances for another, as in the case of symbiotic bacteria, which help certain plants get nitrogen while the bacteria grow in the plant root nodules. If you recall, glucose is also the most common molecule that organisms use for
fuel in the process of cell respiration. In the simplest scenario, this receptor-hormone complex then passes through the nuclear membrane and selectively binds to one or more specific gene. Amino acids can have two possible orientations: left-handed and right-handed, depending on the way their atoms are attached together. Could there be some
other mechanism that would favour one allele over another and generate results that deviate from the expected ratio? The outer covering of isopods (exoskeleton) lacks a waterproof waxy cuticle (as found in many land-dwelling groups), so they are highly subject to desiccation (drying out). The allele frequency is expressed as a proportion or a
percentage. Pyruvate is the ionized form of pyruvic acid. If a gene that codes for the production in a female sheep, she will produce that protein in her milk. A B C D Other examples of adaptive radiation can be seen in birds such as Darwin's finches (described in Section 5.2) on
the Galapagos Islands and the Hawaiian honeycreepers. But sometimes these molecular collisions provide enough energy to specific molecular collisions provide enough enough energy to specific molecular collisions provide enough energy to specific molecular collisions provide enough ener
a solid surface which can be used to identify a genetic marker. There is no cure for PKU, but there is a course of treatment that is effective as long as the disease is detected early. Such studies are called epidemiological studies, and they look at trends in populations, often examining thousands of cases. 2011), Copyright© 2011, with permission from
Elsevier; Figure 14.38 from Liling Lee, The influence of edge effects on habitat suitability of western meadowlarks in east bay regional park district grasslands, Spring 2013, classes/es196/projects/2013final/LeeL_2013.pdf [accessed 8/05/2014], reproduced with permission; Figure on page 764 from Nutrition: Effect of vegetables on bone metabolism,
Nature, 401, 23 September, pp. If, for 116 whatever reason, one or more of the bases (A, C, G or T) is misplaced or substituted for a different base, the results can be dramatic. Humans have 22 pairs of autosomes and one pair of sex chromosomes (see Figure 3.11 in Section 3.2). In an effort to double-check the timing of the evolutionary clock,
biochemical data can be compared with morphological fossil evidence and radioisotope dating. In 2007, 12 million farmers in 23 countries were growing GM crops. Mitosis and cell division in the shoot apex provide cells needed for extension of the stem and development of leaves. One side of the apparatus is near the rough ER, called the cis side. No
matter what the outcome, each offspring is the result of two alleles coming together when the gene is now in its genetic makeup, the modified E. The batch fermenter is missing glucose, which will starve the Penicillium. So 90 people would be carriers
If the unknown fly has the heterozygous genotype GgLl, the resulting offspring will show some traits from each parent. For this there are some concepts that need to be clarified. For his contributions to the new science of genetics, Morgan won the Nobel Prize in 1933. It was not until many decades later, when a new generation of scientists repeated
his experiments that the scientific community started to get excited about genetics. • Skill: Drawing an absorption spectrum for chlorophyll, and an action spectrum for photosynthesis. 64 Molecules, such as water, that are polar substances are said to be hydrophilic, or water 'loving'. The fourth haploid cell produced is very large and is the ovum
(plural ova). Any plants touching the top or right should be counted. Hybrids, on the other hand, such as most of the varieties of corn grown in the world, have increased yields. This gate is called an ion channel because ions like Na+ are moving back and forth across the postsynaptic membrane. • Scroll down and click
BLAST. The second tRNA matches its three anticodon bases with the second codon triplet of the mRNA. His subjects were dogs. The upper curve shows the activation energy when no enzyme is involved. A nucleosome consists of eight spherical histones with a strand of DNA wrapped around them and secured with a ninth histone. Dark-coloured
substances such as the asphalt have a low albedo, and absorb lots of light and convert it into heat. Sunlight itself, which is made up of short wavelengths, is not warm; the temperature of outer space between the Sun and Earth is hundreds of degrees below freezing. Notice how only one population is growing in its native state: the one from Delaware
Table 15.1 summarizes some of the more important digestive exocrine secretions. For example, cold temperatures could increase mortality in an exponentially growing population of fruit fly larva. We need T cells because they are helper cells for the B cells in the immune system. Let's look at the oxygen dissociation curve for human adult
haemoglobin (Figure 15.22). This is followed by an entire series of reactions that ultimately cleaves the 6-carbon molecules. left semilunar valve closed left atrium aorta 5 left In Figure 6.9, the atrium is undergoing atrioventricular a systole (contraction). To form the brain, nerve cells migrate to the outer edge of the neural
tube and cause the walls to thicken. Cardiac muscle cells are very good at conducting these action potentials through the gap junctions within the intercalated discs that join the cells together. Small sacs called vesicles can then be seen coming off the trans side. Phloem is mostly made up of sieve tube members and their companion cells. To do this, a
plasmid is removed from the host cell and cut open using a restriction endonuclease. However, gene therapy trials are coming back, little by little, notably in helping blind children to regain their eyesight. The regions of DNA that do not code for proteins should be limited to regulators of gene expression, introns, telomeres, and genes for tRNAs.
323 07 Nucleic acids Is DNA the genetic material? Biodiverse stocks fare better. Potassium ions move through specialized transport proteins called potassium channels. With some forms of diabetes, the pancreas is depleted of essential cells and it is hoped that 10 a stem cell implant in this organ could have positive effects. Water velocity = 4.2cm s-1
40 Crab A 0 -40 40 Water velocity = 10cm s-1 Lateral movement/cm Crab B Crab C 0 -40 40 Water velocity = 25cm s-1 0 -40 0 50 100 150 200 250 Distance downstream from source/cm 300 Adapted from Zimmer-Faust et al. 2 (a) In terms of cellular respiration and photosynthesis rates in the northern hemisphere, explain the yearly downward
 fluctuations from May to October. This means every erythrocyte needs to be replaced every 120 days or so by the blood cell-forming tissue of the bone marrow. In short, a new species has evolved from the old one and both will continue in their separate ways (see Figure 10.28). The female sex cells that are fertilized by the pollen are present within
the ovules of the flower. (Total 1 mark) 266 4 Antibiotic resistance in bacteria is an example of evolution in response to environmental change. Like minerals, the intake of vitamins needs only to be in small quantities, as vitamins are typically used to create relatively long-lived substances within the body. Because they take so long to form, fossil fuels
are considered to be a non-renewable resource. 6 When a person's blood type is O+, the positive sign refers to a genetic characteristic called the Rhesus factor, Rh. D denotes the allele for Rh+ and d denotes Rh-. Most words used in binomial nomenclature are Latin or Greek in origin. It involves metabolic reactions, DNA replication, and an increase
to overcome the limitations of their environment. In addition, skeletons provide attachment points for muscles. Parent organisms that do not produce as many may find the probability of their genes being passed on greatly reduced. The blood within the
hepatic portal vein varies in two ways from blood that normally arrives at an organ: • it is low-pressure, deoxygenated blood because it has already been through a capillary bed • it varies considerably in quantity of nutrients (especially glucose), depending on the types of food and the timing of ingestion, and absorption of food within the
small intestine. The male red-garter snake ((Thamnophis sirtalis) displays a courtship preference for larger female snakes. cell wall outer membrane periplasmic gel protein peptidoglycan plasma membrane Gram-stain technique *Safety alerts: Follow standard safety protocols for bacterial work.* Gram-positive bacteria retain the primary dye and
Gram-negative bacteria are easily decolourized. In other words, we can safely declare that there is no statistically significant difference in the data collected from the synapse. Limit the physical methods of introducing genes into plant to
time, as mutations occur from generation to generation in a species. • Active uptake of mineral ions in the first breast milk, called colostrum. The Na/K out pump works by transporting three sodium ions 'out' for every two potassium ions 'in'. II.
Along with energy, a membrane protein must be involved for this process to occur. Stephen Jay Gould Gould 2002 Science and technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more for its own sake or for the technology Is scientific knowledge valued more f
ward off attackers such as insects. The result of this altered gene expression is shown in Figure 9.19. (FASTA is the letter codes that stand for the amino acids in a peptide). As a result of this, the lichen-free, soot-darkened branches were a more difficult place for light-coloured peppered moths to hide: their camouflage simply did not work anymore
This is formed by hydrogen bonds between NH and CO groups Tertiary The secondary structure folded into a complex shape as a result of disulfide bridges, weak hydrogen and ionic bonds, and hydrophobic interactions Quaternary Not always present. A multiple-choice test is easier than an essay test because you can recognize something you have
seen before within limited choices. Transport mechanisms used by epithelial cells to absorb nutrients Figure 6.5 Schematic view of diffusion passive transport mechanisms used by cells of the wore important mechanisms used by cells of the wore important mechanisms used by cells of the world intension and the intension of the intension and the intension are important mechanisms.
particular allergy is first exposed to that allergen, they produce a particular class of antibody known as IgE. Small mice have a relatively large brain. Often genetic traits that show sex linkage affect one sex more than the other. In fact, DNA evidence provides new support for natural selection beyond anything Darwin could have dreamt of, and is
referred to as the modern synthesis or neo-Darwinism, a combination of Darwin's ideas with a newer one, the idea of genetics that Mendel started, that was only confirmed long after both men had died. If a particular dance becomes common place in a species, it is because that specific courtship display has evolved over time based on the positive
response of the females of that species. The genotypes and their phenotypes are: • CRCW makes red flowers • CRCW makes pink flowers • CRCW makes pin
what an axon of a neurone is like when it is not sending an impulse. The body of the embryo will develop from the mass of tissue shown in yellow. aurelia 250 200 P. A computer can match the current brain scan pattern with one of the patterns observed before and can determine which image the person's brain is perceiving. Bacteriophages are
helpful in assessing the resistance of viruses to the waste water disinfectant process. Nucleoli reappear. When a new gene is introduced into a species, that new gene is introduced into a species into a species, that new gene is introduced into a species in the species in the species i
secreted to the environment outside the cell. In addition, repeated touching of the siphon leads to a greater number of synapses between neurones in the very simple brain of Aplysia. There is actually a great deal more than this involved in metabolism. Wash your hands thoroughly upon completion of the activity.* Electrons energized by light allows
the production of ATP and NADPH in the light-dependent reaction of photosynthesis. Exocrine glands secrete to the surface of the body or the lumen of the gut. When mature, this flower smells like rotting meat, thus attracting flies that transfer pollen from the male reproductive structures to the female structures. Continuous synthesis occurs on the
leading strand: primase adds an RNA primer and DNA polymerase III adds nucleotides to the 3 end of the leading strand. The only component in our diet that we can synthesize, by exposure to sunlight, is vitamin D. Atmospheric CO2 at Mauna Loa Observatory 400 380 parts per million 7 360 340 320 300 280 1960 1970 1980 1990 2000 2010 year
Figure 4.16 The National Aeronautics and Space Administration (NASA) data on carbon dioxide levels in the atmosphere 1958-2014. 250 (Papagianni, M. This will require a large sink. Name the trophic levels (as producer or consumer) for each organism listed. (c) How did you determine the five locations where oxidation occurred? Look at Figure
whether or not you should accept something as valid or not. Notice the name is murid herpesvirus 4. Be careful when choosing letters. These form fibrelike structures that anchor the matrix to the plasma membrane. The growing polypeptide chain exits the ribosome through a tunnel in the large subunit core. Whenever possible in science, controlled
experiments are needed to verify or refute theories. Cherry picking is a form of confirmation bias that consists of only looking at the evidence supporting your side of the argument, and ignoring or downplaying the evidence supporting your side of the argument, and ignoring or downplaying the evidence supporting your side of the argument, and ignoring or downplaying the evidence supporting your side of the argument.
20 years of measurements of five different things. Again, this has been confirmed by the introduction of foreign genes using genetic engineering to get an organism to synthesize a protein that it never synthesize a protein that it never synthesize a protein that it never synthesized before. Stimulants Notice that the following drugs mimic the stimulation provided by the sympathetic nervous system, which we studied in
Section 12.2. The sympathetic system is associated with 'fight or flight'. (a) Determine in sequence the amino acids that are coded for by the above mRNA molecule. Some compounds that covered the beach in black particles, this
 particular species of bird is now laying more and more dark-coloured eggs. Carbon dioxide (CO2) is one of them but so are methane (CH4) and oxides of nitrogen (NOx). There is a constant interaction amongst all species. • Dopamine enters the SERT receptors by mistake. Scientists need to make random samples, not visit locations where fish are
 known to congregate. Skill: Analysis of data from invertebrate behaviour experiments in terms of the effect on chances of survival and reproduction. Maintaining a narrow homeostatic range of pH in the blood Figure 15.26 Carbonic anhydrase catalyses the formation of carbonic acid and therefore the spontaneous formation of hydrogen carbonate
These can be illustrated by Mendel's dihybrid cross, shown on the following page. Sedimentary rocks that are rich in phosphorous are mined for fertilizer and applied to soils. 1 2 3 4 5 6 Determine the expected values (although we sometimes like to use percentages
or ratios). The result is the cladogram shown in Figure 13.38. !() (If d.f. = 18, we need to look at the row on the table of t-values that corresponds to 18. 22 Because of the temperature differences between the ballast water? To learn
more about the three-dimensional models of cellulose, starch, and glycogen, and calculating BMI, go to the hotlinks site, search for the title or ISBN, and discrepancies: most but not all organisms assemble proteins from the same amino acids. So, in
effect, three molecules are involved in the collision but only two of them result in the production of ATP. Why did it take so long for the truth to come out? Limestone Marine organisms take dissolved carbon out of the water and use some of it to make their carbonate shells. Although these apples may look similar, inside they are carrying seeds that
each has a unique combination of genes. Based on the frequencies, we can replace the proportions, as shown in Figure 10.26. If you get lost, they have video tutorials to help. Therefore, it is not unusual for a macrophage to first encounter an invading cell outside the bloodstream. When blood that is relatively high in glucose enters the liver by the
hepatic portal vein, insulin stimulates the hepatocytes to take in the glucose (a monosaccharide) and convert it to glycogen (a polysaccharide) and convert it to glycogen (a polysaccharide). Thus a chromosome originally carrying a recessive allele could end up with a dominant allele that was traded during crossing over. Isotopes are versions of atoms that are heavier or lighter than other versions
of the same atom (carbon-14 has more mass than carbon-12). According to an article in Scientific American in 2009, the USA is the second largest producer of phosphate mining is from one area in Tampa, Florida. In this design, a complete plant with its
whole root system is immersed in a container. Also circulating in the bloodstream are cell fragments known as platelets. tRemove 40 kernels and mark with a permanent marker. The side closer to the embryo is formed by the embryo and also contains connective tissue and small blood vessels. (1) (c) Compare the pheromone profile of large female
snakes with the profile of small female snakes. This will slow or stop the process. Fast-growing economies such as China and India have been under scrutiny for their exponential increases in energy sources such as Coal, which produce excessive carbon dioxide
emissions. Some cells have a greatly reduced ability to reproduce once they become specialized, or lose the ability altogether. Splicing of mRNA increases the number of different proteins an organism can produce. Astronomer: That's interesting, sheep in Scotland are black. Whales, for example, could probably swim just as well with a different
number of fingers in their front fins, so the fact that there are five suggests that there is a reason other than swimming efficiency: that of a common ancestry with other five-fingered organisms. For example, if the female parts of one population of plants reach maturity at a different time compared with the release of pollen of another
population, the two will have great difficulty producing offspring together. Thus, cytoplasm and water environments such as the oceans are all aqueous solutions. How can we know if such claims are valid? Alternative: if weather or space forces a group to do this indoors, the activity can be simulated with disks of paper or sticky notes scattered
around a gymnasium. 606 exopolymer matrix immune defence persister cells therapy discontinued planktonic cells biofilm resistance to antibiotics. Table 9.3 Sample results Time 0 min 2 min 4 min 10 min 12 min 12 min 14 min 12 min 12 min 12 min 14 min 12 min 14 min 10 min 12 min 14 min 10 m
leaf surface To calculate water loss per square metre of leaf surface, two methods can be used: the leaf mass method. 328 CHALLENGE YOURSELF 5 A locus designated D7S280 is one of the 13 polymorphisms often used in DNA profiling. Photosynthetic organisms, such as phytoplankton, cyanobacteria,
and plants, are able to produce food by using carbon dioxide, water, and sunlight. Continuous-batch fermenter and sunlight. Continuous are added to the fermenter and sunlight. Continuous are added to the fermenter and sunlight.
Reptile 6b = Mollusca Exercises 9 List the three classification domains. The other two did not show any bacterial growth. The slow-acting transmission system studied the most intensively by Paul Greengard and his group was the dopamine system. Cholinergic versus adrenergic synapses Acetylcholine is released by all motor neurones and activates
skeletal muscle. For example, the chi-square statistical test can be used on these data from the deta from the data from the dat
then free to combine with other substrate molecules. Quorum sensing is the ability of microorganisms in a biofilm to cooperate with each other. Limestone has long been used by humans as a building material (the Great Pyramid at Giza and Notre Dame cathedral in Paris are two examples), and is a major ingredient in modern cement. Some of the
cane toads moved to other areas in Australia. All of these questions are addressed with data collected from both behaviour axon branches of neurone 2 cell body path of action potential synaptic vesicles axon bulbs Ca2! axon bulb dendrites synaptic cleft! Many
axons synapse with each cell body. Repeat each test five times. As the seed is developing, the ovary around the ovule matures into a fruit. Some people are tempted to say that the more genes an organism has, the more advanced it is. Certain molecules from the target cell can act as signals to the growth cone. Saliva contains amylase, the enzyme that
hydrolyses the starch polysaccharide into the disaccharide maltose. These anti-HCG antibodies are chemically bonded to an enzyme that catalyses a colour change when the antibody encounters HCG molecules. Working together, these two scientists have pioneered a technique to insert stem cells into scaffold implants in injured spinal cords in
animals. Reflex arc A reflex arc is composed of a receptor cell, a sensory neurone, a relay neurone, a relay
shortest phase of mitosis. food and water intake active transport through gills dilute urine with few ions direction and magnitude of water movement direction and water moveme
photos such as the one at the top of page 204 possible. Modulation of synaptic transmission Slow versus fast neurotransmitter is a chemical that binds to a receptor, so is a 'doorway' to the neurone. Scientists have come to understand the processes of embryogenesis by studying various animal models. An area
Human physiology Type II diabetes Like hypertension, there are several factors that may contribute to the development of type II diabetes. Like all endocrine glands secrete their hormone (epinephrine) into the bloodstream for distribution to all parts of the body. 1, 10 and 6 respectively (Olff, H., Huisman, J. Recall the events that led
P 94 RNA polymerase is the gene A (synthesis of an RNA molecule). In this example, we will use a protein found in many organisms called haemoglobin. This explains why both atria, and then later both ventricles, contract in synchrony (see Figure 6.7). Notice that the chain has an alternating pentose-phosphate backbone, with the nitrogenous bases
extending outward. rate of photosynthesis rate of photosynthesis rate of photosynthesis rate of photosynthesis a plateau unless light or temperature is also increased positive correlation Figure 2.54 The effect of increasing carbon dioxide concentration on the rate of photosynthesis. DNA molecule is
always conserved (saved). (b) How many differences are there between the human sequence of species B? Just like any virus, HIV is very specific about which organisms and which cell types in an organism it infects. Researchers have knocked out the leptin gene in mice by replacing it with a mutant gene, and found that the mice
become obese. . NATURE OF SCIENCE A paradigm shift has occurred in our approach to saving the world's pollinators. Human activities such as burning fossil fuels are increasing, so why aren't the temperatures increasing equally fast? Is it possible to really 'know' the truth? Resistance to antimicrobial agents A colour SEM Staphylococcus aureus
biofilm found on the microscopic fibres of a wound dressing. 22 Which two groups are the 'control' rats? More possibilities lead to more possible outcomes: some members of the population samples periodically to
determine whether there is exponential growth that slows and finally reaches the carrying capacity of the container in which the plant is growing. The verbal information travels to the right hemisphere, which understands what a 'spoon' is even if the word 'spoon' cannot be verbalized. Produce the ATP necessary to develop the positive hydrostatic
pressure at the source. This mucus can trap incoming pathogens and so prevent them from reaching cells that they could infect. Electroporation makes pores in the cell membrane using electrical impulses. The process is continuous and relatively fast, and the strand produced is called the leading strand. For example, we can measure
the size of breeding cormorant birds to see whether there is a correlation between the sizes of males and females that breed together. NATURE OF SCIENCE Notice how the reclassification of the foxglove is a good example of how scientists work. A value of r2 = 0 means the regression model does not fit the data at all, whereas a value of r2 = 1
means a perfect fit. Adolescents can be influenced or coerced into experimentation with drugs by their peer group. In Figure 6, the data are presented alphabetically, but there is no reason why you couldn't order the bars from the greatest to the smallest numerical values. The supply of glucose for older rats runs out much more quickly. As an
example, if a person with a blood type of A Rh+ (often referred to as A+ for short) was to donate blood to an individual that has B Rh- (B-) blood, the receiving erythrocytes that have two types of proteins that they do not already have as part of their genetic makeup. Xylem Phloem A away from the root only towards the root only B
towards the root only away from the root only D away from the root only D away from and towards the root only D away from 
Figure 1.26 The cell cycle in eukaryotes. One idea is that, in the 7th century BC, in a Greek and Roman city called Cyrene, the plant known as silphium was used as a form of birth control. • Haemophilia is a disorder in which blood does not clot properly. Or should we be confident that countries will work together to find the best solution? Most of the
sunlight bounces off the surface and goes back into space. A limiting factor is described as a factor that would most directly affect the rate of a physiological process. This 10 p.p.m. increase represents a percentage change of +2.6% for the period shown. Genetic modification of crops You may have already heard of genetically modified (GM) crops.
One of these effects is to increase the production and secretion of the centromere. Fortunately, because the brain has plasticity, other parts of the brain may take over during rehabilitation and facilitate the return of full motion. In this mode
the black, centre atom is the carbon atom, and the two red atoms are the oxygen atoms. 13 611 13 Option B: Biotechnology and bioinformatics Detail of DNA microarray Look at the Figure 13.29 and the sequence described below. This is what is typically called 'jet lag', produced when a person travels through several time zones in a short period of
time. To keep the glucose level in the normal range, the stored glycogen in the granules is reconverted to glucose and added into the bloodstream in the sinusoids. Some polar substances, particularly ions and carbohydrates, are transported across the membrane via the channel proteins. QDs are nanoparticles that are 10 nm in diameter; 3 million
QDs could be lined up end to end and still fit the width of your thumb. This causes you to brush off the bee before you can even think about it. A rat is either born with a susceptibility to be killed by the pesticide or is born with the green alga
Chlorella. One of the main reasons for producing a GMO is so that it can be more competitive in food production. If that test is positive, the treatment is based on a diet that limits proteins sources that are known to be high in phenylalanine. To copy a gene, it must be glued into a plasmid. 3 Obtain a microscope, slide, and cover slip. This is called
anabolism. One way to do this is to try to stay away from sources of infection. Appetite is controlled by the hypotheses on the migratory behaviour of
blackcaps have been carried out. Tumour markers can be used to help diagnose cancer or to check a patient's response to treatment. In this graph, the number of bean plants is plotted on the y-axis and the heights, ranging from short to medium to tall, are plotted on the x-axis. Human physiology remains closed. We will see how this works as this
section continues. True-breeding means homozygous for the traits being studied; using them means no surprises can be produced by masked recessive alleles. However, there are some countries where the incidence of smoking has rapidly increased over the last two decades. Windebank, a neurologist, has implanted stem cells into damaged nerve
tissue. Although peat is a heterogeneous mixture of many things, at least 30% of its dry mass must be composed of dead organic material for it to be called peat. General anaesthetics are usually volatile compounds and inhaled, and thus affect the whole body. Paramecium is a unicellular member of the kingdom known as the Protista. 261 05 Evolutions
and biodiversity Cladograms and classification Cladistics attempts to find the most logical and most natural connections between organisms in order to reveal their evolutionary past. • All three polysaccharides can be composed of many thousands of glucose monomers. Many people assume that smoking is just a bad habit. 226 Worked example Using
the map in Figure 5.6 and the information presented about peppered moths during and after the industrial revolution in the UK, answer the following questions. D Filicinophyta. Partial pressure is the pressure exerted from a single type of gas when it is found within a mixture of gases. acetyl CoA CoA 4C oxaloacetate Figure 8.14 Finally, the 4-carbon
compound is converted to oxaloacetate. 8 What would a genetic counsellor look for to determine the sex of the unborn child? The blue colour shows the axons, and the surrounding yellow is the myelin sheath of each axon. When an organelle is present in both types of cell, it usually has the same structure and function. The page that comes up is the
 alignment page. Table 2.3 shows some common aqueous solutions in which specific biochemical reactions take place. In addition, a single bivalent can have several chiasmata producing crossing over in more than one chromatid. Nutrition problems and their consequences Food quantity and quality is a serious problem in many areas of the world.
Determining the osmolarity of tissues *Safety alerts. With Stargardt's disease, within the first 20 years of a patient's life he or she begins to lose his or her central vision. Because haemoglobin has a total of four oxygen molecules
 (4O2). But what is the benefit to the pride (females) of being in oestrus at the same time? 733 15 Option D: Human physiology Sinusoids are the capillaries of the liver instances, they have confirmed the presence of mutations in the plants and an
that have colonized the abandoned zone. • The motor neurone carries the impulse to an effector. Interested in insulin or haemoglobin? In our lungs, stretch receptors respond to the degree of lung inflation. The fluid that is ultrafiltered from the glomerulus passes through the basement membrane, which helps prevent large molecules like proteins
from becoming a part of the filtrate. Although edible mushrooms are found in the fruit and vegetable section of your local supermarket, they are not classified by biologists as plants. This book is the second edition of the market-leading Pearson Baccalaureate HL biology book, first published in 2007. DNA Evidence stated Clearly HIGHER LEVEL P E A
R SO N B ACC A L AU R E AT E HIGHER LE VEL Biology 2nd Edition ALAN DAMON • RANDY McGONEGAL • PATRICIA TOSTO • WILLIAM WARD Supporting every learner across the IB continuum Published by Pearson Education Limited, Edinburgh Gate, Harlow, Essex, CM20 2JE. Thus the release of calcium ions and the interaction with troponin
and tropomyosin represent the link between the nervous system and the muscular system, as well as the skeletal system that is being moved. There are a total of five myofibrils visible in this photo, arranged from top to bottom. 164 Investigating the
rooting of stem cuttings. A 'living' model to observe water transport in plants *Safety alerts: Wear eye protection and aprons during this procedure. Generally, it consists of a pair of centrioles at right angles to one another. Modern technology allowing extensive communication has been extremely important in the continual improvement of the
present-day microscope. The outer membrane also protects the Gram-negative bacteria from antibiotics. As of September 2012, the algal bloom is gone, the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence. A spike in the level of FSH and LH leads to ovulation (the release of the oxygen levels are up and a community of fish has made a resurgence.)
is a mixture of all of the wavelengths (colours) of visible light. The d on the x-axis of the graphs represents the distance from the light source. Top of solution Red Blue band band • • • In Figure 2.37, you can see the two bands. • • • In Figure 2.37, you can see the two bands. • • • In Figure 2.37, you 
baking. Rough ER has ribosomes on its exterior. The nuclear envelope disintegrates and nucleoli disappear. See if you can determine the phenotype of each child before reading on. 305 06 Human physiology Synapses can be between a motor neurone and muscle. Is the
midwife lying? • If I find a gene that has medical value, can I patent it and make money from my discovery? Consumers take the energy-rich carbon compounds, such as sugars, 175 04 Ecology CHALLENGE YOURSELF 1 From the photo, identify the following: (a) non-living inorganic components, both visible and non-visible (these are referred to as
abiotic components) (b) living components, both visible and non-visible (d) heterotrophs present, both visible and non-visible and non-visible
This carbohydrate provides the major nutritional source for the organism. The nature of science sometimes dictates that good, new scientific knowledge takes time to become trusted. The end result is not only a body that is far too thin, but a physiology that is in grave danger of collapsing because of a lack of essential nutrients. • Normal heart
sounds are caused by the atrioventricular valves and semilunar valves closing, causing changes in blood flow. When scientific investigations are completed, usually they generate new questions or new ideas for further investigations are completed, usually they generate new questions or new ideas for further investigations. The Amflora potato Just recently, for the first time since 1998, a GM crop has been approved to be grown in a European
Union (EU) country. The hunting behaviour of the blue crabs was studied by recording their movements after the release of the chemical, which was visualized by adding a dye (noted by shading in the figure below). A Nutrients are recycled by the decomposers back to the producers. 4 (a) Does not possess a notochord at any time
                                  Now that the background colour has changed, the light-coloured moths will get eaten. The cells here contain large numbers of chloroplasts to carry out photosynthesis. Also, you could try other types of germ-line cells if they are available. Some modern cultures still use drugs in religious and ritualistic ways. This is not true.
Generally speaking, lumpers focus on the similarities between organisms, while splitters focus on the differences between organisms such as seaweed used to be considered to be plants, until closer examination revealed that they do not possess the structures we expect to find in plants, such as
roots and leaves. This process of a radioactive parent isotope changing into a stable daughter isotope is called decay. They argued that a company such as Myriad should not be able to put an industrial patent on genes, because DNA sequences occur naturally and are not invented by a company: therefore, they are not patentable objects. Decades-old
predictions of extreme weather events, record temperatures, and receding glaciers are being confirmed day after day. These two hormone (FSH) and luteinizing hormone (FSH) and luteinizing hormone (LH). 3 How was smallpox completely eradicated by a global vaccination programme? Global demand for fish has doubled in less than 30 years
because of human population growth in poor countries and a matching increase in demand for fish in those countries. Do not split a data table across two pages. top carnivores herbivores producers 4 kJ m!2 yr!1 400 kJ m!2 y
first name in the binomial nomenclature system is always capitalized and it refers to the genus; the second name always begins with a small letter and refers to the environmental resistance consists of limiting factors in the environment which keep populations from reaching their maximum growth potential. There are seven pages of
organisms. Global climate change is affected by greenhouse gases Because the greenhouse effect is often misunderstood, be sure to master the scientific vocabulary and concepts. However, the chemical signals that are responsible for the communication between neurones consume half of all the energy used by the brain. 19 01 Cells Nucleus The
nucleus in eukaryotic cells is an isolated region where the DNA resides. You may laugh, but early classification systems were often based on listing the cause of Alzheimer's disease? Again, this increases the number of possible proteins
produced by one gene. Application: Changes to the Earth's atmosphere, oceans, and rock deposition due to photosynthesis. However, we are now moving from the observed to the unobserved to the unobserved to the unobserved. Look at the following images. These two blood vessels carry blood into the capillaries of the liver, called sinusoids. Most of these
genetic variations are called SNPs (snips). • Guidance The sequence of events in the four phases of mitosis should be known. There is a start codon (AUG) that signals the beginning of a polypeptide chain. This can be referred to as monoploidy. The Gram-positive bacteria have no outer membrane to protect them from an antibiotic. Carbon is such a
crucial element to living organisms that it is part of the definition of a living thing. Bakers' yeast is added to bread products for baking because the generation of carbon dioxide helps the dough to rise. 12 After extensive studies of cells, it has become apparent that all cells use some common molecular mechanisms. C Several ribosomes using a mRNA
molecule to synthesize protein at the same time. The DNA is cut open using enzymes. • • Applications and skills: Applicat
fermentation. Skills: Drawing and labelling a diagram of the nitrogen cycle. A monohybrid cross is one in which the parents have different alleles and which shows the results for only one trait. 89 02 Helicase can catalyse the unzipping of DNA at a rate measured in hundreds of base pairs per second. Do video games have a long-term effect on brain
functioning? Compared with the original population on the mainland, an island population on the mainland population of the mainland population of the mainland population of the mainla
urlid=68726 (or do an internet search for 'Swiss-Prot expasy'). C Coniferophyta. A gene coding for a useful protein is added using enzymes. 148 blood type B Tom Kate A O Figure 3.30 How the ABO blood groups can be inherited. mitochondria tight junctions between adjoining cells absorbed nutrients to capillary or lacteal invaginations
in the inner membrane (basal labyrinth) CHALLENGE YOURSELF 1 See if you can identify the epithelial cell adaptations described in the previous section on the electron micrograph shown on the left. 750 cyoplasm nuclear membrane Figure 15.17 An illustrated nucleus plasma peptide hormone 1 gene activated or suppressed secondary messenger 2
4a 4b enzyme activated 3 plasma membrane of target cell series of messenger molecules PLEASE ADVISE WHERE ENZYME ACTIVATED The pituitary anterior pituitary anterior pituitary version of the general mechanism of a peptide hormone. Undigested
nutrients cannot pass through the villus epithelium. It is likely that tumour may be given a poorer prognosis than a patient with a tumour that has a lower mitotic index. DNA is replicated before meiosis so that all chromosomes consist of two sisters
chromatids. Skill: Annotation of diagrams of seminiferous tubule and ovary to show the stages of gametogenesis. When they returned the bacteria had grown. The first evidence of an experimental attempt to make artificial clones was performed by Hans Dreisch in the 1890s with sea urchin embryos. Do you know how the ideas of Galileo were first
received? mouth oesophagus The alimentary canal is a muscular tube Food does not make its one-way journey through the alimentary canal by gravity. The brain regulates and monitors unconscious body processes such as blood pressure, heart rate, and breathing. Before continuing, it is essential to review the interior structure of the mitochondrion
A baby having a small amount of blood drawn from his or her heel to test for the possibility of PKU. Gram-positive bacteria have a small amount. However, plant cells have a relatively firm cell wall and they form a cell plate. Now that we know what their sequences are, we need to know
the order in which to put them. 6 If both NAD and FAD are reduced, which would allow the greater production of ATPs via the electron transport process. Optional: if your lab has some available, observe slides that have been prepared by professionals.
Some in the second sample will be marked and some will be unmarked. In addition to the 20 amino acids whose structures are given in Figure 2.20, there are two additional amino acids called selenocysteine and pyrrolysine. Individual trees can grow to more than 118 metres (390 feet) and have a trunk diameter of more than 10.5 metres (35 feet).
empty circle = female empty square = male filled-in circle = a female who possesses the trait being studied | vertical line = the relationship parents and offspring — horizontal line between a man and a woman = they are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate that are the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the offspring 152 2 The symbols indicate the parents who had the of
the unaffected members of the family are the mother, the first child (a girl) and the fourth child (a boy). 231 05 There are three main sources for variation in a population: • mutations in DNA • meiosis • sexual reproduction. New combinations of alleles For crossing over to happen, each chromatid involved has to have a separated tip. However,
osmosis involves only the passive movement of water across a partially permeable membrane. Among these mutations was one discovered in May 1910 for white eyes, easily detected amongst the red eyes of the normal (also called wild-type) flies. In the decades since those events, more and more people have become concerned about our ability as a
species to have enough space, water, and food for everyone. Genetics 5 Work out the chances of each genotype and phenotype occurring. • What kind of emotions might someone feel after spending 18 years in prison, and then being freed thanks to a DNA test? Both of these fatty acids are essential in the human diet and indicate that consuming fats
is not necessarily bad for your health. Prophase II 1 2 DNA condenses into visible chromosomes again. Eventually, many of these connections are lost because it turns out they are not with the right partner cell. In the example above, proteins used by fish to resist the icy temperatures of arctic waters are now produced by the modified tomatoes to
make them more resistant to cold. The light-dependent reaction occurs in the thylakoids or grana of the chloroplast. germinal epithelium cell (diploid) lumen partially differentiated spermatogenesis and spermatogenesis.
are the female and male processes of meiosis, respectively. Nuclear membranes then form around the two daughter nuclei as the chromosomes de-condense (telophase). As each sample contains 10 plants, we can divide the sum of all the heights by 10 in each case. far greater than shown in this On one side of the membrane is the patient's blood, and
on the other side is a solution schematic. Gross photosynthesis refers to the sum of net photosynthesis and respiration. • Oxygen is dissolved in the water of the filter bed and is made available to the biofilm by diffusion from the water.
was presented by Lynn Margulis in 1981. There is about a 1 in 250 million chance that any single spermatozoon ejaculated in the vagina will be the one that will fertilize the secondary oocyte. The labelling is the original Latin. in the format Educational/Instructional Program via Copyright Clearance Center; Figure 14.27 adapted from Lost at sea:
where is all the plastic?, Science, 304, 7 May (Thompson, v et al 2004), reproduced with permission from the author; Figures 14.28 adapted from SFWOzStrmUpper.JPG, reproduced with permission; Figures 14.29 and Environmental
Safety, 74 (8), November, pp. Summary of ATP production in cellular respiration We have now described the complete catabolism of one molecule of glucose. The polar bodies produced during oogenesis later degenerate. • Genetic modification is carried out by gene transfer between species. On the right track? Thus DNA indirectly controls the
biochemistry of carbohydrates, lipids, and nucleic acids with the production of enzymes. 4b Nitrification. Some of the iron is inevitably lost, however, as the recycling is not 100% efficient. The atrioventricular valves closing are heard as a second sound, 'dub'. 68 Scanning electron
micrograph (SEM) of sliced open plant cells. • Recombinant DNA must be inserted into the plant cell and taken up by its chromosome or chloroplast DNA. The 2 value will help us to determine whether the null hypothesis can be rejected. Limit your answer to the type of locomotion. Haemoglobin molecules typically do not 'empty' their oxygen load
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when they reach respiring body tissues, but they do release a significant amount of oxygen within a relatively narrow range of oxygen within the fluids within the tubules or the collecting ducts. In Table 4, there are two categories into which the data fall (possible outcomes 1 and 2, so there is 2 - 1 = 1 degree of freedom). The procedure for producing monoclonal antibodies begins with the injection of an antigen into a laboratory animal such as a mouse (see Figure 11.2). \bullet To learn more about Thomas Hunt Morgan and his work, along with more information about genetics, and about chisquared

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tests, go to the hotlinks site, search for the title or ISBN, and click on Chapter 10: Section 10.2. NATURE OF SCIENCE Looking for patterns, trends, and discrepancies: patterns of chromosome number in some genera can be explained by speciation due to polyploidy. C The external intercostal muscles relax and the diaphragm contracts. The light and
dark green lines running horizontally are the sarcomeres. 17 What type of amino acids will be present where integral proteins attach to cell membranes? Using recombinant human DNA avoids that problem. There are many ideas about how this association was made. And yet, those same critics may very well accept the effectiveness of the placebo
effect: an effect that appears to be produced essentially by ritual. There are three main objectives to using binomial nomenclature and its associated rules: (1) to be sure that each organism; (2) so that that the names can be universally understood, no matter what nationality or culture
is using the name; and (3) so that there is some stability in the system by not allowing people to change the names of organisms without valid reasons. Notice that the data points are connected by straight lines rather than using a trend line or line of best fit. Each cluster of alveoli is surrounded by a capillary bed for efficient gas exchange. Pepsin is
an example of a hydrolysing enzyme. 14 The micropyle allows water to enter the testa of a seed during germination. This is sexual selection. Glucose that is filtered is normally completely reabsorbed in locations such as the proximal convoluted tubule. 736 cells for protein synthesis amino acids bile bilirubin bone marrow iron stored in liver Figure
15.9 The molecular components of haemoglobin are recycled when erythrocytes die after about 4 months. 12 10 8 6 In line graphs, the x-axis is usually the independent variable, in 4 which case the y-axis is the dependent variable. Before beginning this practical, it is essential you understand how to use your school's microscopes properly. For
example, linguists look at changes in words and uses of vocabulary to trace the evolution of a language throughout the course of history. • Neurotoxicity can cause long-lasting damage to brain cells, killing them or impairing their function. If you are not in an emergency situation
and are in a relaxed state, the parasympathetic system takes over. Crossing over allows DNA from a person's maternal chromosomes to mix with DNA from the paternal chromosomes to mix with DNA from the paternal chromosomes to mix with DNA from the paternal chromosomes. This organelle is especially prevalent incompanies to mix with DNA from the paternal chromosomes to mix with DNA from the paternal chromosomes.
glandular cells, such as those in the pancreas, which manufacture and secrete substances. domestic duck 0.00959 Canada goose 0.01096 alligator 0.11644 Nile crocodile 0.07534 human 0.02825 Option B: Biotechnology and bioinformatics Clustal Omega performs multiple alignments. The preferred habitat of the brown-headed cowbird is open
 agricultural areas. Prokaryotic ribosomes are smaller than eukaryotic ribosomes. A process called autoradiography can then be used to track the flow of the carbohydrate, usually sucrose, through the plant. Exercises 10 Outline the steps for using a DNA microarray. In such an environment, 0 oxygen binds easily to haemoglobin. Some of these
organisms are sessile, others are free-swimming, and some can be both depending on the period of their life cycle. The flower is the hardworking and very successful reproductive structure of angiosperms. Below is a figure representing the Meselson-Stahl experiment. 548 For a long-term memory to be created, a stronger, more long-lasting stimulus
is needed. The chromosomes are placed in order according to their size and shape. Structures in the middle ear transmit and amplify sound. fresh, leafy shoot petroleum jelly seal rubber bung 1-cm3 pipette clamp stand flask filled with water There are many different designs for potometers. Normal milk and milk products enter their digestive tract
and are not digested; instead the normal bacterial colonies in their intestines feed directly on the lactose. G1 During G2, organelles may increase in number, S DNA begins to condense G1 checkpoint from chromatin to G1 cyclin chromosomes, and P microtubules may begin to form. The objects inside radiate their heat to the air inside the greenhouse
but the glass of the greenhouse is not as transparent to heat energy as it is to light energy, so some of frequencies (see Figure 10.20). Unlike the six previous examples, these organisms are all called vertebrates. The only method of replacing it again is
to add more fertilizer. Nucleic acids The front of RNA polymerase opens the DNA helix. 527 NATURE OF SCIENCE Animal horns were the first hearing aid, used in the 13th century. This means it is a group composed of the most recent common ancestor of the group and all its descendants. The consequence of this is that sometimes organisms were
put in the same genus even though they are not in fact closely related to each other. What factors influence scientists in their decision to accept or reject new theories? This allows scientists to gain information about where the insulin is produced (localization) and its interaction with other molecules. This helps maintain the blood pressure between
pump cycles. Referring to the top of this column in the table, p = 0.05: so the probability that chance alone could produce that result is only 5%. edu/carterp/Courses/bio110/ chap07/chap07.html 466 myosin binding sites Exercises 5 List three common
functions that bones of some animals and the exoskeleton of other animals have. wild-type plastid genome 2 Tobacco mosaic virus is a pathogen. Table 3.4 Mendel's results seen in second generation Round × wrinkled seeds
100% round 5474 round 1850 wrinkled 2.96:1 Yellow × green seeds 100% yellow 6022 yellow 2001 green 3.01:1 Green × yellow pods 100% green 428 green 152 yellow 2.82:1 Tall × short plants 100% long 1787 long 277 short 2.84:1 Can you identify the independent variable and dependent variable in each experiment? Cells of mucous membranes
produce and secrete a lining of sticky mucus. As the monomer units of carbohydrates are monosaccharides, we will start by looking at their structure. The University of Göttingen in Germany found in recent studies that nearly 76% of the world's leading crops are pollinated by animals. Autotroph II. These ribosomes are involved in protein synthesis.
olfactory receptor cells 1 Odorants bind to receptors. Enzyme degrades neurotransmitter. Every day more information is added to this database, and every day other scientists access the information fails to help them in their research projects. After birth, two events stimulate the secretion of milk so that breastfeeding can begin. As it
is possible to come up with many hypotheses to fit a given set of observations, how did Alexander Flemming in 1928 prove that it was the mould that had killed the staphylococcus bacteria in the culture dish, and not something else? (a) In semi-conservative replication, the new molecule of DNA has one strand from the original molecule and one new
strand produced from nucleotides in the surrounding environment. Provide your reasoning for each answer. Most amphibians can also absorb oxygen through their skin. Each letter represents an amino acid in the protein. For example, the presence of hair is part of what defines a mammal, so any species found after the line marked 'hair' should be in
the class of mammals. Use the following steps to go to the website and explore chromosome 21. They concluded that pollutants in the urban areas stimulate the problems of diseases such as asthma and bronchitis because of the expression of usually non-expressed genes. Note that, today, we would use a different notation: sex-linked genes like this
would be shown as XW, Xw or Y. The variable n represents the haploid number, and it refers to the number of sets of chromosomes that a nucleus can have. This suggests that other factors may be influencing growth, in addition to sunlight and
shade. They provide an identification label that represents the cells of different types of species. The cycles of growth, death, and decomposition show how nature recycles nutrients, but energy pyramids show that energy flows through a system and is lost. 

Interphase is a very active phase of the cell cycle with many processes occurring in the
nucleus and cytoplasm. Table 1.7 Diffusion and osmosis Type of passive transport 32 Description of membrane Simple diffusion Non-channel protein carriers change shape to allow movement of substances other than
water Osmosis Only water moves through the membrane using aquaporins, which are proteins with specialized channels for water movement urea partially permeable membrane between two solutions of different osmotic concentrations allows water
molecules to pass from the hypo-osmotic solution. The muscular walls of both atria are very thin, and the pressure exerted during atrial systole is very low. For a period of time after hatching, she also protects the young from predators, including any male alligators in the area, who appear to show no paternal instincts
towards the young. When a male lion and a female tiger are crossed, a liger is the name of the hybrid formed. It is often used in forensic situations when only a limited amount of the original DNA has been recovered at a crime scene. Are we justified in making such claims? Fawcett/ Science Source 49 02 Molecular biology Essential ideas 2.1 Living
organisms control their composition by a complex web of chemical reactions. ! Here are the linked genes in the heterozygous for both traits: g l == g l One way of showing this cross is by drawing a
Punnett grid (see Figure 10.16). This process involves dehydration until the water content of the seed is about 10-15% of its weight. It is passive because it involves transport along hydrostatic pressure gradients. Figure 1.35 Examine this graph from the World Health Organization noting tobacco use as a risk factor for eight leading causes of death in
the world. It aligns more than two sequences at the same time. At this point the vesicle membrane is actually a part of the plasma membrane is actually a part of the plasma membrane. (a) In the 1700s in a relatively non-polluted area where there is a large number of grey peppered moths and only
a very small number of black peppered moths. People affected by sickle cell anaemia are at risk of passing the mutated gene on to their offspring. In countries where medical care is good, it is common for every newborn to be tested for PKU. A mutation of this gene stops a person from being able to make the protein transducin properly, which is
necessary to transmit information about colour from the eye to the brain; as a result, the person will not see in colour. The message written into the mRNA molecule is the message that determines the order of the amino acids. Figure 15.27 The events occurring when carbon dioxide enters a erythrocyte include the formation of carbonic acid and the
resulting buffering by haemoglobin and plasma proteins. Everything you can smell, like bread baking, onions, coffee, anything good or bad, is releasing volatile molecules that diffuse into the air. In preparation for meiosis, DNA Spermatogonian
exists as a pair of chromatids. Unlike fossil fuels, biofuels made in a biogas generator like this do not take millions of years to form. Another product, nitrous oxide (NO), can contribute to global warming, as it is a minor greenhouse gas. The DNA fragments are placed into small wells (holes) in the gel, which are aligned along one end. 210 1998 Argo
float 2000 2002 Jason-1 2004 This is a satellite photo of forest fires in the Yucatan peninsula in 1998. No matter how many instances of white swans are white. Give the products of each of the following reactions: (a) the complete hydrolysis of a starch molecule (b) the
condensation reaction between glucose and galactose (c) the complete hydrolysis of a triglyceride lipid. Monomers into polymers CHALLENGE YOURSELF Monomers (single nucleotides) in both DNA and RNA may bond together to produce long chains or polymers. Secondary metabolites are metabolites produced by a microorganism that are no
used for energy. 195 04 Ecology A lump of coal. • Bryophyta: the bryophyta: the bryophyta: the bryophyta is the value of knowledge? An example of this are the primates
found in Madagascar and the Comoro Islands off the southeast coast of Africa, hyperosmotic solution Size and charge The size and polarity of molecules determine the ease with which various substances can cross membranes. An ice core being removed from the drilling apparatus. 

Dietary minerals are essential chemical elements. 4 William
Bateson and Reginald Punnett (the man whose grids we use to calculate expected offspring) continued Mendel's work on pea plants, and tried other traits besides the seven that Mendel looked at. A simple version of song is innate in birds. It is estimated that each square millimetre of small intestine contains approximately 10-40 villi. The methane
can be collected in the Mylar balloon. Rough ER has ribosomes on the exterior of the channels. The chromosomes line up in pairs. This is nothing to brag about though, as a high gene count falls somewhere between grape plants (which have about 30 000 genes) and chickens (which have about 17 000 genes). The actin fibres will change position so
that the Z lines become closer together. After inserting the DNA, the plant will be genetically modified. Although 75% of the plants are tall, they have differing genotypes. This high-resolution, falsecolour SEM shows a single mitochondrion. 

Skill: Drawing and labelling a diagram of the human kidney. Applications and skills: Applications are tall, they have differing genotypes. This high-resolution, falsecolour SEM shows a single mitochondrion.
pairs of muscles in an insect leg. 15 Evaluate one method used to determine the size of commercial stock of marine fish. Because heterotrophs rely on other organisms for food, they are called consumers. This is where the doublestranded DNA opens to provide the two parental DNA strands that are the templates necessary to produce the daughter
DNA molecules by semiconservative replication. Another very common reason why a plant's roots may have to expend energy for a particular mineral ion to pass into it, is because the ion cannot cross the lipid bilayer of the membranes. 6 Use the nomogram to confirm your own BMI calculation. The more you explore BLAST or any of the other
websites we will use, the more you will learn about them. In addition, each specific cell type then uses the genes that help accomplish the specific activities necessary for that cell type. However, there is a strain called Ljutika, grown in Croatia along the coast of the Adriatic Sea, that has been found to be triploid. Even though tonnes of space dust fall
on Earth each year, there is not enough to meet the mineral needs of all the organisms in the biosphere. action potential arrives calcium ions diffuse in presynaptic cleft synaptic cleft synaptic neurone neurotransmitter binds to receptor ion channels
neurotransmitter molecules Many mental disorders are associated with imbalances of certain neurotransmitters within the brain. For example, a company called Affymetrics has developed the SARS virus. 7 Compare and contrast tillage results from 1996 and 2001. 238
Design an experiment simulating natural selection *Safety alerts: When choosing objects used for simulating mouthparts or food, avoid objects that are too sharp, such as certain types of tweezers or thumb tacks. Some countries have policies controlling fossils to make sure that scientifically significant fossils are kept in museums or university
separate DNA fragments so that they can be analysed. Each polypeptide has a haem group near its centre, and each haem group has an iron atom within it (see Figure 15.21). The filtrate then enters the proximal convoluted tubule. It is advisable to dip the seeds in a fungicide, such as 5% bleach, for 15 minutes before carrying out your procedure. As
a result, someone who has the gene for Huntington's disease may not know it for certain until they have started a family. The resulting ratio 9:3:3:1 indicates that, for every wrinkled green pea in the F2 generation, there should be three round green peas. The brain is divided into the left and the right hemispheres. Day 1
(Monday) 1 Pour 20 ml of nutrient broth into a clean 100-ml beaker. With the correct laboratory equipment, it is possible to separated cells in the uterus of a female of that species and get artificial twins, triplets, quadruplets, etc., depending on how many cells were separated. The
spermatozoon is a very small cell with a flagellum for motility and mitochondria to provide adenosine triphosphate (ATP) for swimming. Figure 2.53 The effect of increasing temperature on the rate of photosynthesis. If no plasmid is present, the antibiotic will kill the agrobacter. However, our continually evolving immune response has a way of
producing many of the same type of plasma cells when they are needed. There are well-established databases like GenBank, but also small specific databases are emerging. Excess dopamine may contribute to psychotic illnesses, notably schizophrenia. CharacteristicPlantainSnapdragonFigwortBuddlejaFoxgloveMonkey flowerLopseedSpeedwell2
upper lobes3 lower lobesPetals form a tube4 or 5 sepals (not visible in the photos on the worksheet but in a flower identification book or on google images these details can be found) Create a cladogram in the space below using data from the table of flower structures. To access the entire contents of this site, you need to log in or subscribe to it. You
can also request a Free trial or check the blog (which is also free) In this lesson students first try to make a cladogram using the physical appearance of flowers from the figwort family. Vessel elements appear to be more efficient in the transport of water. They carry out protein synthesis within the cell. Imprinting is learning at a particular life stage
and is independent of the consequences of behaviour. • • NATURE OF SCIENCE Developments in research follow improvements in techniques: autoradiography was used to establish the length of DNA molecules in chromosomes. Each erythrocyte contains around 250 million haemoglobin molecules. To people who are colour blind, these two colours
look the same; they would not see a difference between a green apple and a red apple, for example. Examples include sulfur bacteria that use hydrogen sulfide (H2S) for energy. If there had been a biologist on board the train, what would he or she have said about the sheep? What changed? The jury is still out regarding whether this approach will
ultimately be both beneficial and safe. Myrmecophaga tridactyla is a name that literally means 'eater of ants' plus 'with three fingers'. The gene to be copied is placed inside the open plasmid. The clade that included species B instead,
because C, D, and E show a common ancestry with species B. Other parts of the brain deal with species B. Other par
immune response. Researchers at MIT and Tufts University have engineered a metabolic pathway of the bacteria E. Fresh, wet dung can be mixed with other refuse from a farm and put into a large container, where methane gas, as seen in Figure 4.14
This would be a good time to review Section 3.5, which discusses DNA profiling, polymerase chain reaction (PCR) and gel electrophoresis. Will the connection work? Singing is an important business for the male bird. Different versions of a species are referred to as polymorphisms (meaning many shapes) and can be the result of a mutation. Such
ratios work reasonably well for many crosses. This combination of factors permits the ventricular pressure to build up considerably as systole continues. Only after exposure to pre-existing cells was life able to re-establish itself in the sterilized chicken broth. Predators may emigrate to an area of high prey density; this will increase mortality and
reduce natality in that area. False-colour TEM showing pores in the nuclear membrane. One product is another NADH. NATURE OF SCIENCE As with most scientific theories, cell theory is not without areas of concern and problems. When the DNA mutation leads to cancer, as happened to Marie Curie, the organism's health is in jeopardy. As our
understanding of the cell has increased, so has our ability to understand all forms of life, including diseases, that occur on Earth. If this bell curve was flatter, the standard deviation would have to be larger to account for the 68% or 95% of the data set. Have these new discoveries been properly scrutinized? The final codon triplet will be a triplet that
does not act as a code for an amino acid, instead it signals 'stop' to the process of translation. In order for the brain to fit into a skull that is actually in proportion to the body, the brain has to fold in on itself. The cytoplasm of muscle fibres is called the sarcoplasm. As you continue your study of human physiology, look for instances where two or more for the brain to fit into a skull that is actually in proportion to the body, the brain has to fold in on itself.
systems of the body interact in order to accomplish an action. Once carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, there are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream, the blood plasma of the bloodstream are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream are three ways in which it is transported to the lungs: • a small percentage of carbon dioxide enters the bloodstream are three ways in the blood plasma.
haemoglobin (each haemoglobin can carry a single carbon dioxide enters erythrocytes and is converted into hydrogen carbonate ions, which then move into the blood plasma for transport. • The binomial system of names for species You have a name that
you were given when you were born, but you also have a scientific name based on your species: Homo sapiens. (b) Then add in any functional groups that are found as part of the molecule. The movie Winged Migration is a story of how birds were trained using imprinting to fly along with ultralight airplanes. Some say that the shrubby ones should be
called Diplacus, and the herby ones Mimulus. Option A: Neurobiology and behaviour A.1 Neural development Understandings: The neural tube of embryonic chordates is formed by infolding of ectoderm followed by elongation of the tube. In contrast, analogous characteristics are those that may have the same function but they do not necessarily have
the same structure and they are not derived from a common ancestor. During embryogenesis, these cells follow the same pathways to synapse with muscle targets as other neurones located within the CNS. They cause positive ions to move out of a postsynaptic neurone located within the CNS. They cause positive ions to move out of a postsynaptic neurone located within the CNS.
can be measured. Can you think of other examples of learning to which you can apply conditioned and unconditioned and unconditioned and they can then be eliminated in the baby's urine and stools. 

504 The neural tube expands to form the brain Figure 12.6 The neural tube
expands to form the brain. A whole plant is then grown from each protoplast. The effects of HIV on the immune system should be limited to a reduction in the number of active lymphocytes and a loss of the ability to produce antibodies, leading to the development of AIDS. Currently, the prevailing theory about the cause of Alzheimer's disease is
that amyloid plaque accumulates on neurones. • Application: Use of karyograms to deduce sex and diagnose Down syndrome in humans. Ice ages were periods of significant change in climate that produced sheets of ice hundreds of metres thick in regions where today there are thriving cities. Glucose is the primary energy source that fuels the
metabolism of neurones in the human brain. I II III 1 cm (3) (b) (i) Using the external features shown in the photograph, state the phylum to which this plant belongs. This occurs when ATP levels in the cell are high. Nuclear pore allows communication between the nucleus and the rest of the cell. It is essential that you are able to draw the internal
structure of seeds. The events involving birth in other placental mammals have some differences compared with humans, but there are many similarities as well. As you may remember, enzymes are protein molecules that act as catalysts for reactions. Key: B Two affected parents have affected children. You can find what the letters mean by looking up
the chart on amino acid codes. The large growth on his neck is called a goitre. In the intestinal villi, the glucose travels through a multitude of capillaries, small venules, and veins into the hepatic portal vein, which takes the blood to the liver. Once in the root, water moves to the vascular cylinder, which contains the xylem and phloem. Then collect
one anther from a lily flower and place it in the drop. One of the best-studied worms in genetics laboratories is Caenorhabditis elegans, whose genome was first sequenced in 1998. 546 primary transmitter out in primary transmitter out in
exchange in the leaf. Sunlight is actually a mixture of different colours of light. 1998), with permission from the Marine Biological Laboratory, Woods Hole, MA; Figure 14.4 from Kangeroos and climate: an analysis of distribution, Journal of Animal Ecology, 56, pp. Solutions 1 (a) The years are divided into quarters: Jan/Feb/Mar, Apr/May/Jun,
Jul/Aug/Sep and Oct/Nov/Dec. Skill: Identification of biochemicals such as sugars, lipids, or amino acids from molecular diagrams. (C) The total 5-day intake of nicotine plus acetaldehyde was greatest for the youngest group of animals. Each country must consider the mounting evidence, but chemicals in our environment have ways of crossing
international borders through water, air, and many other means. In fact, many future generations will be identical or show very little change. Veins also have many internal passive 'one-way flow' valves that help keep the slow-moving blood travelling consistently towards the heart. The point is, a protein is able to carry out its intended function. In
many countries there are few if any laws about such things because the techniques are so new. (1) (b) Identify the period during which the spawning of echinoderm lies between 25% and 75%. What international organization should decide on and enforce such policies? The heart beat is initiated by a group of specialized muscle cells in the right
difficult decision? aorta superior vena cava sinoatrial node left pulmonary veins left atrium right ventricle inferior vena cava Purkinje fibre conducting fibres from AV node receives the action potential coming from the SA node and delays for approximately 0.1 second. (1) (d) Discuss the
implications of this study for the survival of bees. This correlates with the increase in atmospheric carbon dioxide levels in the 20th century as a result of humans burning fossil fuels. (c) There must be an equal possibility for the isopods to travel to either chamber. Add as many rows as needed to complete it. • There is a correlation between rising
atmospheric concentrations of carbon dioxide since the start of the industrial revolution 200 years ago and average global temperatures. The pharmaceutical company Sanofi has pledged to sell the drug without profit. Can you guess what happened? Cocaine and amphetamines stimulate adrenergic synapses. Patients in a coma have neurological signs
that can be measured. It is hypothesized that glycerol gives Pseudomonas extra nutrients. When examining for brain death, a physician must first perform a toxicology test to make sure that the patient is not under the influence of drugs that would slow down neurological reflexes. Applications and skills: Application: Degradation of benzene by
halophilic bacteria such as Marinobacter. Bacteriophages and the disinfection of water systems Bacteriophages are viruses found in human waste products. You do not need to memorize the R-groups but you do need to memorize the general structure that applies to all amino acids. A CO2 C O2 B H2O D NAD (Total 1 mark) 3 Which of the following
statements is true about enzymes? When glaciations happen, the oceans have a slightly higher ratio of oxygen-18, and the glaciers that form have a slightly higher ratio of oxygen-16. Some cattle farmers use steroids to 'bulk up' their beef cattle. The other unzipped strand also acts as a template for the formation of another new strand. NATURE OF
SCIENCE How can scientists determine a quantitative value for something that is not directly measurable? Much of the orange area of this computer artwork shows an area of the brainstem called the medulla (oblongata). The blood within these two vessels is deoxygenated and carries waste products. Or is this knowledge claim based on carefully
analysed statistics comparing birth numbers with a lunar calendar? In the Linnaean system, apart from the definition of species, which we have already seen is sometimes challenged, the other hierarchical groupings are not always clearly defined: what makes a class a class, or a phylum? 

Raised hydrostatic pressure causes the contents of
= allele for long wings • l = allele for short wings. • Applications and skills: Applications causes and consequences of lung cancer. Dominant alleles and co-dominant alleles using the five steps of the Punnett grid method, we are going to examine the theoretical chances of genetic traits being passed on from one generation to the next. They can
tolerate discharge into water that is ±15°C that of the ballast water. These three genes can now be used in the targeted therapy of prostate cancer. These repair enzymes are also used when chemicals or high-energy waves cause damage to existing cells. How to 'read' a 'normal' ECG trace (Figure 15.14). Quick random movements enable isopods to
find themselves in a humid environment. History has shown that many people think so, yet genetics shows that this is not the case. Below, you will see some of the characteristics that scientists look for when classifying organisms. Continued research is needed to see how these exceptions 'fit' in with the current cell theory. It is also possible for two
scientists using the same data to construct two different cladograms. 52 CHALLENGE YOURSELF 1 Read through this example of molecular interactions leading to a physiological response. As well as pluripotent stem cells, there are tissue-specific stem cells. The trachea branches many times into multiple bronchioles. He was finally fired from his
post at the Institute of Genetics in 1965 and his reputation was crushed. t Conversely, some alleles are disadvantageous to the survival of the organisms in the formulas of these three simple sugars; monosaccharides typically fit the formula
CnH2nOn, where n equals the number of carbon atoms. In the third trophic level, the carnivores absorb 100 kJ m-2 yr-1 and the top predators who eat them get 10 kJ m-2 yr-1. The cloned goat produces milk rich in the desired protein. Protein synthesis involves two major sets of reactions, transcription and translation. The DNA of a chloroplast takes
the form of a ring. What kind of evidence would give more credibility to this claim? In this case, the pain impulse is travelling to the pain centre in the CNS. This is the self-propagate to the axon end of the cell, where the
synaptic terminals are located. In the absence of speciation, species can live for millions of years with little or no channel gate. There is a lot of evidence to support this theory. The emergent properties of biofilms include: • complex architecture • quorum sensing • resistance to antimicrobials. (d) Which letter represents a
granum, which is where the light-dependent reaction occurs? These hormones are also produced by neurosecretory cells, but these cells are located entirely within the hypothalamus. 26 Compare cytokinesis in plant and animal cells. 625 13 NATURE OF SCIENCE Cooperation and collaboration between groups of scientists: databases on the internet
allow scientists free access to information. Figure 10.11 A Punnett grid showing a monohybrid cross. This would support the hypothesis that it will also be carried by the QDs. 621 13 Option B: Biotechnology and bioinformatics Tracking with transferrin and a
luminescent probe The protein transferrin can help find cancer cells. However, the direction of 393 09 Figure 9.11 When girdling is carried out, the bark and the living phloem just below it is removed. If we find enough examples of instances where this is true, can we proceed by induction that it is true for all phenomena? The extra chromosome
results from a phenomenon called non-disjunction, which can happen at different times but most often occurs when the 21st pair of homologous chromosomes fails to separate during anaphase I. If the grasshopper is eaten, some of the chemical energy in its body (in the form of protein, for example) is passed on to the next organism (a toad, for
example). You have heard of the Human Genome Project. Xerophytes are plants adapted to arid climates. The behaviour occurs regardless of the consequences. Biochemical evidence of clades Biochemical evidence, including DNA and protein structures, has brought new validity and confirmation to the idea of a common ancestor. ring stand plant
order to guide policy makers, and how will they answer those questions? One particular gene that we will look at is the gene for obesity. Thus the primary immune response takes place. • At the top in the tabs, select the tab Phylogenetic tree (if you can't see this, try using a different browser). Researchers tested the hypothesis that males could
distinguish among females of varying size by the composition of the skin lipids that act as pheromones. To find the protein sequence we must go to the database called Swiss-Prot. • First-generation relatives of patients who have suffered a heart attack. The
seedpod of the silphium plant has the classic heart shape that we recognize today. In some cases, environmental concerns about the preservation of wetlands, because they are an important part of the ecosystem and a habitat for unique species, have prevented the digging and drainage of peatlands. Get out some paper and a pencil and practise
drawing the two glucose molecules shown on the previous page and the three molecules shown below. The instructions use potatoes as a source of tissue, but other tissues could be used. Insulin is a peptide (protein) hormone that helps to regulate glucose levels between the bloodstream and the cytoplasm of cells. See Figure 2.45. By definition,
diploid cells have homologous pairs of chromosomes and haploid cells do not. Liquid water has molecules with a much faster molecules stop their motion. They make food from air using sunlight energy. The testes of human males are located
outside the body in order to provide the cooler temperature (lower than the internal body temperature) necessary for production of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa) and the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa) and the concentration of spermatozoa and the concentration of spermatozoa. Dialysis is also an example of how cell or tissue osmolarity (the concentration of spermatozoa) and the concentration of spermatozoa 
nap. Pain receptors are a type of chemoreceptor that respond to chemicals released by damaged tissues. In mammals, including humans, urea is produced in the liver, enters the bloodstream by the kidneys, and becomes a component of urine. The harmful consequences of ozone depletion do no need to be
discussed and it should be made clear that ozone depletion is not the cause of the enhanced greenhouse effect. The letter x represents what is called the basic number of chromosomes. One lead extends into the right atrium and the other into the right ventricle. The purpose of the menstrual cycle is to time the release of an egg or ovum (ovulation) for
possible fertilization and later implantation into the inner lining of the uterus. The rungs of the ladder (what you step on) are made up of the nitrogenous bases. C A female with Down syndrome. The names condensation and dehydration synthesis are both good reminders that water is always one of the products of these reactions. Of the genera that
were put into the New World group, one example is the blue wood aster, which has now been placed in the genus Symphyotrichum. When the cell is not in the group, one example is the blue wood aster, which has now been placed into chromosomes. At the tip of the axon is a growth cone, which directs the axon. Cells and sizes Cells are made up of a number
of different subunits. Sometimes, it is more difficult to guess their common name: • Apis mellifera (honeybee, although you might have guessed this if you know that beekeeping is also called apiculture) • Aptenodytes patagonicus (king penguin, although you can probably guess where it lives from its species name) • Loxodonta cyclotis (African forest
elephant) • Malus domestica (apple tree). Insulin's effect on body cells is to open protein channels in their plasma membranes. So, the first step in initiation of translation is when an activated amino acid, methionine attached to a tRNA with the anticodon UAC, combines with an mRNA strand and a small ribosomal subunit. This story illustrates how
easy it is to jump to conclusions before having all the evidence. • Conducting fibres ensure coordinated contraction of the entire ventricle wall. This is because the food is moved by peristalsis, not by gravity. There is a story from Asia about a small group of blind men who encounter a tame work elephant, a creature none of them have ever had
contact with before. At the end of this section, we will use the chi-squared test to check whether Mendel's dihybrid results show any statistically significant difference between the expected values and the observed values. The word vaccine community would be
if scientists repeated MacDougall's experiment? energy supplied It is important to note that, even though enzymes lower the activation energy of a particular reaction, they do not alter the proportion of reactants to products. Cocaine is an alkaloid drug that comes from the leaves of the coca plant, Erythroxylon coca. 15 SNP person 3 A C A C SNP T
low or non-functioning protein Other variations lead to genetic disease (e.g. sickle cell) or increased susceptibility to disease (e.g. lung cancer). As NADH is being formed, released energy is used to add an inorganic phosphate to the remaining 3-carbon compound. 18 What is the difference between a codon and a triplet? Not shown is endocytosis
where a portion of the plasma membrane invaginates to take in many molecules at one time. Digested molecules must pass through these cells in order to reach a capillary bed or lacteal. Once all the peat in a wetland has been harvested it is gone; it is unrealistic to wait for new peat to form, so new sources of fuel are needed. Thus the cells remain
within the interior of the seminiferous tubule for a period of time as they form the cellular structures characteristic of a mature spermatozoon. Explain why there are no bacteria shown in this diagram. Snake antivenom contains antibodies that agglutinate (clump together) the proteins making up the venom of a particular species of snake. 80 Enzymeson.
are organic molecules that act as catalysts Enzymes are proteins. Exercises 16 Why is the term equilibrium used with passive but not active transport? However, it is essential for humans and thus must be a part of our diet. Figure 2.49 This action spectrum of photosynthesis indicates that most photosynthesis occurs in the blue and the red
wavelength areas. Several copies made of different lengths ending in ddG. teeth gums jaw tongue pharynx swallowing intraabdominal Primary motor cortex Primary somatosensory cortex blue, can cross over at the optic chiasm so that the information from left field of view is received by right side of the brain, and vice versa. From a
demographics point of view, the mutated gene is mostly found in populations originating from West Africa or from the Mediterranean. Let's look at an example of one reaction that makes up part of a typical cell's metabolism. 427 10 Genetics and evolution The genotypes of the true-breeding (homozygous) parents are: • GGLL = genotype of a grey-
bodied, long-winged parent • ggll = genotype of a black-bodied, short-winged parent. 431 10 Genetics and evolution NATURE OF SCIENCE Studies looking at identical twins, fraternal (non-identical) twins, and non-twin siblings have revealed that the heritability of height is about 80%. 453 11 Humans sometimes make use of antibody production by
Cytokinesis occurs after mitosis and is different in plant and animal cells. Death from infanticide because of pride take over is common, and cubs are vulnerable to predators such as hyenas. When pepsinogen enters the cavity of the stomach and comes into
contact with HCl, the pepsinogen converts into its active enzymatic form known as pepsin. The reason could be to find any: • functional relationship, for example above) • structural relationship, for example if a scientist has isolated
a protein but does not know what its function is, it can be structurally aligned in a database with another protein and the function may be learned (we will be looking at this below). D Mature RNA and histones. Would
it be possible for the same couple to have four children and all of them have type AB blood? 3 Did any protein from the bacteriophage enter the bacterium? Many animal's bodies, including humans, become very rigid a few hours after death, a condition called rigor mortis. C A G *And start. Martinez 649t, Animated Healthcare Ltd 551, 489, Arno
Massee 613 br, Astrid & Hanns-Frieder Michler 480 t, 532t, 384 t, Bildagentur-online / 0HDE 593t, Xiiitr, Biology Media 20 tc, 463 t, Biophoto Associates 249tl, 274l, 293t, 470r, 719, 735b, 762, 762b, 393 l, Bjorn Svensson 710b, British Antarctic Survey 207t, Christian ii Darkin 9, Claudia Stocker 230, Claus Lunau 52, Clouds Hill Imaging Ltd 580 t,
CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 131br, 297, 361t, 285 b, 466 l, CNRI 19b, 285 b, 466 l, 
hydrogen bonds between nucleotides. For example, a hard frost will kill all leaf hoppers or 100 leaf hoppers or 100 leaf hoppers or 100 leaf hoppers or 100 leaf hoppers. In this process, blood is passed through a system of tubes composed of selectively permeable membranes. This process allows a cell to maintain interior concentrations of molecules that are
different from exterior concentrations. Effective waste management is a rising cost in our society, but these problems must be solved in order to prevent dire consequences. Because of the larger number, the electronegativity difference between adjacent carriers is not as great. Learning is the acquisition of skill or knowledge. This could partly
explain the difficulty in finding out which genes are responsible for traits whose genetic components are poorly understood, for example mathematical aptitude, musical talent, or susceptibility to certain illnesses. Line graphs can sometimes show discrepancies in the data. The supply of inorganic nutrients is maintained by nutrient cycling. This
shows why it would be a mistake to correlate the number of genes with organism complexity. UK blackcaps get to Germany 10 days earlier than Spanish blackcaps, and are already 562 breeding before the Spanish blackcaps get to Germany 10 days earlier than Spanish blackcaps, and are already 562 breeding before the Spanish blackcaps get to Germany 10 days earlier than Spanish blackcaps.
tumefaciens to carry the genes for hepatitis antigen into tobacco plants. The wide variation in this data set makes us question the experimental design. Plant biology 9.3 Growth in plants Understandings: Undifferentiated cells in the meristems of plants allow indeterminate growth. Think of it in this way: one compound's or element's loss is another
compound's or element's gain. Auxins appear to increase the flexibility of plant cell walls in young developing shoots. Evolution happens to populations and its effects are only visible over many generations. This false-colour scanning electron micrograph (SEM) shows the cross-shaped union of chromosomes exchanging material, which is where the
name chiasma (meaning cross) comes from. 1 (Duke, Stephen O. A gene called CFTR, found on chromosome 7, plays a key role in the production of mucus. This is advantageous to the company because it saves money (trials are very costly), and it reduces that participants develop side-effects or show negative results after 6 months.
Observations involving tracheids and vessels have provided evidence that vessel elements evolved after tracheids. Colostrum is high in carbohydrates, proteins, and antibodies, but low in fat, because newborns are not efficient at digesting fats. person 2 A A C C G T C T T normal protein Some DNA variations have no negative effects on
protein structure and function. Anaphase I Spindle fibres from the poles attach to chromosomes and pull them to opposite poles of the cell. Karp 2009. A B guard cells open H2O Models are often used to represent the movement of water in
plants. • The decrease in heart rate for a person who has recently stopped exercising. This hormone is produced in the roots during a drought. Practice questions 1 Draw the basic structure of an amino acid, and label the groups that are hybridoma cells and the produced in the roots during times of water deficiency, for example during a drought.
what two beneficial characteristics do hybridoma cells possess? Notice also that the pressure in the aorta is much higher than in the left ventricle. Notice the error bars representing standard deviation on the bar chart in Figure 2 and the graph in Figure 3. The bipolar neurone carries the impulse to the ganglion cell. Of those 100 plants, you might
guess that a few will be very short (maybe the soil they are in is slightly 784 sandier). And about the importance of repeatability and verifiability? Anaerobic cell respiration gives a small yield of ATP from glucose. pH 1 2 strongly acidic 3 some specialized enzymes have optimum pH that is acidic 4 rate of enzymecatalysed reaction most enzymes in
the human body have optimum pH near 7 Figure 2.26 The effect of pH on the rate of an enzyme-catalysed reaction. Figure 6.9 Typical blood pressure readings in mm Hg during atrial systole. Think about the opposite of hybridization: inbreeding.
are: a table of random numbers from 1 to 99, a pencil, and something on which to record your data. The black traces are left by the radioactivity of the materials used in marking the DNA samples. Among those organisms are the fruit fly, Drosophila melanogaster, and the bacterium, Escherichia coli, because these two organisms have been used
extensively in genetics experiments for decades. The algae cells were then exposed to 14C (radioactive carbon) and light. 2001), Copyright © 2001, Sinauer Associates, Inc.; Figure 12.28 after Neuroscience, 2nd ed., Sinauer Associates, Inc.; Figure 12.28 after Neuroscience, 2nd ed., Sinauer Associates (Purves, D., Augustine, G. • Applications and skills: • Skill: Quantitative representations of energy flow using
pyramids of energy. This is the front right fin of a southern right whale showing five articulated fingers. Members of the Archaea include methanogens, which are anaerobic (they live in environments with no oxygen). (Total 4 marks) 3 Explain the relationship between the structure and function of arteries, veins, and capillaries. Chromosomes carry
all the information that is necessary for the cell to exist; this allows an organism to survive, whether it is unicellular or multicellular. All test tubes contain the primers, the DNA polymerases necessary to begin DNA replication, and the nucleotides of DNA. Practise drawing diagrams of the neural pathway for vision until you understand it thoroughly
Electron microscopes use electrons passing through a dead specimen to form an image and provide us with the greatest magnifications (over 100 000×) and resolution, outer membrane inner membrane inner membrane granum of several thylakoids stroma 1 thylakoid The structure of the chloroplast was discussed in Chapter 1. They also produce and release the
ovum (in the form of secondary oocytes). The double line in the centre of this photomicrograph shows the phospholipid bilayer of a membrane. Cell theory has a very solid foundation largely because of the microscope. There is a positive correlation between a higher BMI and hypertension. As time and research proceeds, a causal
relationship may be seen. Many PEDs are hormones, including a variety of steroids and also GH. 334 Transcription has some similarities with replication. Fish, tadpoles, or invertebrates bigger than a few millimetres are probably not appropriate. Neuroblasts differentiate into neurones. This can lead to dehydration (too little
water intake) or overhydration (too much water intake). • Point Q: this is the point at which the AV node sends its impulse. 3 The trend shows an increase from 387 p.p.m. in October 2013. Sometimes a competitive environment, striving to be the first to discover something, can get in the way of productive
collaboration. Ultimately, this project may provide much more effective treatments for patients based upon their individual DNA composition. Oogenesis in humans is a process that takes many years to complete. They are also dead cells, and have thick, lignified secondary walls. The cells of this region are chloroplast rich, to allow maximum
photosynthesis. Sea urchin ova start by having a negative electric charge on the inside of their plasma membrane. As peristalsis continues to move the food through the lumen of the small intestine, the hydrolytic reactions continue. • In 2011, haemophilia B, caused by the absence of a coagulation factor, was successfully treated. 469 11 The
       osition of blood plasma in the renal artery compared with the renal vein is different, and that difference is because of the filtering action to the chain. (Total 2 marks) 169 04 Ecology Essential ideas 4.1 The continued survival of living
organisms, including humans, depends on sustainable communities 4.2 Ecosystems require a continuous supply of energy to fuel life processes and to replace energy lost as heat. Adenine always pairs with thymine (from the opposite chain). Carbon in aquatic ecosystems As you know
from drinking fizzy drinks or carbonated water, carbon dioxide can dissolve in water. If a botanist finds a new species of orchid, for example, he or she would have to describe the plant, describe the plant is a new species of orchid, for example, he or she would have to describe the plant, describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, for example, he or she would have to describe the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the plant is a new species of orchid, and the pla
and publish the findings in a publically accessible publication. In ecology, the term 'interacting' can mean one population feeding on another, or being eaten. A muscle fibre is the site of a heated competition, with multiple synapses trying to win. • The waste water is applied with a rotary arm that causes the waste water to trickle over the media
intermittently. An example of a synovial joint is the human elbow. However, if you reach p = 0.05, the probability that the difference is caused by chance alone is only 5%. They are then secreted in a similar way to the release of a neurotransmitter. 239 05 Evolution and biodiversity Applications and skills: Application: Classification of one plant and
one animal species from domain to species from domain to species level. SEM showing a macrophage (red) chemically communicating the identity of a pathogen to a helper T cell (blue). 1 An archaeological dig searching for evidence of the past. Tongue map As students and teachers, what do we claim to know about biology? Also, do not mix letters: for example, you cannot
use P for pigmented and a for albino. An example of a disease involving facilitated diffusion is cystinuria. Then, with your group, look at the first number on the random number table and walk in the designated direction that is 'new'.
However, the myogenic activity of the heart does need to be controlled, in order to make the timing of the contractions unified and useful. Reabsorption recovers substances that the body cannot afford to lose as part of the urine. This happens as variations within
a population allow certain members to exploit a slightly different niche in a more successful way. Use the scale bar to determine the approximate size of the three central, fully shown Volvox. Let's first consider a cross that Gregor Mendel did with his garden pea plants. Calvin devised the 'lollipop' apparatus. 12 List three metabolites found in blood
and urine that indicate disease. NATURE OF SCIENCE In 1880, Charles Darwin and his son Francis carried out some of the first experiments involving plant hormones. The branch length of the cladogram represents the amount of evolutionary divergence. As with homologous anatomical features, these sequences are evidence of a common ancestry.
The nucleotides attach to one another to form a chain as a result of condensation reactions forming connecting covalent bonds. As many as 300 different species of bacteria can inhabit dental plaque. The numbers on the curve show the passage of time (in thousands of years) through each successive half-life. C C C H H H H O HO three fatty acids C
(CH2)24CH3 O HO C (CH2)21CH3 H C O C O (CH2)24CH3 H C O C O (CH2)27CH3 H O HO C O H (CH2)27CH3 H O HO C O H
various types of lipids in your foods. Since then, scientists have looked for discrepancies and asked questions to show exceptions to the rules. As for the Sun's output: yes, it is currently in a high-output phase, but that extra energy has only a small fraction of the effect that human-induced global warming has. These
channels allow glucose to diffuse into the cell by the process known as facilitated diffusion. When analysing a particular scenario, students are not asked Try it out on the example of the scientists on the train looking at the sheep. This movement of Cl- into the neurone or K+ out of the neurone is what causes the hyperpolarization. Does this secrecy
undermine the scientific validity of the technique? Zoologists started these conferences in Paris in 1889, on the occasion of the World Fair that year, the one that inaugurated the Eiffel Tower, diesel fuel oil crude oil in lube oil furnace oil vaporized at 400 C hot 350 C bitumen for cars short chains low boiling points, runny, volatile and easily ignited for
aeroplanes for lorries for home heating for lubrication for roads long chains high boiling points, viscous, non-volatile and not easily ignited fractions Crude oil has the nickname 'black gold'. Examples of slow-acting neurotransmitters are: • dopamine • serotonin • acetylcholine. However, chromosomes are highly organized and compacted because of
the large increase in nucleosomes. There was a time when scientists hesitated to publish their works out of fear of the church. B.2 Biotechnology in agriculture Understandings: Transgenic organisms produce proteins that were not previously part of their species' proteome. Use the hotlinks at the end of this section to see a video of Aplysia and this
research. It is quite possible to experience hunger and yet not feel the desire to eat (i.e. to be hungry but have no appetite), for example when you are sick. Eventually, the transcript is released from the DNA strand. Because of this, muscle cells are said to be 'electrically coupled'. This computer graphic shows an insulin molecule. Light-independent
reaction (Calvin cycle) Light-dependent reactions H2O light To learn more about photosynthesis, go to the hotlinks site, search for the title or ISBN, and click on Chapter 8: Section 8.3 CO2 NADP! ADP! P i stroma RuBP photosynthesis, go to the hotlinks site, search for the title or ISBN, and click on Chapter 8: Section 8.3 CO2 NADP! ADP! P i stroma RuBP photosynthesis, go to the hotlinks site, search for the title or ISBN, and click on Chapter 8: Section 8.3 CO2 NADP! ADP! P i stroma RuBP photosynthesis.
used up. After training, he could ring the bell (CS) and the dogs would salivate (CR). • From the pretectal nucleus, a message is sent to the exterior of the root or stem? With
alcohol addiction, withdrawal symptoms include conditions that are sometimes fatal, such as seizures and delirium tremens (severe shaking). 558 CHALLENGE YOURSELF saline + MDMA vitamin C + saline 180 Figure 12.51 Effect of vitamin C and MDMA on free
radical levels in rats. These guard cells are cylindrical and their cell wall thickness is uneven. This is an SEM (with false colour added) of an upper leaf section. These signs are based on responses to external stimuli. In the 1950s it was common to dump wastes into rivers and streams or into the soil. When two nucleotides unite 5! in this way, the two-
unit polymer still has a 5 carbon free T at one end and a 3 carbon free at the other end. Upon reception of a certain stimulus, the protein receptor becomes activated, initiating a metabolic pathway. In some plants, as cells age they form a secondary cell wall composed of materials other than cellulose. Examine the following diagrams and pictures.
Mycorrhizal fungi growing in association with roots. Grass fruits by not containing seeds, are specifically called grain and they supply food for almost every human in the world. Skill: Estimation of osmolarity in tissues by bathing samples in hypotonic and hypertonic solutions. For example, in cultures where having a boy is
considered to be more valuable than having a girl (notably in countries where the law prohibits couples from having more than one child), parents might be tempted to terminate pregnancies when the baby is not the sex they want. • What are the implications of having or not having knowledge? How does NASA know that the 'fossils' are from
bacteria? 404 Dicots Parallel venation (the system of veins) in leaves Netlike venation pattern in leaves Three flower parts, or multiples of four or five Seeds contain two cotyledons (seed leaves) Vascular bundles arranged throughout the stem Vascular bundles
arranged as a ring in the stem Root system mainly fibrous Root system involves a taproot (main root) Pollen grain with one opening Pollen grain with three openings Monocot characteristics Dicot char
tissue scattered veins usually netlike Roots Flowers floral organs usually in multiples of four or five root system usually in multiple
these drawings to the table of features (Table 9.4) comparing monocots and dicots. Treatment includes the use of stimulant medications. They also read current scientific articles throughout their career in order to gain further insight into their research. Methylation and gene expression Methylation may regulate the expression of either the maternal
or paternal form (allele) of a gene. A question that society will eventually have to answer is what constitutes an acceptable level of screening? Passive immunity. The glucagon circulates in the bloodstream and stimulates hydrolysis of the granules of
glycogen stored in hepatocytes and muscle cells; the hydrolysis produces the monosaccharide glucose. If the fruit has any seeds inside, the plant is an angiosperm. 20 Provide an explanation for how a nucleus might have come to exist within eukaryotic cells. The two sugar-phosphate backbones are attached to each another by their nitrogenous bases.
Some microorganisms use larger organic molecules such as glucose, C6H12O6 for a carbon source. This results from the fact that the paternal allele is different from the maternal one. Cytoplasm All eukaryotic cells have a region called the cytoplasm that occurs inside the plasma membrane or the outer boundary of the cell. When a second gene is
introduced, the number of possible genotypes increases dramatically. The nitrogen was part of the nucleotides' nitrogenous bases. They have some sickle-shaped cells, glucose, proteins, and drugs are detected in urinary tests.
Because many people put out bird seed in their gardens all winter, the blackcaps in the UK population are surviving. 336 promoter terminator exon exon Figure 7.12 Splicing of mRNA in eukaryotes. Questions There are three types of questions their gardens all winter, the blackcaps in the UK population are surviving. 336 promoter terminator exon exon Figure 7.12 Splicing of mRNA in eukaryotes. Questions There are three types of questions their gardens all winter, the blackcaps in the UK population are surviving.
the concepts covered. Is it morally and ethically acceptable to manipulate nature in this way? A single nerve cell can make a myriad of connections with its neighbouring nerve cells at the many points of branching that radiate from the main cell body. In a situation where there are too many organisms for limited resources, it is obvious that some
individuals will succeed in accessing those resources and the rest will fail. Flowers of plants that involve insect or other animal pollinators employ various means to attract their vector. Notice that the cranial nerves going straight down out of the picture are heading towards the chest and abdomen. Temperature should be kept constant to avoid
volume changes due to temperature fluctuations. A larger, dense population is more likely to experience emigration as individuals move to other areas in search of more food and space. In effect, nitrogenous wastes, excess water, and many salt ions (Na+, K+, Cl-) remain in the tubules. Often, people think only of physiological parameters, such as
heart rate and digestion, as their metabolism. These are valves curved in the direction of blood by preventing backflow. These are valves curved in the proper direction within the vessel. Valves in veins and the heart ensure circulation of blood by preventing backflow.
volume of blood in the ventricle during this time, and the ventricle is highly muscular. Even though the air we breathe is inside our lungs for only a short period of time, it is long enough for diffusion of gases to occur. The notes are filled with interesting ideas but also contain severe criticisms of the methods of the famous scientist. Again, there is no
guarantee that fitness will allow survival or that survival must come first. Each haemoglobin molecule is composed of four polypeptides. Because the example shown is for animal taxa in this chapter, try one for the plant taxa described in this chapter. No one knows why
Mendel's numbers are so close to perfection, and the mystery may never be solved. The essential idea behind cladograms constructed by studying biochemical differences is that an organism with the most modifications (mutations) in the same
DNA sequence will be the more recently evolved organisms. Enzymes are globular proteins that, as a minimum, have the tertiary level of organization. Here are four to consider. The procedure involved searching the EST sequences from human prostate cDNA libraries. He had lots of both. No change in allele frequencies, however, means no
evolution. Haemoglobin can carry a maximum of four oxygen molecules, so one that is already carrying four oxygens has no affinity for oxygen. The Davson-Danielli model, proposed by Hugh Davson and James Danielli in 1935, used this lipid bilayer model, suggesting it was covered on both sides by a thin layer of globular protein. Like many flowers,
it depends on insects for pollination. Therefore epigenetics involves the study of splicing, methylation, proteins, and also the environment and its effect on gene expression. You may not already know the phase change temperatures for methane: the freezing point of methane is -183°C and the boiling point is -162°C. Examples: Bb, GG, tt. 142 Key
terminology In order to understand the science of genetics, you first need to know the following terminology. People often associate the symptoms of emphysema with natural ageing, and people can initially find ways to compensate for their breathing problems. Lateral meristematic tissue occurs in stem tissue and allows growth in width. Application
Speciation in the genus Allium by polyploidy. Ser O H H O hydrogen bonds H O C H C C H H C O H N H O C C H H C O H N H O C C H H C O H N H O C C H H C O H N H O C C H H C O H N H O C C H H C O H N H O C C H H C O H N H O C C H H C O H N H C O O H Dond angles produce a pleated shape Figure 2.24 Molecular model of the protein structure of haemoglobin. Other pituitary gland hormones and their
functions Nine different peptide hormones are secreted from the pituitary gland. Cerebellum is associated with the regulation and coordination of movement and balance. The increased production of hormones at this time results in the secondary sex characteristics (the attributes that are characteristic of a sex that only appear at puberty). One of
those thermal properties is high specific heat. • NATURE OF SCIENCE Looking for patterns, trends and discrepancies: Mendel used observations of the natural world to find and explain patterns and trends. Bilirubin is a yellow pigment and so people with jaundice have a yellow tinge to their skin and a yellowing of the whites of their eyes. Because
systems such as global climate are complex, scientists do not fully understand how they work and, although they are regularly gaining further insights, sometimes they are wrong. Included in our study will be transportation within the xylem and phloem, growth, and reproduction. • Annelida: this phylum is made up of segmented worms. BLAST is the
software used to search the database GenBank. Because one microarray contains many probes, it can identify many genetic markers at the same time. The Paramecium. 5' AUGGGUGCUUAUUGGUAA 3' A Met-Pro-Arg-Ile-Thr C Met-Gly-Ala-Tyr-Trp B Met-Cys-Ser-Tyr-Trp D Met-Gly-Tyr-Ala-Thr (Total Total 1 mark) 349 08 Metabolism, cell respiration,
and photosynthesis Essential ideas 8.1 Metabolic reactions are regulated in response to the cell's needs. Nitrates are actively transported by plants (using ATP for energy) into their roots. For example, the capsid (protein coat) of a virus is made up of several different kinds of protein. The fruit, which is the enlarged ovary of the plant, holds the seeds.
Are there any parallels with pollution? There is a separate circulation for the lungs. For example, human red blood cells do not have nuclei: they are specialized to action' by events associated with bleeding. The photoreceptor
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cells are the rods and the cones. In the other phase, division is the major process. The following guidelines describe this type of learning, called operant conditioning. One type of antibiotic may selectively block protein synthesis in bacteria, but have no effect on our cells' ability to manufacture proteins. As you can see, growth of the strain of bacteria
on the left is greatly inhibited by the penicillin that is diffusing outwards from the pellet. Recent research indicates there is an enzyme with helicase activity that works with the RNA polymerase to open the DNA double helix. Synapses that are highly active will be preserved, while those that are underactive will be pruned. He attracts a mate with his
song and deters male rivals. 72, reproduced with permission; Figure on page 571 (bottom) adapted from Prior classical olfactory conditioning improves odour-cued flight orientation of honey bees in a wind tunnel, Journal of Experimental Biology, 208 (19), October, pp. Now that we have DNA sequencing methods available at a much more affordable
price we can use this data to improve our cladograms. • Application: Use of micropropagation for rapid bulking up of new varieties, production of virusfree strains of existing varieties, and propagation for rapid bulking up of new varieties, production of virusfree strains of existing varieties, and propagation for rapid bulking up of new varieties.
green fluorescent protein. Hydrogenation: cis and trans fatty acids In many heavily processed foods, polyunsaturated fats are often hydrogenated or partially hydrogenated as part of the processing. A skill can be improved with practice. Applications and skills: Applications and skills: Applications are often hydrogenated or partially hydrogenated or partially hydrogenated as part of the processing. A skill can be improved with practice.
as doctors find out more and more of the practices exposed, what will happen to their faith in the data presented by the medical journals? If we cannot find a use for the waste we produce, then we truly are polluting our environment. We remember the taste of mouldy food. Notice how, unlike the example of the quadrats used in the fieldwork lab,
there are no random numbers. NATURE OF SCIENCE Vitamin C should not be thought of as just a vitamin that prevents scurvy. • Examples for food: dry chickpeas or kidney beans, dry grains of rice, marbles, paper clips, or coins. Models The double-helix shape for DNA, and the fluid mosaic membrane model, are examples of models that were
created in order to explain observed phenomena. The dark blue line shows the trend corrected for these seasonal fluctuations. The placenta does not produce measurable levels of oestrogen until the final two-thirds of the pregnancy. The DNA of a eukaryotic cell often occurs in the form of chromosomes; chromosomes vary in number depending on the
species. The DNA and histone combination often results in structures called a nucleosome. Note the two large cotyledons or seed leaves. D They supply the energy of activation for a reaction. However, other factors may also be involved. This is referred to as secondary growth (see Figure 9.17). Meiosis occurs in the stamen and carpel to produce the
 sex cells. 2 Compare and contrast batch and continuous culture. Half-life is defined as the time it takes for half of the parent isotope to decay into a stable daughter isotope. Clades Cladistics is a system of classification that groups taxa together according to the characteristics that have evolved most recently. The availability of phosphorous may
become limiting to agriculture Figure 14.44 The phosphorus cycle. Purves et al. These loops are called 127 03 Genetics plasmids. Responses to stimuli in the environment are imperative for the survival of an organism. Producers can once again absorb the nutrients from the soil, and grow new sources of food. The nucleus is often located centrally
within the cell's cytoplasm, although in some cell types it is pushed to one side or the other. 7.2 Information stored as a code in DNA is copied onto mRNA. This allows the DNA to cross the cell membrane. Figure 2.32 A small section of a double-stranded DNA molecule showing hydrogen bonds between complementary nitrogenous bases.
Applications and skills: Application: Use of PCR to detect different strains of influenza virus. NATURE OF SCIENCE Students sometimes get the impression that genetics is only about diseases. Following an autopsy of the man's brain, a lesion was discovered in the left cerebral hemisphere. Jacks are smaller as
juveniles and develop in a shallow area of the stream called a riffle. The term antigen is used for any molecule that is recognized as 'not-self'. Consumers cannot 'eat' sunlight and air, but they can eat carbohydrates, proteins, and lipids. This is one of the reasons why, long after a decision has been made, it is still possible to see an older name in field
guides, databases, scientific journals, and museum labels. These target cells produce chemical messages that the neurone responds to. Each G3P or triose phosphate molecule undergoes oxidation to form a reduced molecule of NAD+, which is NADH. Maltase is produced by the cells of the inner lining of the small intestine, and typically remains
bound into the plasma membranes of the epithelial cells that are in contact with the food material within the lumen. • The rate of turnover in the phosphorous cycle is much lower than the nitrogen cycle. • Skill: Drawing labelled diagrams of the structure of a sarcomere. As you read the descriptions below, see if you can identify the main features of
how natural selection works: variation in the population making some individuals better suited for their environment than others, overproduction of offspring leading to a struggle for survival, differentiated survival because some die and some live, and, finally, the passing on of successful traits to the next generation. However, sometimes a mutation
can produce a characteristic that is advantageous, perhaps a slightly faster growth rate for a tree or better frost resistance for a plant. Another facet of this type of plant culturing is the ability to alter the genome of existing plants to make them more beneficial to humankind. This is the site of amino acid attachment. Those birds with a smaller range
are at greater risk of extinction. Animals cloned from a single parent. Figure 2.50 Functions of light during photosynthesis. Remember that blood in arteries is at a high pressure because arteries are the vessels that are directly
connected to the ventricles of the heart. If we looked at only the means, we would not recognize the plant in a bacterial solution containing the modified plasmid. If a scientist is getting funding from an organization that promotes the
preservation of nature, the chances are reasonably good that that scientist whose funding comes from industries highly reliant on fossil fuels will probably tend to look for evidence against human-induced climate change, whereas a scientist whose funding comes from industries highly reliant on fossil fuels will probably tend to look for evidence against human-induced climate change, whereas a scientist whose funding comes from industries highly reliant on fossil fuels will probably tend to look for evidence against human-induced climate change, whereas a scientist whose funding comes from industries highly reliant on fossil fuels will probably tend to look for evidence against human-induced climate change, whereas a scientist whose funding comes from industries highly reliant on fossil fuels will probably tend to look for evidence against human-induced climate change.
each of the three types of nitrogenous wastes. A protein called a release factor then fills the A site. 6C NADH CO2 NAD! NAD! It is important to remember that the Krebs cycle will run twice for each glucose molecule entering cellular respiration. Examples include algae. An example is the
sulfur bacteria that inhabits the hot springs of Yellowstone National Park in the USA. A species is made up of organisms that: • have similar physiological and morphological characteristics that can be observed and measured • have similar physiological and morphological characteristics that can be observed and measured • have similar physiological and morphological characteristics that can be observed and measured • have similar physiological and morphological characteristics that can be observed and measured • have similar physiological and morphological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics that can be observed and measured • have similar physiological characteristics of the characteristics of the characteristics 
phylogeny (family tree). As these molecules are added, two phosphates are lost. If you recall from earlier, a depolarization is when sodium ions diffuse through the axon membrane from outside to inside. Antibodies aid the destruction of pathogens. There is no need for great pressure because much of the volume of blood has already accumulated
passively within the ventricle through the open atrioventricular valve. This division is based on morphological characteristics. • The sequence and number of amino acids in the polypeptide is the primary structure. The experiments carried out in the late 1950s by Matthew Meselson and Franklin Stahl confirmed this DNA semi-conservative model of
replication. Biofilm bacteria use the excess nitrogen and phosphates that are polluting the waters for nutrients. They can: • absorb that wavelength (if so, energy is being absorbed and may be used) • reflect that wavelength (if so, the energy is not
being absorbed and you will see that colour). and Brumbaugh, William G. Governments and societies are going to need to think about what limits the length of a food chain and prevents one from going beyond a certain number of trophic levels can be
explained by the energy pyramids shown earlier. There are many different proteins, which have six general functions: • sites for hormone-binding • enzymatic action • cell adhesion • cell-to-cell communication • channels for passive transport. (Total 1 mark) 2 The diagram below shows a pair of chromosomes during
meiosis in a cell in the human testis. Sharks are less closely related to bats and dolphins to each other. Type II pneumocytes This type of alveolar cell is cuboidal in shape and thus has relatively little membrane surface area. The spectrophotometer is set at 400 nm
for this test. The drop in progesterone and oestrogen also signals the hypothalamus to begin secreting GnRH, and thus another menstrual cycle begins. Some examples of biofilms you would recognize are plaque on your teeth, which your dentist has to remove, and slimy waste that blocks kitchen drains. • The interdependence of living organisms In
1980 there was a major volcanic catastrophe at Mount Saint Helens on the west coast of the USA. Crossing over and random orientation, one of the two sperms produced by the pollen grain combines with the egg. (2) (c) Outline one therapeutic use of stem cells. The hormones move in the plant of the USA.
through the phloem or from cell to cell. Temporal isolation Temporal isolation refers to incompatible time frames that prevent populations or their gametes from encountering each other. Some cells use anaerobic respiration for ATP production The term 'cell respiration' refers to a variety of biochemical pathways that can be used to metabolize
glucose. Discuss the difference between evidence that shows correlation and evidence that shows causation. Summary of procedures 1 Choosing human subjects for experimentation is difficult as it is often not possible to account for comparable subjects based on criteria such as gender, age, body mass index (BMI) similarities, health, current level of
activity (sports), and genetic background. One area of research involves using human embryonic stem cells in order to understand human development better. At least some of the spermatozoa find their way through the cervical opening (the cervix separates the vagina and the uterus) and gain access to the uterus. Dispose of chemicals as directed by
your teacher. If a relationship is statistically significant, it means that there is very little chance that the relationship is caused by chance. These strategies have enabled researchers to have a deeper understanding of biofilms. There are precursors in human skin that absorb ultraviolet (UV) light waves and produce vitamin D. The ion gradient is
created by a hydrogen ion concentration difference that occurs across the cristae membranes. Ribosomes Once mRNA is produced from the DNA template, the process of actually producing the protein at the ribosomes can begin. These dideoxynucleotides are only available in limited amounts but allow chains of various lengths to be assembled. No
blood is ever exchanged between the mother and foetus because their blood vessels do not join. In order to make such special cells with half the chromosomes, a special type of cell respiration? When a female is in oestrus, she gives off a scent. An
increased surface area is needed for more complex behaviours, but it still has to fit into the limited space of a skull. Journalists and citizens need to be vigilant about this, and double-check where the interpretations of the data are coming from. Why does this make sense? 202, Copyright © 2001, Sinauer Associates, Inc.; Figure 12.39 from http://
www.nobelprize.org/nobel_prizes/medicine/laureates/2000/press.html, Copyright © The Nobel Committee for Physiology or Medicine; Figure 12.50 from Repeated administration of MDMA causes transient down-regulation of serotonin 5-HT2receptors, Neuropharmacology, 31 (9), pp. Notice that the disease can be 'hidden' in families for several
generations before manifesting itself when two carriers have children. 367 08 Metabolism, cell respiration, and photosynthesis Table 8.4 The role of the mitochondrion provided in Figure 8.19 to indicate the adaptations that allow the mitochondrion to
carry out its essential functions. This is an illustration of how some scientists are conservative and prefer to keep things the way they are. Ornithologists began studying blackcap behaviour. Typically we are not aware of single impulses that reach our brain. This ratio is 9:3:3:1 and is calculated using a 4 × 4 Punnett grid, as shown in Figure 10.10.
Role of the placenta The placenta The placenta forms from the trophoblast layer of the blastocyst (see Figure 11.30). • NATURE OF SCIENCE Looking for patterns, trends, and discrepancies: there are common features in the bone structure of vertebrate limbs despite their varied use. These methods allowed faster results with the Human Genome Project. Because
there is no difference this gene is probably not involved in causing skin cancer. Rice is one example: biologists from 10 countries contributed to sequencing the first rice genome. after pesticide application Figure 5.9 How populations of pests such as rats develop resistance by natural selection. During any single crossing over event, hundreds or
thousands of genes can be traded in this way between non-sister chromatids. • The r2-value, the coefficient of determination, is useful for seeing if the trend line matches the data points closely or not. Follow the instructions to compare the genetic sequences for various organisms for the gene that makes cytochrome c. This means that a maternal
chromosome can end up with a segment of genetic material from a paternal chromosome, and vice versa. However, the use of embryonic stem cells has led to major breakthroughs in the understanding of human biology. In most cases, the cell produces two cells that are genetically identical to the original. Singer and Garth L. The final products were
already well known. Figure 5.7 Random orientation during metaphase I and crossing-over (shown by banding on sister chromatids) promote variety in the gametes. Does this new knowledge of the human brain have intrinsic value or is it a double-edged sword that can be used for good and bad? Below is a base sequence of this locus provided by
GenBank, a public DNA database. In the early 1980s, a small company called Genentech was the first to make laboratory-synthesized insulin available to patients who needed it to treat their diabetes. 12 If a group of cells are placed in a hypotonic solution, what will happen to their mass? Even though biochemistry can be amazingly complex and
varied, there are common patterns that are well known. When sunlight goes through the glass of the greenhouse, it warms up the objects inside: the plants, the ground, and anything else inside eat foods, the food is digested
(or hydrolysed) into the building blocks (catabolism). Humans maintain a stable body temperature of 37°C. These 'pure' antibodies are called monoclonal antibodies are called monoclonal antibodies. Neurones synapse with each other using molecular signals. chudler/brainsize.html monkey frog cat human 514 • reasoning • language • complex thought rabbit chimpanzee The cerebral
cortex The cerebrum develops from the front part of the neural tube. The ATP is then released from the enzyme is ready for another collision with another ADP and phosphate group. More specifically, xylem carries water and dissolved minerals up from the root system to the leaves of a plant. We know that organisms that share
many features are closely related and probably had a relatively recent common ancestor. Note the root hairs developing in the zone of maturation. Each type of antibody is different because each type has been produced in response to a different because each type has been produced in response to a different pathogen. Viruses make use of our own body cells' metabolism to create new viruses. Figure 7.4 Histones
and DNA together form nucleosomes. Other classifications The system of kingdoms and taxa is used for identifying and naming organisms, but there are countless other ways to classify organisms. It does not require a difference in concentration to occur. 4a Nitrification. The sound, which is sensed by the brain, is processed in the auditory area of the
cerebral cortex. The light colour helps to hide the eggs from predators and it is extremely rare to see any dark eggs produced. Animal experiments One type of relevant animal experimentation is to expose animal models to addictive substances in controlled situations. Follow the guidelines given below when completing any drawing. In other ways,
however, electricity and action potentials are very different. CHALLENGE YOURSELF Using the topics covered in Section A.6, summarize the example that fits the following principles best. This first tube represented a 'standard' to which future results could be compared. The enzymes are obtained from the sweet wormwood plant. This process
happens on each of the many copies of fragment 1. As the filtrate moves up the ascending portion of the loop, salt ions are pumped out and enter the intercellular fluid. The highly vascular endometrium is not maintained if there is no implantation. Thus we need to consider the two environments that affect each other: one is the closed environment of
the thorax, and the other is the internal environment of the lungs. When an action potential reaches the area of the terminal buttons, it initiates the following sequence of events (see Figure 6.21). When the minerals in rocks crystallize from magma, they contain a certain percentage of 40K ions. As mammals, you share many similarities in internal
organ structure and function. This fifth histone leads to further wrapping (packaging) of the DNA molecule and eventually to the highly condensed or supercoiled chromosomes. Pathogens can be species-specific although others can cross species barriers. The three most common monosaccharides are: • trioses, containing 3 carbons and with the
chemical formula C3H6O3 • pentoses, containing 5 carbons and with the chemical formula C5H10O5 • hexoses, containing 6 carbons and with the chemical formula C6H12O6. Plants are different from most animals in that they show growth throughout their life. Fluids with higher temperatures will have faster moving molecules (more kinetic
energy). Any time two parents are involved, the offspring will have pairs of chromosomes rather than single chromosomes rather than single chromosomes rather than single chromosomes. Another example, the word prokaryotic comes from the Greek word 'pro', whicher example is the flea, Ctenocephalides felis, that infects household cats; these fleas are known to jump over 150 times their own body length. For example, the word prokaryotic comes from the Greek word 'pro', whicher example is the fleas are known to jump over 150 times their own body length.
means 'before', and 'karyon', which means kernel, referring to the nucleus. Discuss with your peers the values of each method of acquiring abilities in the survival of an organism. The hypothalamus contains capillary beds that take in hormones produced by the hypothalamus itself. • Quaternary: two or more polypeptides combined together to make a
single functional protein, e.g. haemoglobin. Such limbs are called pentadactyl limbs because 'penta' means five and 'dactyl' refers to fingers. A chromosome is a highly coiled structure of many nucleosomes. Instead they will have to make use of protein within their body as a source of energy. 511 12 Option A: Neurobiology and behaviour brain
Parasympathetic division constricts pupil Sympathetic division eye stimulates saliva production neck region salivary glands lung speeds up heart slows heart adrenal gland spinal cord stimulates stomach, pancreas, and intestines liver stomach stimulates urination inhibits activity intestines causes erection Figure 12.11 Effects of the autonomic
nervous system. This conference addressed the goals of the Global Artificial Photosynthesis (GAP) project. Gradualism was first proposed in the late 18th century in reference to geological ideas. At the end of the testing, there can be no doubt about the result. Because every organism has its own DNA, so every organism has its own unique proteinsm has its own the late 18th century in reference to geological ideas. At the end of the testing, there can be no doubt about the result.
The alcoholpreferring rats had 20% lower levels of dopamine receptors than non-preferring rats. The rate of mitotic division continues to increase and, by the time the embryo reaches the uterine cavity, it is approximately 100 cells in size and is ready to implant itself into the endometrium of the uterus. Each specific gene recognizes a different smell
Do the practices he denounces sound like the kinds of things your biology teacher encourages you to do in your lab investigations? Likewise, for a female, it is highly likely that she will never produce the same egg twice in her lifetime. Leptin is a hormone that is produced by adipose (fat) tissue in the body. 386 Roots and fluid movement in
plants The main function of roots is to provide mineral ion and water uptake for the plant. • Next annotate the diagram. This crude song is species-specific. Because of any number of things, including limitations in the equipment and human error, the lab measurements do not fit the mathematical model perfectly. Hair cells in the semicircular canals
detect movement of the head We have three semicircular canals in each inner ear. From this terminology, what can be deduced about the females can produce more offspring. 604 Cooperative aggregates Working in teams is always a
great idea, and it seems that microorganisms have figured that out. These short-lived hydrogen bonds give rise to many of the interesting properties of water. Two fatty acids or precursors. This organism, sometimes named LUCA for last
universal common ancestor, or LUA for last universal ancestor, lived over 3.5 billion years ago and parts of its DNA code can be worked out by retracing and examining the ancestries of various forms of life. Polar and non-polar amino acids are relevant to the bonds formed between R-groups. Figure 2.34 The first step of DNA replication is helicase
unzipping the doublestranded DNA molecule, forming a section with two single strands. For example, look at Figure 12.16 and you can see the primary somatosensory cortex and the motor cortex. For a person with a resting heart rate of 72 beats a minute, the signal from the SA node is sent out every 0.8 seconds. Most groups live in extreme
environments. • Continuous variation across the geographical range of related populations matches the concept of gradual divergence. But sharks are fish whereas dolphins are aquatic mammals, and the two are classified differently in both the Linnaean system and in cladistics. Can the company patent that gene in order to protect its discovery and
in order to earn money from it? • Application: Recognition of features of birds, mammals, amphibians, reptiles, and fish. Researchers studying the placebo effect have observed that the following things have a positive influence on how effective the patients thought the pill was: how the various components of the membrane are arranged. CO2
pyruvate 3C acetyl-CoA 2C 6C CO2 4C Krebs cycle 5C 4C mitochondrion CO2 CO2 diffuses out O2 diffuses in Worked example Respiration by measuring the oxygen rate of exchange. When one area of an axon has opened a channel to allow sodium ions to diffuse in, that area cannot
send another action potential until ions have been restored to the positions characteristic of the resting potential. The new cDNA will be a copy of what was originally in the blood or tissue sample but it is only a single rather than a double strand. cepa. Try: • one or more of your favourite fast food restaurants (or at least some you know) and couple
Diets characteristic of people in various areas of the world appear to have a huge influence on health and longevity. The secretions that fall into this second category are fluids that are necessary for digestion. Fishing from a stock that is too small leads to over-fishing of the stock. 4. Enormous economic burdens are presented by problems such as the
damage caused by an increase in extreme weather events, such as super storms and hurricanes, rising sea levels, droughts as well as flooding, a reduction of snow at high altitudes influencing melt water supplies downstream, to name a few. The neurotransmitter diffuses across the synaptic gap (or cleft) from the presynaptic neurone to the
postsynaptic neurone. Each side also has a thick-walled muscular pump called a ventricle, which builds up enough pressure to send the blood out from the heart with a force we refer to as blood pressure. Consider the structure and polarity of these two molecules. tube to collect saliva food dish is hidden from dog Figure 12.35 Pavlov's experimental
setup. The waved hand is called the unconditioned stimulus (UCS) because it unconditionally stimulates the eye blink response. Saprotroph A III only. Euglena can make its own food by photosynthesis because it contains molecules of chlorophyll. Once Stalin and Khrushchev were no longer in power, however, his methods were widely criticized and
his theories attacked for lack of scientific validity. When the Sun rises again in the morning, the surface will heat up and the whole process starts again. During this juvenile stage it is brown. Different methods of membrane transport are required to absorb different nutrients. Nothing more than the brain and cranial nerves emerging from the
brainstem are shown in this illustration. The dish should be placed on the stage of a dissecting microscope. Probes Sterile probes are commonly used to monitor the following conditions in large-scale fermenters: • oxygen concentrations • pH levels • temperature • pressure • stirrer speed. In order to help identify
healthy, because we are calculating an allele frequency, not a genotype frequency. A Both children are related to both parents. Scientists must constantly collect data to support the hypotheses that they are formulating. One spermatozoon will reach the plasma membrane of the secondary oocyte first, and will use the hydrolytic enzymes of its
vision or that dolphins are capable of echolocation. They are mostly taken from previous years' IB examination papers. voltage across the membrane sodium channels open sodium ch
acetylcholine binds to receptors on the sarcolemma. Human mercury poisoning has been attributed to ingestion of methyl mercury. Cells then take up the DNA by endocytosis or phagocytosis. Use Figures 2.52-2.54 to answer the following questions about photosynthesis and limiting factors. Many people report a decline in the disorienting effects or
jet lag by taking melatonin pills until their own circadian rhythm has naturally reset. The sections are shown with a portion of an intercalated disc cut in half. To learn more about using bacteria to clean up oil spills, go to the hotlinks site, search for the title or ISBN, and click on Chapter 13: Section B.3. CHALLENGE YOURSELF In another
questions that encourage you to think about the topic in more depth, or to make detailed connections with other topics. This means it causes relaxation rather than flight. In fact, the animal really has five fingers, but they are hard to see because the animal walks on its front knuckles. (8) (Total Total 20 marks) 9 The table below shows the codons that
determine different amino acids in protein translation. (a) ...G CTC AAA ATG GGT CC.... The reason for a flatworm's flat shape is that all the cells need to be close to the surface to be able to exchange gases by diffusion. • Find the entry number for the entry number P68871).
and progesterone in the menstrual cycle are expected. • The increase in heart rate for a person who has recently begun exercising. Fossil hunting is the job of palaeontologists, and the best palaeontologists are willing to travel around the globe searching for bones, footprints, and plant remains. This project aims to conserve critical areas needed by
waterbirds migrating across these continents. They are even capable of slow but coordinated movement. Figure 4.20 Ice core data. The guard cells are in pairs and have a curved outer wall. 6 When solutes move from the blood through the selectively permeable membrane into the dialysate, what process is occurring? This process results in the
production of a large number of ATPs, carbon dioxide and water. Fifteen promising genes were identified that were previously unknown. The animal is given an injection of an addictive substance as it pushes the lever. More and more cellular debris becomes trapped in the fibrin mesh, and soon a stable clot has formed, preventing both further blood
out through the ventricles from the AV node. Its structure enables its function, which is the transportation of materials throughout the internal region of the cell. Cholera is spread by drinking water or food contaminated with the bacterium. This orange-coloured mushroom from Borneo gets its name from the children's cartoon character SpongeBob
SquarePants. When the body has to 'choose' between energy needs and muscle development, energy needs become the priority for staying alive. Biotechnologists are constantly working to improve how this system works for patients. Some tall plants are homozygous dominant and others are heterozygous.
linker DNA histone H1 helps to maintain the nucleosome DNA wraps twice around the eight histones of the nucleosome core linker DNA when looking at unfolded DNA with an electron microscope, you can see what looks like beads on a string. Whether you want to pursue a career in medicine or just want to know more about the inner workings of
human beings, this material can be fascinating. The DNA imported from the northern latitude instructed the plants to grow smaller. If the threshold is not met, the neurone does not carry the impulse to the next neurone. ATP and hydrogen are used as forms of chemical
energy to convert carbon dioxide and water into useful organic molecules for the plant. Metabolism, cell respiration, and photosynthesis is shown in Table 8.5. Table 8.5. A comparison of chemiosmosis Photosynthesis is shown in Table 8.5. Tabl
transport chain embedded in the membranes of the cristae Involves an electron transport chain embedded in the membranes of the thylakoids Energy is released when electrons are exchanged from one carrier to another Released energy is used to pump hydrogen ions
actively into the intermembrane space Released energy is used to pump hydrogen ions come from the matrix Hydrogen ions come from the stroma Hydrogen ions diffuse back into the matrix Hydrogen ions diffuse back into the matrix Hydrogen ions come from the matrix Hydrogen ions diffuse back into the matrix Hydrogen ions come from the matrix Hydrogen ions diffuse back into the matrix Hydrogen ions diffuse back into the matrix Hydrogen ions come from the matrix Hydrogen ions diffuse back into the matrix Hydrogen ions come from the matrix Hydrogen ions diffuse back into the matrix Hyd
synthase ATP synthase catalyses the photophorylation of ADP to form ATP In both cases ATP synthase is embedded along with the carriers of the electron transport chain in the membranes involved. Later, antibodies are purified from the animal's blood plasma and then used to
make the antivenom. Light-independent reactions take place in the stroma. 451 11 Animal physiology Fundamentals of the immune response A pathogen is any causative agent of disease. The active site of an enzyme matches the substrate in a similar way to a glove fitting a hand. This is a simple observation. Antibodies produced by lymphocytes lead
to specific immunity Antibodies are protein molecules that are produced by the body in response to a specific antibody, it will bind to the antigen. An excellent example is the 459 11 Animal physiology Asian weaver ant, Oecophylla smaragdina; these ants have been
shown to be able to lift over 100 times their own body mass. This is complementary base pairing, and occurs because of the specific distance that exists between the two sugar-phosphate chains. Similar to a forest that has lost all its leaves because of the specific distance that exists between the two sugar-phosphate chains.
Malaria is an infectious disease that occurs in tropical regions. If the animal is in an environment that is not suitable, it moves rapidly but randomly (with no direction) until it is in a more comfortable spot. In the rest of the alimentary canal, peristalsis causes a contraction just 'behind' the food mass and thus keeps it moving through the canal, as well
as helping to mix the food with a variety of enzymes. Of these molecules, proteins are of extreme importance because of their role in controlling the metabolism of cells, as mentioned in Section 2.5. If proteins are so important, then the importance of deoxyribonucleic acid (DNA) must also be recognized, as this very large macromolecule carries the
code for making the proteins. Values are represented as mean ±1 SD from 25 trees per species. For these short-day plants, enough Pfr has to be converted to Pr for flowering to occur. ER connects with the plasma membrane and the nuclear membrane a
for any of three possibilities: deficiency, imbalance, or excess of nutrients. Fragment 1 with a primer and 12 unknown bases? Is this a useful image for 'nature'? This shows the time separation between the systolic contractions of the atria and ventricles. I II (a) (i) Identify the chemical group labelled I. Skill: Analysis of data on risks to monarch
butterflies of Bt crops. As blood moves through the tubes, the dialysate is constantly replaced to maintain ideal levels. Samples of the experiment and the data obtained follows. One recent study conducted by Youssef Idaghdour and Greg Gibson showed that
species is formed: we started with a peppered moth and we finished with a peppered moth. The two main methods of accessing memories are recognition and recall. Using muscles for exercise uses more ATP, because each use requires a new ATP to prepare the myosin heads for a new cycle of activity to begin. Figure 11.19 Saltwater fish: their
tissues are hypotonic in a hypertonic saltwater environment. A test cross with a known homozygous recessive would be necessary to determine whether a fly's phenotype is the result of a homozygous or heterozygous genotype (see Figure 10.16). The unstable 6-carbon compound breaks down into two 3-carbon compounds called glycerate 3-
                                                                                                                unusually long. When a cat has kittens, for example, each one is slightly different, or when a population of guinea pigs interbreeds there can be a wide variety of offspring. Apply crystal violet stain. This also explains why antibiotics have no effect on viruses. These small, circular, DNA molecules are not connected to the main bacterial chromosome.
molecular structure. • Iron is carried to the bone marrow to produce haemoglobin in new red blood cells. These factors change the shape of the excess glucose is taken in by the surrounding hepatocytes and converted to the polysaccharide glycogen. • Some pollutants
are metabolized by microorganisms. However, bacteria cannot make complex proteins. • Diets high in saturated fat, sodium, and sugar increase the risk of CHD. 768 768 • Is there one way that is best for acquiring knowledge? rhesus monkey 0.02654 NATURE OF SCIENCE rat 0.03596 mouse 0.04623 domestic duck 0.00959 Canada goose 0.01096
alligator 0.11644 Nile crocodile 0.07534 human 0.02825 rhesus monkey 0.02654 rat 0.03596 A perfect example of scientists cooperating and collaborating together is Ensembl. • Standard glassware and supplies, such as stirring rods, spatulas, test tubes, beakers, etc., will also be needed, based on your chosen techniques for carrying out the tests.
This arrangement makes it easier for the fibre to act as a single unit when contracting. (3) (2) (Total 5 marks) 713 14 Option C: Ecology and conservation 4 The energy flow diagram below for a temperate ecosystem has been divided into two parts. Amount of decay a short time after death stable daughter isotopes unstable radioactive parent isotopes
220 0% 22.92 28.65 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 time/thousands of years Fortunately, if there is insufficient 14C, there are other radioactive isotopes that have much longer half-lives, such as 40K (potassium-40). The risk of claw damage is therefore of greater importance in terms of reproductive
success than the short-term energy gain of eating a mussel. 0.20 0.10 0.00 controls 0.25 1 3 7 21 days after last dose of MDMA 17 Looking at the labels on the graph, what does 'specific binding of' tell you about the number of active receptors? Should all individuals in all parts of the world have access to the development of positive environmental
influences on their genome? Geologists study the porosity and deformations of rock layers in order to determine which parts of the world might contain exploitable gas and oil reserves. Inside the Bowman's capsule, the afferent arteriole branches into a capillary bed called the glomerulus. This instrument enables scientists to see the blood flow in the
brain as it is occurring. As a result, during translation, instead of adding glutamic acid, which is the intended amino acid in the sixth position of the sequence, valine is added there instead. Viral vectors can be used in gene therapy. It proceeds only when light is not a limiting factor and when there is an accumulation of NADPH in the chloroplast. In
this way, when a biologist discovers a new organism, he or she has detailed guidance from such codes about where to place the organism in the tree of life, a metaphor used to denote the branches leading back to a common ancestor.
inhibition. 517 12 Option A: Neurobiology and behaviour Drugs such as cocaine and nicotine also increase dopamine production in the experiment provides us with evidence that the lack of water is the cause of the wilting. Markers can detect
predisposition to genetic disease. The presence of a genetic marker can tell us whether we have a predisposition to a certain disease. Finally, the pressure in the ventricle becomes greater than that in the aorta, and the semilunar valve opens, allowing the ventricle to pump the blood into the aorta. It is legal in the USA to use peyote if you are Native
American and participating in religious ceremonies. zone of cell division apical meristem root cap • The zone of cell division is where new undifferentiated cells are forming, corresponding with the M phase of the cell cycle (see Section 1.6). For example, a node is the place where a speciation happened and where the common ancestor was found. The
end result is that ovulation does not occur. Phagocytosis is a type of endocytosis that is explained on page 36 in Section 1.4. The interior environment of a functioning lysosome is acidic; this acidic environment of a functioning lysosome is acidic; this acidic environment is necessary for the enzymes to hydrolyse large molecules. When a drug is introduced into a culture, it can become a problem that did not
protein that forms a meshlike network that helps to stabilize the platelet plug. But some animals lack pigmentation. Peptidoglycan is an important material for bacteria. Compare this number stypes of cells and chromosome numbers and chromosome numbers.
Species Haploid = n Diploid = 2n Human (Homo sapiens) 23 46 Chimpanzee (Pan troglodytes) 24 48 Domestic dog (Canis familiaris) 39 78 Rice (Oryza sativa) 12 24 1 2 Roundworm (Parascaris equorum) CHALLENGE YOURSELF 4 Use the karyogram in the photo below to determine whether the child is a boy or a girl. 264 Worked example 1 Examine
this cladogram of four genera of plants. But if cell is not getting a sufficient amount of oxygen for the aerobic pathway, i.e. is in a low-oxygen situation, excess pyruvate molecules are converted into lactic acid molecules. 31 36 66 number of differences in DNA (not to scale) However, we need to be careful when using a word such as 'clock' in this
context. Some research has shown that if drugs are cheap and easy to get a hold of, addiction is more likely. Thieman and Palladino 2013, p. In cases when there is an even number of data points, take the mean (average) of the two numbers in the middle. There are ethical issues involved in stem cell research. • Eating trans-fatty acids (see Section
2.3) increases the risk of CHD. 228 The mechanism for evolution Besides providing evidence for evolution, Darwin and Wallace suggested a mechanism for evolution besides providing evidence for evolution. This area receives less light, so as a result the temperature here is lower than on the upper surface. In the cross shown in Figure 10.13, all the males produced had
white eyes and all the females had red eyes. Such a number is difficult to grasp, but it is higher than the gross domestic product (GDP) of most countries in the world. • Is it possible to clone humans? F James Such diseases are called autosomal recessive diseases because they are caused by recessive alleles, and the locus of their gene is found on one
of the first 22 pairs of chromosomes but not on the sex chromosomes X or Y. • Microorganisms in industry. This shape is indicative of the affinity changes for oxygen that haemoglobin undergoes when at least some oxygen is already bound to the molecule. To create these four
blood types there are three alleles of the gene. There are about 100 billion nerve cells in the brain and each of them communicates with about 1000 others. As both of these hormone levels fall, the highly vascular endometrium can no longer be maintained. Genetic engineers can change these pathways by giving the microorganism a new gene.
CHALLENGE YOURSELF 4 380 2 temperature 340 0 300 -2 -4 260 CO2 concentration 220 180 -6 -8 18 16 14 12 10 8 6 4 2 time (thousands of years trapped in ice core samples. From
the GAP project, it is hoped that enhanced crop production, reduced atmospheric CO2 levels, and increased availability of fuels for heating and cooking may be realized. W, Norton & Company Inc.; Figure on page 570 (top) adapted from Odor plumes and animal navigation in turbulent water flow: a field study, The Biological Bulletin, 188, pp. A large
gene pool exists in a population that shows substantial variety in its traits, whereas a small gene pool exists in a population whose members show little variation, notably in cases of inbreeding. This false-colour SEM shows a synapse between a neurone (green) and a muscle fibre (red). First study the top diagram of the relaxed sarcomere. • Synapses
are junctions between neurones and between neurones and between neurones and receptor or effector cells. The production of the breast nipple caused by the stimulation of the breast nipple caused by a suckling infant. (d) The great apes are the four primates shown that demonstrate the most recently developed derived traits. For decades, the idea of a 'tongue map'
(i.e. certain zones of the tongue relate to certain tastes) was propagated by biology textbooks, and taste-test investigations were suggested as lab work for students. B.4 Biotechnology can be used in the diagnosis and treatment of disease. As you might expect, the right side of the brain receives information from the left visual field, and the left side of
itself. The use of biofilm as an adsorbent of pollutant ions is one of the new technologies for treatment of contaminated water. A miniature world in a plastic bottle You can set up your own ecosystem of microbes in a plastic bottle You can set up your own ecosystem of microbes in a plastic bottle at home or in the lab. Bird skeletons are often very lightweight, making them well-adapted for flight. Give evidence. Na+
ions diffuse into postsynaptic neurone channels. Use of artificial pacemakers to regulate heart rate A coloured X-ray of the chest of a patient with a dual-lead artificial pacemaker. There has been much sharing of data involving stem cell research. Microvilli are too small to be seen at this magnification. To learn more about DNA replication,
transcription, and translation, go to the hotlinks site, search for the title or ISBN, and click on Chapter 7: Section 7.2. RNA polymerase binds to the promoter region of DNA. Can you identify the biotic components in this photo? Sequoiadendron giganteum, the redwood sequoia, is the tallest tree in the world. We were wrong, here's the real
story ... In palaeontology, it seems that every time a new hominid fossil is dug up, we have to redraw the human family tree. Biogas production by archaeans and bacteria One of the renewable energy sources of the future may be biogas. On the one hand, the Human Genome Project has shown that there are only a very small number of DNA bases
that make one person different from any other person in the world. Unique methylation patterns have been associated with a large number of human cancers. • The left cerebral hemisphere controls muscle contraction in the right side of the body, and vice versa for the right hemisphere. Using DNA to make medicines Another advantageous use of
cold from being exposed to low temperatures or changes in humidity. 3.2 Chromosomes carry genes in a linear sequence that is shared by members of a species. The Egyptian walking onion, Allium cepa var. • The activation energy is lowered and the substrate is altered by the rearrangement of the existing atoms. Hypothesis for question 2: the
optimum temperature environment for lactase will be 25°C. Skill: Gram staining of Gram-positive and Gram-negative bacteria. A good way to visualize this model of enzyme action is to think of a hand and glove, the hand being the enzyme.
Conduct some research into the role each of these structures plays in excretion. Along this route, the capillary beds are found in your lungs, where the blood picks up oxygen and releases carbon dioxide. The lining up of chromosomes in a random order is like shuffling a deck of cards, and it greatly promotes variety in the egg cells or sperm cells
produced. A range of membrane proteins should be shown including glycoproteins. In fact, most prokaryotic cells are less than 1 µm in diameter. This is much more complicated than recognition. 16 Arrange these events in the correct sequence to represent synaptic transmission. An organism that has characteristics that are well adapted for its
environment is said to be fit. • Platyhelminthes: this phylum is made up of flatworms. 2.8 Cell respiration supplies energy for the functions of life. In addition to a carboxyl functional group at one end, a fatty acid consists of a long chain of carbons with only hydrogens. For example, it is possible that a certain allele is present in 25% of the
chromosomes studied in a population. Figure 2.33 This artwork shows complementary base pairs and hydrogen bonding in DNA. The techniques involve the use of aphid stylets and radioactively labelled carbon dioxide. A mutation that provides an individual or a species with a better chance for survival is considered to be a beneficial mutation, and
there is a good chance that it will be passed on to the next generation. Fertilization Reproductive biology and birth control issues are important from an international perspective as the world's human population continues to grow. The two offspring labelled R are the recombinants (see text for explanation). Osmogreulators Osmoregulators are
animals whose internal tissues have a different solute concentration compared with their environment. • Populations of a species by evolution. Figure 13.35 Gene therapy. Because this blood has lost a great deal of blood pressure, the blood flow through veins is slower than through arteries. We also
mentioned that there are some problems with and exceptions to the current cell theory. When the first spermatozoon fertilizes an ovum, the charge is immediately reversed to positive. Belling 69, AMI Images 289, Anatomical Travelogue 299t, 315b, Anatomical Travelogue 299t, 315b,
problem is, sometimes people do not know or do not follow the recommendations for the products they use. Platelets form in the bone marrow, along with red blood cells (leucocytes), but do not remain as entire cells. During times of increased body activity, such as exercise, the heart rate needs to increase above
                                   gardeners will induce lateral growth in plants by pinching off the apical bud. This movement is called churning. lacktriangle Guidance Lactase can be immobilized in alginate beads, and experiments can then be carried out in which the lactose in milk is hydrolysed. lacktriangle 754 Erythrocytes have no nucleus and few or
ribosomes in prokaryotic cells are also composed of two subunits, but they only equal 70S. Homologous means similar in shape and size, and it means that the two chromosomes carry the same genes. This seems to be an excellent example of how some birds developed a learned a behaviour, then, when the conditions were altered, the behaviour was
lost. Decomposers such as bacteria and fungi break down complex proteins, and release nitrogen gas into the atmosphere. The target cells of steroid hormones have their biochemistry dramatically altered as a result of the presence of the hormone. The stomach then begins hydrochloric acid (HCl) and pepsinogen production and secretion into the 727
15 Late in the 20th century, researchers discovered a class of drugs that inhibit the production of acid by cells in the gastric pits of the stomach. Storage occurs at the level of the neurone. For example, are such wikis just as valid as traditional scientific journals? 125 03 Genetics teams could not access the BRCA genes to do their own testing and
diagnosis. Consider the following domains of research in biology. tRNA moves sequentially through the three binding sites: from the A site, to the P site, and finally to the E site. There is a temporary decrease in the need for food and sleep. This is illustrated in Figure 3.3. Figure 3.2. The locus is the specific position of a gene on a chromosome. (Total 1
mark) 2 What are Okazaki fragments? The pressure 75 valve open produced by this systole is not very left ventricle high. 338 Proteins and gene expression is also regulated by proteins. • Scroll down the left-hand column to PUBMED. Even if your parents had dozens of other children, none would be identical to you.
Glycolysis occurs in both prokaryotic and eukaryotic cells. The now sterile nutrient broth was then placed in three flasks, as shown to the left. Common examples are insulin for diabetes, melatonin for sleep disorders, and reproductive hormones following female menopause. • Semantic encoding: remembering sensory input in a context. It involved
using a virus to infect some of your cells, but the virus was the carrier of the gene you needed. When neurones have reached their final location, synaptic connections must be made with their target cells. Another place for a synapse is between a receptor neurone (cell) of the nervous system and the first sensory neurone. Healthcare professionals
need fast and accurate tests on hand to distinguish one type of influenza (flu) from another. Logarithmic scales are useful when you are trying to show distributions of data points that would not show up if they were put on a normally incremental scale. These strategies are most relevant to water-dwelling animals. 3 (a) Has two-way digestive tract and
                                         .Platyhelminthes (b) Has a one-way digestive tract (mouth and anus) .......
                                                                                                                                             . Although these organisms are all classified in the animal kingdom, they are certainly not placed in the same clade simply because of their ability to fly with wings. This method is successful because the calcium phosphate coats the
negatively charged DNA and neutralizes it. An essay question is more difficult because it requires you to recall all of the information from memory. There is another possible interpretation to these results, however. The inside of a greenhouse Different gases, different impacts Different gases in the atmosphere have different impacts on the greenhouse Different gases.
effect on Earth. 718 A perfect example to illustrate the idea of an essential vitamin is vitamin is
leaders of the Human Genome Project team. skeletal muscle fibre/cell sarcolemma tendon: connects muscle fibre is a muscl
pathogen-free product. Until recently noone recognized that the problems we were trying to solve in industry, environment, and public health, were caused by biofilms. Application: Completion and analysis of Punnett squares for dihybrid traits. The biomass of a trophic level is an estimate of the mass of all the organisms within that level. How can the
repeating of experiments in science decrease the chances of an illusion? Here is how researchers at the Roslin Institute in Scotland produced Dolly (see Figure 3.38). The one on the right received an extra 21st chromosome and has Down syndrome. To avoid this problem of accumulating too many chromosomes, humans and other animals produce egg
cells and sperm cells in such a way that the number of chromosomes in their nuclei is halved. Plant hormones Plant development involves extensive coordination amongst the individual cells that make up the plant. There are links to relevant websites in this book. The set of ideas first proposed by Francis Crick in 1956 called the central dogma states
that information passes from genes on the DNA to the RNA copy. You can see the two eyespots that are sensitive to light. Metabolism = catabolism to everyday conversations, for example: 'I wish I had a higher metabolic rate so that I could eat more without putting on
weight'. molecule a molecule a molecule b molecule c artemisinic acid Figure 13.1 shows the pathway to artemisinic acid, which will be chemically converted into the malaria drug artemisinin. Below you will find a brief synopsis of some epidemiological data concerning the incidence of CHD in the UK. Because of a certain number of differences in metabolism
and genetic makeup in types of single-celled organisms that looked similar to bacteria, the biologist Carl Woese proposed the domain Archaea to distinguish them from bacteria (prokaryotes) and eukaryotes. The media used currently are plastic particles with high surface areas. That other molecule is rhamnolipid, which is an effective emulsifier
(surfactant) and creates much more surface area upon which the 602 microorganism can act. In effect, the simulated organism dies of hunger. • Centrifuge to separate the cells from the blood serum. Ideally, well-informed consumers could choose products or services that are provided by ecologically minded companies. The advantage of this is two-
fold. In this phase oxidative phosphorylation is the means by which the ATPs are produced. Copying DNA (DNA cloning) Copying DNA is more complex, because a host cell is needed in addition to the cutting and pasting enzymes described above. We have evolved that method of motion because the elbow joint is not capable of such a rotation. (a)
Using the dark blue trend line, determine the atmospheric carbon dioxide concentration for 1965 and 2001. The outer ring of follicle cells remains within the ovary. In 1981, Willy Burgdorfer identified the bacteria that causes
the disease. In some ways, meiosis is like a lottery. As we go through the various developmental stages of an ovum, note the many similarities to spermatogenesis. • Individuals with genetic characteristics that are poorly adapted for their environment tend to be less successful at accessing resources and have less chance of surviving to maturity.
Reclassification From time to time, new evidence about a taxon requires a new classification. Another type may inhibit the production of a new cell wall by bacteria, thus blocking their ability to grow and divide. A. Worked example Let's suppose a group of students has been working in a forest in late summer and they have measured several abiotic
factors, including light intensity in two distinct areas: a heavily wooded area and an open prairie. These units are known as cells. • The brain interprets the signals as sound. The examples of genome and chromosome number have been done since the work of these
two science pioneers, casting further doubt on the idea of spontaneous generation. Pepsinogen is first secreted from the activity of the stomach, it is in an inactive form. Should research about a tropical disease such as malaria be paid for by tax money
from non-tropical countries? Although this is extremely rare, and exceptional, among certain invertebrates, one animal that is capable of reproducing asexually by making clones of itself is the hydra, Hydra vulgaris. Having said this, closer inspection of the data shows that the increase in temperature (in blue) happens first and then the carbon dioxide
concentration (in red) rises. 9 Explain why brain metabolism requires a large input of energy. Examples from different plant phyla. In skeletal muscle, many individual cells are fused together to make a fibre. The behaviour of the isopods
is to move randomly and quickly in a dry environment until they finally come to rest in the humid environment. These transport proteins are specific for certain ions. The sarcoplasm contains large numbers of organelles that store glycogen as an energy reserve. However, no matter which organ is involved, excretion is the removal of the waste
products of metabolic pathways from the body. Using coded wire tag detectors Fish populations can be marked by attaching tags to the fish. Each of these 3-carbon molecules is called pyruvate. 381 09 Figure 9.1 Major structures of a generalized leaf. CAMs are located on the surface of cells in the growth environment of the axon. The industrial
revolution carbon dioxide (parts per million) hundred years of atmospheric changes. When the electrons combine with the oxygen, so do two hydrogen ions from the aqueous surroundings. They found receptors for opiates, morphine, and heroin in brain cells. One of the reasons why they are much more numerous in the population is that black moths
are seen more easily against light-coloured lichens and thus are more frequently preyed upon by birds. D I, II and III. Option A: Neurobiology and behaviour • MDMA forces serotonin axons to release lots of serotonin. Usually about 300 nucleotides separate the start code from the stop code. By microinjection or biolistics (see above). 709 14 Option C:
Ecology and conservation Insectivorous plants in waterlogged soils with low nitrogen for protein synthesis and to make new DNA molecules. In some ways this is accurate, as a nerve impulse can be measured in the same way as electricity. So, each nucleotide is attached to the previous one by this type of bond. It is not enough
for an enzyme's substrate(s) to just enter an active site. State whether each of these transfusions can be safely accomplished, and give the logic behind your answer. This enzyme is involved in the first major step of making glucose during photosynthesis (see Chapter 2). In contrast, because the organic alcohol with phosphate is highly polar, it is water
soluble. The stinger continues to pump venom, and to embed itself deeper into the victim's skin. After these building blocks are transported to body cells, they are bonded together to form larger molecules once again (anabolism). particle gun particle 
biolistic particle delivery system is a device for injecting cells with genetic information. Here are some examples showing the r2 values calculated by Microsoft Excel for three data sets and their trend lines. Heritability refers to how much of an effect genetic has on the trait. 214 (Total 1 mark) 3 Why do food chains in an ecosystem rarely contain
more than five organisms? In the 1800s Thomas Malthus famously predicted that our food demand would outstrip our food supply. They can also use a key to determine whether or not certain plants are endangered or protected species. Figure 15.23 Oxygen dissociation curves of haemoglobin and myoglobin. If the only other statistics for North
Koreans come from measuring refugees fleeing the country, is this group a representative sample of the height of the country's population as a whole? If this is a first encounter with a particular pathogen, the response is known as a primary immune response. 2 You should have seen that when food was added to a culture of paramecia they clustered
around the food particles. (f) The chloroplasts within some plant cells can often be seen moving in a cyclical pattern near the periphery of the cell. • Application: Production of Amflora potato (Solanum tuberosum) for paper and adhesive industries. • What effect would such a result have on the relationships between siblings or between spouses? The
shape and number of the bones may vary, and the function may vary, but the general format is the same, and the conclusion is that the organisms that possess these limbs had a common ancestor. CH C CH2 CH3 CH2 COOH 755 15 Haemoglobin changes shape and affinity when carrying oxygen Carbon monoxide is a by-product of the combustion of
many fuels. Exercises 5 Besides mutation, list two factors that are responsible for increasing variation in a population. prometaphase B Composite of transmission electron micrographs showing that represent how two
membranes could have come to exist on mitochondria and chloroplasts through an engulfing process involving endocytosis. Other techniques must be used for genetically modified (GM) crops and animals, which we will discuss later (also in Section 3.5). Nitrogen-fixing bacteria, e.g. Azotobacter, live freely in the soil and do not need a host. He
autopsied the brain of a deceased patient who had a strange language disorder. This strand forms in a similar fashion, but in the opposite direction to the first enzyme, thus bringing about inhibition. The loading of sugar into the sieve tube at the
source, and the removal of sugar at the sink, is accomplished by active transport. Ageing fossils The age of a rock can be determined by carefully examining differences in the ratios of isotopes. However, this chain is essential to chemiosmosis, which does produce the ATP. When the ingested muscle reaches the intestines of the snake, enzymes (such
as trypsin) help the snake digest the actin and myosin into amino acids. ADH controls reabsorption of water in the collecting duct The colour of urine, from relatively colourless to dark yellow, is a clue to how hydrated you are. What do the invertebrate behaviour experiments tell us about survival and reproduction? 539 12 Option A: Neurobiology and
behaviour Learning is the acquisition of skill or knowledge What skills have you learned recently? • Vitamins are chemically diverse carbon compounds that cannot be synthesized by the body. (d) You should look at more images of micrographs on the internet to develop your skills in determining the sizes of cells and cell structures. They are actually
quite similar. Critical thinking: Is this statement valid? 601 13 Option B: Biotechnology and bioinformatics Bioremediation is the process of using an organism's metabolism to break down pollutants. So the probability that a woman could produce the same egg twice is 1 in 223 or 1 in 8 388 608. • Weeds: when a herbicide is sprayed to
kill weeds, herbicide-resistant plants are not harmed and so the crop is not affected; for example the crop yield of GM soybeans is higher. Glucose enters liver and is converted to glycogen. Sieve tube member. This causes natality to immediately decrease and mortality to dramatically increase. Such a patient New technology to study the human brain
has been advancing at a rapid rate. Diploid and haploid cells The term diploid is used to describe a nucleus that has chromosomes organized into pairs of homologous chromosomes. Within a couple of decades, a grassland and shrub ecosystem had reappeared. In this case, complete the table below, which allows a comparison of the two compounds.
The recent discovery of groups of organisms called biofilms could be very important for these types of processes. Prostate cancer is one example where certain detectable methylation patterns are being used in early diagnoses to classify tumours and promote successful treatments. Figure 2.15 The three sections omega end found in all fatty acids: the
carboxyl group at one end, the long hydrocarbon chain in the middle, and the methyl group at the other end. A second very slight stimulation caused the same strong retraction. We might notice, for example, in the
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geographical location that is now Berlin in Germany, there would have been an ice sheet similar to the ones still sitting on Greenland and Antarctica today. Whichever technique is applied, the end result is either that the organism no longer shows the undesired trait or that it shows a trait that genetic engineers want. Neural pruning eliminates axons

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that are not being used. Radioactive tracers, mentioned in the Nature of Science, can be used to study this movement, and show that more than just diffusion and osmosis are involved. Again, halophytes have an impressive list of adaptations. Viral vectors can be used in gene therapy. Cells Anterior end anterior contractile vacuole oral groove
micronucleus trichocysts macronucleus oral vestibule cilia buccal cavity with rows of cilia used in feeding food vacuole CHALLENGE YOURSELF Answer the following questions about the observations you made in the labs. This behaviour does not seem to increase the survival of the donor bat directly. LTM involves a physical change in the neural
network of the brain. Fruit flies are bred in laboratories and used to study genetics. Operant conditioning is a form of learning B. For a long time, it was thought that once a cell has gone through differentiation, it cannot be used to make a clone. Individuals can have CHD for many years without any obvious symptoms, because the early stages do not
have noticeable symptoms. B: When solution pressure is low, the guard cells become limp and the stoma closes. The x-axis of these graphs measures the partial pressure of oxygen. The sticky biofilms also bond with other pollutants such as suspended solids, copper, lead and zinc removing them from the water. Eyes: a homologous characteristic. 537
catttaatta ccaatatttg 241 gtgcaattct gtcaatgagg ataaatgtgg aatcgttata attcttaaga atatatattc 301 cctctgagtt tttgatacct cagattttaa ggcc (a) What is abnormal in this case about the section marked, including STRs of 'gata'? Dicotyledonous and monocotyledonous plants and their characteristics will be discussed in Section 9.4 epidermis cortex xylem
phloem endodermis phloem cambium vascular bundle xylem epidermis pith cortex After looking at some prepared slides or internet images, answer the following questions. Spread the cells on nutrient medium containing an antibiotic. Pathogens should not be found in bathing and drinking water, or water used to irrigate crops. Think of the axon as
threedimensional 'tube', and thus the ion movements shown are occurring all around the tube. Monosaccharide monomers are linked together by condensation reactions to form disaccharide and no lungs. • NATURE OF
SCIENCE Developments in scientific research follow improvements in bioinformatics, such as the interrogation of databases, have facilitated research into metabolic pathways. Which curve represents the effects of a non-competitive inhibitor? 489 Animal physiology molecular exchanges 11 foetal blood to placenta foetus
foetal blood from placenta mother's capillaries Figure 11.31 A schematic showing the blood flow pattern of the placenta. • Observe the stem for movement of the coloured solution. New strains of syphilis, for example, have adapted to antibiotics and show multiple resistance. • Guidance Illinois Elbow diagram should include cartilage, synovial fluid,
joint capsule, named bones, and antagonistic muscles. When redox reactions take place, the reduced form of a molecule always has more potential energy that the oxidized form of the molecule always has more potential energy that the oxidized form of the molecule. Aspects such as historic notes on the life of scientists and origins of names are included here. • the doctor was wearing a white lab coat • there were
diplomas on the wall in the doctor's office • the doctor sat down and listened attentively to the patient. Thus this investigation should attempt to start at a slightly acidic pH and have various increments to (safe) alkaline solutions. Gram-positive bacteria have a simple cell wall and Gram-negative bacteria have a cell wall that is more complex (see
Figure 13.7). Videos show that certain bacteria do a little wiggle dance that helps the aggregates of cells form. Figure 10.7 shows three possibilities for random orientation: Figure 10.7 shows three possibilities for random orientation: Figure 10.7 shows three possibilities for random orientation for four bivalents. 5! RNA polymerase 3! T GC C A T T G G A 3! UGC C A U UG GA 3! 5! A CGG T A A C C T sense strand
antisense strand The promoter in the transcription process is a prime example of a noncoding section of DNA with a function. Functions of life All organisms exist in either a unicellular or a multicellular form. Certain genes have been found to control the formation of the mammalian neural tube, but dietary factors also seem to be critical. These small
structures occur in very large numbers in cells that produce a lot of protein, and, when numerous, they give a granular appearance to an electron micrograph of a prokaryotic cell. The discussion about the safety of gene therapy greatly intensified because of his death. C Cohesion between water molecules and the container in which the water is
boiled. It is shown in the following diagram. The size of the graticule units can now be determined. 2001 percent correct 60 50 40 30 20 0 20 30 40 50 age (years) 60 70 To learn more about sensory organs and colour blindness, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: Section A.3. Exercises 10 Label a diagram of
the retina and show the direction in which the light moves. • Exocrine secretions are fundamental to the digestive process Exocrine glands are glands that produce a secretion in the body and are taken to that location by a duct. The two alleles of each gene separate Let's consider a condition called albinism. Do all
the citizens of a country have a right to know the contents of the food that they are buying? 373–382 (Wu, Jer-Horng, Liu, Wen-Tso, Tseng, I-Cheng and Cheng, Sheng-Shung 2001), © Society for General Microbiology, reprinted with permission; Figure 13.5 from Advances in citric acid fermentation by aspergillus niger: biochemical aspects,
membrane transport and modeling, Biotechnology Advances, 25, fig. Within a given ship, part of the microorganism population is biofilms formed on the internal surfaces of the ballast water tanks. Van der Waals interactions between hydrophobic side chains of amino acids. 19 What are the primary disadvantages of external fertilization? Again find a
picture online, print it out, and label it. Exercises 1 A single sandwich is likely to contain carbohydrates, lipids, and proteins. • Some generally less active at colder times of
the year, their cellular respiration rates put more carbon dioxide into the air than the photosynthetic organisms can remove. Are any of the claims you find examples of pseudoscience rather than science? Without supplemental iodine, people in these areas can suffer several conditions, including severe brain damage. It contains both exons and
introns. In the circular plasmid, Figure 13.9, that there is a 'gene for antibiotic selection'. Why hasn't anyone repeated this experiment in over a century? Uncontrolled diabetes of either type can lead to many serious effects, including: • damage to the retina, leading to blindness • kidney failure • nerve damage • increased risk of cardiovascular
disease • poor wound healing (and possibly gangrene, thus making amputation necessary). 39 What is a positive control? The fact that biofilms are implicated in human disease is of great concern to the medical community. This is obtained using the following values in the contingency tables. This would be an unacceptable situation for epithelial cellsus.
that make up villi. (Total 1 mark) 2 What evidence is given in the pedigree chart below to establish that the condition is caused by a dominant allele? Even though some information was exchanged, the development of the first accurate model of DNA was highly competitive. If years of research had not been delayed because human trials had been
stopped, wouldn't we have made much more progress by now in curing genetic diseases? Two of the recent successes are described briefly below. The newly oxygenated blood will be brought back to the heart by the pulmonary veins. • Skill: Analysis of examples of DNA profiles. 17 Compare and contrast innate and learned behaviour.
Organisms that are not capable of synthesizing their own food from inorganic components of their environment need to get their nourishment by ingesting (eating) other organisms. 22 From the evidence presented in this section, explain why many scientists feel there has been an unbroken chain of life from the first cells on Earth to all cells in
organisms alive today. The type of replacement valve shown is known as a ball-andcage design. The science of anatomy is based on identifying structures and parts of structures and the amino acid that it transferred in. The green tube shown is
bringing bile from the liver (not shown) to be added to aid lipid digestion. Sucrose, lactose, and maltose should be included as examples of disaccharides produced by combining monosaccharides. Calculating phenotype frequency Using information who do not
have the disease. 324 C 5! O 1! 4! H 3! 2! OH base To understand the detailed structure of DNA, which is deoxyribose. How can you be sure that there is not another part of the cell that photosynthesizes? Haemoglobin molecules that are already carrying three
oxygen molecules have the greatest affinity for oxygen. Plants bought at a garden centre or nursery are often the result of many years of work on the part of horticulturalists and they can have intellectual property rights on their creative work. ? Fatty acids are not water soluble because they are non-polar. If these features are similar the assumption
is that the plants are closely related, and that they share many genes. In addition to increasing the metabolic rate, thyroxin helps to regulate internal body temperature. Figure 2.43 A simplified version of the events of glycolysis. The parents who produced this F2 generation were PpLl. Purple long Table 10.5 Purple round Red long Red round Total
Linked genes Observed 284 21 21 55 381 Using the information about the observed values, set up a similar table and do the same calculations as for question 3. The first 'milk' produced and secreted after birth is called colostrum. Let's examine each of these phyla more closely. 

Skill: Determination of a mitotic index from a micrograph. 128 Table
3.2 A comparison of eukaryote chromosomes and prokaryote chromosomes Prokaryote Eukaryote Eukaryote Eukaryote Shape Circular Linear Histones Not present** Present Present Present Present Present Present Presence of plasmids Sometimes Never Organized into pairs No Yes *It is rare for eukaryote to have one chromosome, but some can, such as male bees
wasps, and ants. Modern research has demonstrated that the adult brain does have plasticity. This sharing of cytoplasm is what allows the cardiac muscle cells to pass an electrical signal so quickly from cell to cell. Locate as many of the structures of an animal cell as you can. Confirmation bias happens when we only remember the times when
something confirmed our beliefs, and ignore the times when something refuted our beliefs. Computers are used to speed up the sequencing process. In this reaction, a water molecule is split into its component elements: hydrogen and oxygen. It is difficult to enforce and monitor such regulations. It is within Kupffer cells that haemoglobin is
disassembled into its component parts. The rich black layer of soil called humus is made up of organic debris and nutrients released by decomposers. The y-axis gives counts of bacteria and viruses per 100 ml. This effect is called the Bohr shift and results when carbon dioxide binds to haemoglobin, causing a shape change that promotes the release of
oxygen. There are two types of memory: shortterm memory (STM) and long-term memory (LTM). In order to avoid confusion, some of the more common synonyms (alternative names) are given in Table 15.3. right semilunar valve left atrioventricular valve left atrioventricular valve left semilunar valve left semilunar valve.
Synonym(s) Right atrioventricular valve Tricuspid valve Left atrioventricular valve Bicuspid valve, Mitral valve Right semilunar valve Pulmonary semilunar valve Figure 15.10 The location of the four heart valves. And when a sperm cell fertilizes the egg, the total number of
21st chromosomes is three. Attention: acid. Cyt: These are cytochromes (ironcontaining proteins). However, the number reduces as the radioisotope decays into more stable forms. Some strains of S. To learn more about evolution, go to the hotlinks site, search for the title or ISBN, and click on Chapter 5: Section 5.2. NATURE OF SCIENCE
Cooperation and collaboration between groups of scientists: scientists use the binomial system to identify a species rather than the many different local names. Multicellular organisms usually start their existence as a single cell after some type of sexual reproduction. Polyspermy will not lead to a viable embryo. 20 0 1994 1998 2002 year µg m-3 =
microgrammes per cubic meter Mathematics and statistical analysis In the first part of this chapter, you will learn how scientists analyse the evidence they collect when they perform experiments. antibody in test serum peroxidase Wash and add enzyme-labelled anti-human IgG antibodies. Some people think that science and religion can coexist;
others believe that they are mutually exclusive. In contrast, all species of conifer use wind to help them reproduce by pollination. Researchers are developing an improved variety of maize that has increased levels of lysine and tryptophan. Now that the light-coloured moths can hide better and avoid being eaten, their numbers have increased
Halophytes are plants adapted to grow in water with high levels of salinity. Figure 3.1 Zooming into a cell reveals where DNA is found. How do you know this is a plant cell? Today, young men in South Korea are among the tallest in Asia. Table 7.2 The roles of the replication proteins in E. The tertiary structure is particularly important in determining the tallest in Asia.
the specificity of proteins that are enzymes. In order to determine whether this behaviour had a genetic basis, scientist Peter Berthold carried out a series of experiments. 200 CHALLENGE YOURSELF 4 Using Table 4.4, draw a flowchart showing the exchange of carbon between the atmosphere, the oceans, and the biosphere. Data-presentation
possibilities • Design and create a data table showing all the relevant raw data. Note that for simplicity the amine and carboxyl groups are being shown in a nonionized form. 280 Changes in pressure within the heart chambers keep the blood on each side of the valve. • Annual create a data table showing all the relevant raw data. Note that for simplicity the amine and carboxyl groups are being shown in a nonionized form.
ECG clearly shows the delay between the firing of the SA node and the firing of the AV node. In addition to the free nucleotides used for DNA replication, the nucleotides used for DNA replication, the nucleotides used for DNA replication to the free nucleotides. The pineal gland highlighted in a sectioned view of the human brain. Practice questions hours after untreated sewage added 0 5 10 15 20 25 30
counts of bacteria and viruses / 100 ml-1 105 day 1 day 2 104 A 2-day experiment was carried out with untreated sewage added to seawater. The hen that laid the eggs probably ate some kind of grain in order to get the energy to make the eggs, and the plant material eaten by that hen was from a producer, and the producer used sunlight to
transform carbon dioxide and water into energy-rich carbon compounds. Eventually, the end product can be turned into crystals, packaged, and sold. The reasons for putting living organisms into groups according to a natural classification rather than an artificial one are numerous, and include: • trying to make sense of the biosphere • showing
evolutionary links • predicting characteristics shared by members of a group. lumen (interior) of stomach one of many pepsinogensecreting cells one of many mucussecreting cells one of many mucus experiments.
Another way of expressing this is to say that some female and male reproductive structures are homologous. Is it possible to understand all sciences by studying one of them? As each bar represents the mean of the data for a particular tree species; the standard deviation for each type of tree will be different, but the value extending above and below
a particular bar will be the same. It is used with A. Whereas weather can change from hour to hour, climates usually do not change within a human's lifetime: climate changes generally occur over thousands or millions of years. 383 09 Plant biology A light micrograph of a section through pumpkin tissue showing the lignified walls of the vessel
elements. Thus a solution with a pH of 4 has 10 times more relative hydrogen ions compared with a solution with a pH of 5. 

Applications: Cladograms including humans and other primates. And yet biologists have observed this in many species, notably ones that are spread over a wide geographical area. Using the glow of
the green fluorescent protein, they have discovered that when bacteria irreversibly attach to a substrate, a gene begins to make more EPS in all the bacteria. Can most people identified. How do you know? Have there been allergic reactions to the new gene
put into a plant? In this case, the inhibitor interacts with another site on the enzyme (see Figure 8.4). 9 What is a virus doing when it is not infecting a host cell? That is where an enzyme comes into play: the enzyme acts as a catalyst for the reaction. The plasmid is now called a recombinant plasmid and it can be used as a vector, a tool for introducing
a new gene into an organism's genetic makeup. heterotrophs autotrophs autotro
Academy of Sciences of the United States of America website, you should find many articles about the debate. A new proteome A proteome A proteome A proteome A proteome A proteome (all the genes) of a species. • Application: Modes of transport of glucose, amino acids, cholesterol, fats, oxygen, and sodium chloride in blood in relation to their
solubility in water. Figure 9.8 This is another tap capillary tube scale model of a potometer which may be used for this practical. Thus metabolism can also be thought of as the sum of all the reactions that rebuild large, more complex
biochemical substances from the smaller subcomponents (anabolism). Glucose and fructose are isomers of each other because they have the same chemical formula, C6H12O6. R R T wave P wave When you learn about a mechanism such as the timing of the SA node and the delay before the AV node sends an impulse, think about why the mechanism
works in the way that it does. Oxytocin receptors in the muscle of the uterus will respond with the first contraction. Eventually the person will be able to move and walk again. If a mutation occurred causing the eggs to be brightly coloured, how would the change in colour affect their change in colour affect their change in the muscle of the uterus will respond with the first contraction. Eventually separate during
the process of mitosis. Genes are made up of numerous fragments of protein-encoding information interspersed with non-coding fragments. If the minimum is reached, an action potential is initiated and begins to self-propagate. A Intracellular 5 Figure 1.23 Stage 5: The protein opens towards the cell interior again and releases the potassium ions into
the interior. It is easy to demonstrate plant tropisms in the laboratory. Enzymes do not provide this energy, they simply lower the energy minimum that is required. (1) (b) List two examples of how human life depends on mitosis. Monitoring ventilation in humans at rest and after mild and vigorous exercise *Safety alerts: Many schools and the IB
Animal Experimentation policy require parent permission forms to be signed before any type of investigation of the pupils themselves is performed. As development proceeds, the other synapses are eliminated. a T = allele for a tall plant. Some textbooks will refer to condensation reactions as dehydration synthesis reactions. These values will
complete the first two rows of the last column of the table. As the stereocilia on the hair cell itself is created. The negative and positive areas of a substrate must match the opposite charge when the substrate is in the active site of an enzyme, in order for the enzyme to have catalytic action
Cells have the ability to convert energy from one form into another. Dispharming uses genetically modified animals and plants to produce proteins for therapeutic use. If the cubs survive to sexual maturity, the genes they carry then have a higher chance of being inherited in subsequent populations of lions. A blastocyst is characterized by: • a
surrounding layer of cells called the trophoblast, which will help form the foetal portion of the placenta • a group of cells on the interior known as the inner cell mass, located towards one end of the blastocyst; the inner cell mass, located towards on
Optical densities of 0.200- 0.399 need to be retested. 743 15 To learn more about the heart and ECG traces, go to the hotlinks site, search for the title or ISBN, and click on Chapter 15: Section D.4. Option D: Human physiology It is important to be aware of the following. The same phenomenon occurs when water is placed in a capillary tube; in fact,
you can think of the vascular tissue in plants as being biological capillary tubes. If the patterns are similar, it means that the two individuals are probably related. • Sound-tracking equipment should be located. Their bodies are not segmented (divided
up into sections). A virus, bacterium, fungus, or even a transplanted organ, has different (plasma membrane) proteins and thus is recognized as 'not-self'. This means that, for a very short period of time, both sodium ions and potassium ions are inside together (this is why the inside of the membrane becomes positive relative to the outside). When
World War I interfered with the harvesting of the Italian lemon crop, natural citric acid became a rarity. Each absorbs light most efficiently at a different wavelength. In this situation, oxygen is more Haemoglobin is more likely likely to dissociate from haemoglobin at any oxygen partial pressure. The photosynthetic rate is highly dependent on many
environmental factors, including the intensity of light and air temperature. They have no muscle or nerve tissue and no distinct internal organs. The homeostatic blood pH is 7.35 to 7.45, which is very slightly alkaline. These people are said to be lactors intolerant. Genetic engineering enabled us to place the human insulin-coding gene into bacteria so
that the bacteria can produce this protein for human use. This is how new alleles are produced. Table 11.3 summarizes some of the symptoms of each. We will see how this is another tool in the toolbox of biotechnologists to enable efficient diagnosis and treatment of disease. Primer? It has not disappeared, however; it has simply been converted into
a form that the organism can no longer use as a source of energy. Consumers will then come along and eat the producers, and digest the complex organic compounds into simpler building blocks, such as amino acids and sugars, for growth and energy. When one branch of science confirms the work of another branch, the findings have more
credibility. B.3 Environmental protection Understandings: Responses to pollution incidents can involve bioremediation combined with physical and chemical procedures. Microorganisms have certain pathways that they use to make a product that they use the pro
lever much more frequently. 3.3 Alleles segregate during meiosis allowing new combinations to be formed by the fusion of gametes. How do we decide when evidence is reliable or not? Polar covalent bonding results from an unequal sharing of electrons.
centromeres are attached to the microtubules, they move towards the poles first. Table 1.5 Outermost parts of different cells Cell wall of cellulose Plants Cell wall of cellulose Animals No cell wall, instead a plasma membrane
that secretes a mixture of sugar and proteins called glycoproteins that forms the extracellular matrix 23 01 Cells cell middle lamella and secondary walls. Do not use electricity of a higher voltage, otherwise the organism will be harmed. This time the
signal is carried by a different cranial nerve, called the vagus nerve. The sequence starts with a damaged blood vessel, and leads to a meshwork of fibrin that traps blood cells to form a clot. They might seem similar to reptiles, but their eggs do not have a membrane around the embryo. I.
already working at their maximum rate increased molecular collisions enzymes and other proteins become denatured increasing light intensity (all other variables constant) Figure 2.52 The effect of increasing light intensity on the rate of photosynthesis. It can be purchased from several online
sources and in many large food stores. In the early 1980s, two researchers isolated living bacterial cells (Helicobacter pylori) from the stomach lining of patients suffering from stomach ulcers. They used to be common on mainland Africa but natural selection, notably competition with other primates, has eliminated them from the continent. Nitrates
may not sound as dramatic a problem as raw sewage, but they can be disastrous to ecosystems. Heterozygous - Having two different alleles of a gene (see Figure 3.22). DNA sequence 1: GTG CAC CTG ACT CCT GAG GAG DNA sequence 2: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG ACT CCT GAG GAG DNA sequence 3: GTG CAC CTG GAG GAG GAG DNA sequence 3: GTG CAC CTG GAG GAG GAG 
number , whereas the codon in the same position in sequence 2 has the letter T instead. Stomata or stomatal pores occur on the bottom surface of leaves, and they allow oxygen and
before continuing. The pair of diagrams in Figures 11.5 and 11.6 show how a joint in an insect and a human move by antagonistic muscle pairs. There are 64 possible codons. Which side of the debate is this scientist on? Genetic predisposition Evidence of a genetic predisposition to addiction has been found in studies of twins. The ion channel closes
to sodium ions. Determine the mitotic index of these various types of tissue. siphon head gill Isn't it amazing that the behaviour of an animal has a basis in the shape of the protein, which results in a message being relayed to the interior of
the cell. The result is that the second generation is identical to the first. The process that occurs at the second arrow is translation. How does she know? 13 A scuba diver returns to her favourite coral reef only to find it empty of life and all the corals turned white. Molecular biology DNA replication involves 'unzipping' Cells must prepare for a cell
division by doubling the DNA content of the cell in a process called DNA replication. China is increasingly producing cotton with the same pesticide gene: currently 66% of its cotton crop has this gene. This can occur when an organism's environment changes. You should now be able to explain more fully how temperature, light intensity, and carbon
dioxide concentration may limit the rate of photosynthesis. Skill: Drawing internal structure of seeds. Calculating the standard deviation of a data set is easily done on a calculator with mathematical functions. This is what makes fruits, grains, and vegetables good food sources. 747 15 Option D: Human physiology Exercises 13 Artificial hearts and
heart valves have been designed and surgically implanted into both test animals and humans. If you use a scale of 1:200, what will the size of your drawing of the organism be? This is another technical improvement that has allowed scientists to diagnose and treat disease. Unfortunately, since the beginning of scientific experimentation, there have
been instances of improper presentation of results. Thus, under most circumstances, at least some of this water is reabsorbed through the wall of the collecting duct. Myosin heads are energized and ready to connect to actin-binding sites if/when the binding sites become uncovered. Science often makes major leaps forward when careful and critical
attractive or repellent. Although it has other functions as well, it can be said that the hypothalamus acts as your appetite control centre. Because of its rigidity it will only allow a certain amount of water to enter the cell. It can safely be ignored, and therefore the value of 0.91 can be used for analysis purposes. The method you use includes a gene chip
that contains the DNA probes for the microarray. That did happen, and what is interesting is the ratio in which they appeared. Notice that anhydrase buffered by H 2O when carbonic acid dissociates within the cytoplasm haemoglobin H2CO3 Hb4 or plasma of the erythrocyte, some of the resulting hydrogen carbonic acid proteins ions can become
because entry and exit of matter can be prevented but light can enter and heat can leave. Debates To get your brain warmed up, consider the following two statements about the nature of all human beings on Earth. 6 Explain why muscles occur in antagonistic pairs. Again, the name would have to be published along with a description in a reputable
scientific publication. Ecologists are studying the area around Chernobyl to see how nature has responded to the presence of radiation. This is why the fluid mosaic model was introduced. An altruistic behaviour is one that benefits others at a cost to oneself. • Villi absorb monomers formed by digestion as well as mineral ions and vitamins. 3 Finally,
cause of a plant wilting? K! Figure 6.19 Return to the resting potential. For example, using a mnemonic device such as ROYGBIV as a strategy to remember the colours of the light spectrum in order (red, orange, yellow, green, blue, indigo, and violet). In either situation, the body needs to use the glycogen made and stored by the liver (and muscle
cells). In the previous section you learned that a cardiac cycle is initiated by impulses given off by the SA node. Each polypeptide that has been selected for a specific purpose has not only its own amino acid sequence, but also its own three-dimensional shape; that shape has a dominant influence on the function of the polypeptide. chromosomes reach
chance of surviving until adulthood and reaching maturity. • Determine the expected values (E) (although we sometimes like to use percentages or ratios). The majority of substances that are biochemically important are polar. The products produced
after the breakdown are environmentally neutral. Traits can be analogous or homologous. If cells may lose mass, or the cells may remain at the same mass. The switch is to change the view of the patient from a 'non-functioning person' to a
'person who is in a dormant state'. Reuptake of neurotransmitter fragments. Type I pneumocytes are extremely thin alveolar cells that are adapted to carry out gas exchange. After left-hemisphere damage, patients may have difficulty speaking or doing complicated movements with their hands or arms. Examples of nonpolar amino acids are
tryptophan, leucine, alanine, and glycine. Large biogas fermenters: the advantage of biogas over wind and solar is that it is always available. Production of monoclonal antibodies A primary immune response by an organism is called a polyclonal response. Keep going until you get to a name instead of a number: if you have answered each question
correctly, that will be the name of the taxon your organism belongs to. Oestrus is a period of sexual receptiveness. D Several ribosomes that are synthesizing different proteins for use in the cytoplasm. What this means is that, as a general rule, one allele does not follow another when it is passed on to a gamete. One such online 247 05 How are
taxonomists classified? Dopamine gives you a feeling of pleasure. (1) (d) Deduce the long-term effects of sustained pollution that kills decomposers on autotrophic productivity (2) (Total 6 marks) 714 5 Sea-water temperature has an effect on the spawning (release of eggs) of echinoderms living in Antarctic waters. This will denature or change the
organizational structure of the venom, resulting in a change in the properties of the protein, and a lessening of the symptoms. For example, the pill bug and woodlouse sound like two different organisms but they are, in fact, the same one: Armadillidium vulgare. This requires a means of communication within the plant. (b) Ever since the Clean Air Act
was passed in 1956, air quality around industrial zones of the UK has improved: there are fewer sulfur dioxides and less soot in the fields, pesticides kill all the rats ... or so the farmer thinks. But people may still wonder if the patient could be in a coma. Fish heads are collected
and each is then checked with the handheld detector for the presence of a tag. Stargardt's disease is an inherited disease caused by both parents passing on a gene to their offspring that codes for a defect in the processing of vitamin A. It synthesizes hormones which are stored in the posterior pituitary and releases factors regulating the anterior
pituitary. This gene is probably not involved in causing skin cancer. 10 If plant cells have chloroplasts for photosynthesis, why do they also need mitochondria? For example, a man can produce millions of different sperm cells, each with a unique combination of half his DNA. The greater the tendency to bind with oxygen, the higher the affinity. 4 Using
first cell division. Humans are incapable of digesting cellulose, one of the most common organic substances on Earth. Example: calculate the mean percentage increase for all the test subjects who did jumping jacks for 90 seconds. 73 02 Molecular biology CHALLENGE YOURSELF 3 Calculate the BMI of a person who is 1.64 m tall and weighs 79 kg.
sensory receptor (in skin) sensory nerve fibre spinal cord stimulus motor transmission motor nerve fibre response to the musical note is called the conditioned response (CR). There is no homeostatic factor being controlled, the
is called continuous variation. The TOK framework is a useful tool for analysing knowledge issues. In this case, however, the process is in reverse. This could be one of the reasons why it is so widely misunderstood by the general public. • Some species are able to compartmentalize Na+ and Cl- in the vacuoles of their cells, thereby preventing NaCl
toxicity. The syrinx is a bony structure at the bottom of their trachea (windpipe). The proportion of marked individuals to the whole population. Because with Theory of knowledge (TOK), you are the knower. Interestingly, this code has the same
meaning in nearly all organisms on Earth and is said to be 'universal'. • Application: Evidence from Pasteur's experiments that spontaneous generation of cells and organisms does not now occur on Earth. The function of the myelin sheath and nodes of Ranvier are described on pages 302-303. A pesticide that a woman
puts on her vegetable garden may not cause cancer in the doses she inhales or gets on her skin, but if she smokes and she works at the radiology department in the local hospital, and she uses a cell phone many hours a day, and she goes to the tanning salon regularly, and she lives in a city with severe air pollution ... Could all those repeated non-
 lethal daily doses of possible cancer-causing things add up? • Ingestion of pathogens by phagocytic white blood cells gives non-specific immunity to diseases. However, instead of having its connection in the spinal cord, as with the pain reflex. What is the structure labelled D called? What are some of the potential hazards?
Addiction is a chemical dependency on drugs where the drug has 'rewired' the brain so that it has become and essential biochemical for the body. As technology is improved and becomes more affordable, more and more specialists are using methods involving protein sequences and DNA. 

In a natural classification, the genus and accompanying the brain so that it has become an essential biochemical for the body. As technology is improved and becomes more affordable, more and more specialists are using methods involving protein sequences.
higher taxa consist of all the species that have evolved from one common ancestral species. Anaphase II During telophase II, a new nuclear membrane can form around each of the four new cells. This gives the mammal the ability to control voluntary muscular movement. Determine the number of degrees of freedom in this calculation. Birth, or
parturition, is a process that is not a normal part of mammalian homeostasis. As the hydrogen ions move through the ATP synthase channel, the enzyme harnesses the available energy, thus allowing the phosphorylation of ADP. Some molecules along the food chain cannot participate in the accumulating biomass because they are lost in various forms
carbon dioxide is lost from the organisms during cellular respiration, water is lost during transpiration and evaporation from the skin, and waste products including urea are excreted. (Total 1 mark) 6 What is the advantage of having a small volume inside the thylakoids of the chloroplast? Calculate the frequency of the healthy allele in the population
It has become common for some employers (and professional sports teams) to test individuals regularly for unprescribed or unauthorized chemicals. These vesicles carry modified materials to wherever they are needed inside or outside the cell. pylori infection of the stomach lining leads to gastritis and stomach ulcers. The greenhouse effect refers to
a planet's ability to use its atmosphere to retain heat and keep warm even when no sunlight is hitting the surface. Each cerebral hemisphere is responsible for one half of the body. The function of any particular protein is closely related to its structure. Use BLASTp to find out. Is it passed on from generation? Nitrogen starts the cycle in
gas form in the atmosphere, as N2. Active transport and the cell 34 As you will remember, active transport requires work to be performed. Cocaine attaches to the dopamine receptors on the presynaptic membrane. For example, some birds may mature quicker, some birds may develop more extreme courtship
patterns. An overview of respiration Section 2.8 provided an introduction to the process of cellular respiration. Studies of song learning have shown that birds hatch with what is called a 'crude template'. Each action potential must reach a minimum threshold in order to be self-propagated. 1181 (Gross, Mart M. In addition, the high levels of both
oestrogen and progesterone at the same time provide a negative feedback signal to the hypothalamus. Each of the protein types can cause an immune response, and thus several different kinds of plasma B cells undergo clonal selection, so several different kinds of antibodies are produced. Colorized magnetic resonance image (MRI) of a woman with
a very high BMI. These physiological factors include: • the total volume of water ingested recently, as liquid and in solid foods • perspiration rate, which is largely dependent on the activity/exercise level (a significant amount of water is exhaled
when we breathe out). Similar to an enzyme and substrate, there must be a molecular shape and charge 'fit' between the peptide hormone and its receptor molecule. This is how the problem of changing chromosome number is avoided. This system of naming organisms was consolidated and popularized by the dynamic Swedish naturalist Carolus
(Carl) Linnaeus. If we feel a greater pressure, it is because the pressure has caused even more receptors in that area to reach their minimum threshold. Another example of a change of bases can be seen in the gene ABCC11, which determines several things, one of them being whether or not the cerumen (ear wax) that you produce is wet or dry. This
is shown by the following equation: C6H12O6 + 6 O2 6 CO2 + 6 H2O + energy In this equation, glucose is oxidized because electrons are transferred from it to oxygen. Exercises 17 What type of bonds does helicase act upon? Despite the apparent complexity, this is a relatively short peptide consisting of only nine amino acids. Only a small amount is
converted into infrared to warm up the surface. In this case, the presence of the notochord, a mesodermal tissue, causes the ectoderm to develop into a neural plate. Some cells will pause during G1 and enter a separate phase, the ground tissue, causes the ectoderm to develop into a neural plate. Some cells will pause during G1 and enter a separate phase, the ground tissue, causes the ectoderm to develop into a neural plate.
living cells present with the open tubes of xylem? Cell wall is a semi-rigid structure composed mainly of cellulose. Warmth receptors respond when the temperature rises; cold receptors respond when the temperature drops. Scientists trying to find out about brain functions became interested in studying a group of patients who had undergone
surgery to sever their corpus callosum to relieve symptoms of epilepsy. Burning wood in a fire is a good example of turning chemical energy in the organic compounds of the wood into light energy (and heat energy). There are databases of protein families and databases built around disease. 18 What is an example of a positive feedback loop in the
menstrual cycle? Eubacteria is the domain in which we find that makes your yogurt taste good, the kind that might give you an infection. Table 6.4 shows some common areas that have a mucous membrane. Chemiosmosis involves the
movement of protons (hydrogen ions) to provide energy so that phosphorylation can occur. Table 8.3 The produced Net ATP gain Glycolysis 2 4 2 Krebs cycle 0 2 2 Electron transport chain and chemiosmosis 0 32 32 Total 2 38 36 Theoretically 36 ATPs are produced by cellular respiration, but innovement of protons (hydrogen ions) to provide energy so that phosphorylation can occur. Table 8.3 The produced by cellular respiration, but innovement of protons (hydrogen ions) to provide energy so that phosphorylation can occur. Table 8.3 The produced by cellular respiration, but innovement of protons (hydrogen ions) to provide energy so that phosphorylation can occur. Table 8.3 The produced by cellular respiration process are produced by cellular respiration.
reality the number is closer to 30. Selective breeding of domesticated animals shows that artificial selection can cause evolution. Whole plants. So the alleles for co-dominant flowers of domesticated animals shows that artificial selection can cause evolution.
the numbers so they would fit with what he wanted to show? An unbroken transitional pattern from one group to another is not present. Table 7.2 summarizes the replication proteins in E. Large databases have been developed to help find the genes necessary for these genetic modifications. The best way to learn this picture is to draw it
and label the parts. (d) Of all the commonly used petroleum products, this one has the smallest density. See if you can answer the following questions using the EQ values shown in Table 12.4. 3 Can you see which four animals have diets of meat or fish? If you see a face in the crowd and remember who that is, that is recognition. A simple 9-volt
battery will usually trigger a response. • Application: Use of cochlear implants by deaf patients. Hearing varies between people and changes with age. Note: Fatty acids typically have more carbons than the one shown for this illustration.
same time using the same databases. • The result is short-term learning in the gill withdrawal reflex of Aplysia (see Figure 12.40). 1987-1990 (Robinson, S. Fertilization Fertilization
DNA evidence, it should be clear that person F is much more likely to be the father of child number 2 than of any of the other children. A quadrat is a square of a particular dimension that can be made of a rigid material such as metal, plastic, or wood. Arteries have a relatively thick, smooth, muscle layer that is used by the autonomic nervous system.
to change the inside diameter (lumen) of the blood vessels. 11.3 The kidney and osmoregulation Understandings: Animals are either osmoregulators or osmoconformers. 3 Explain why eukaryotic chromosomes always come in pairs. It is a fascinating story. Repeat the procedure so that each test is done five times. A Both the external intercostal
species. The cortical reaction is designed to prevent more than one spermatozoon from fertilizing the ovum. This chapter has some ideas, quotes, anecdotes, case studies, and many unanswered questions, but very little factual information. Animals such as goats are now making pharmaceutical proteins for us along with their milk. During this time
cellular respiration is contributing large quantities of carbon dioxide to the atmosphere, but not as fast as photosynthesis is taking it out. Have your calculator with you to practise calculations for standard deviation and t-tests, so that you can use these methods of analysing data when you do your own experiments. Role Outer mitochondrial
membrane that contains the carriers for the electron transport chain and ATP synthase for chemiosmosis Space between inner and outer membranes A reservoir for hydrogen ions (protons) The overall equation for cellular respiration is: C6H12O6 + 6 O2 6 CO2 + 6 H2O + energy (as heat or ATP) All organisms need the ability to produce ATP for
energy, so all organisms carry out respiration. Natural selection Animal behaviour is more than just single reflexes. • Cladograms are tree diagrams that show the most probable sequence of divergence in clades. The process of eutrophication proceeds as follows: • high nitrates and phosphates fertilize the algae present in water • there is increased
The answer lies in an understanding of the process of meiosis. D A group of populations living and interacting in an area. Cells from higher plants, plants that are thought to have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though they do not have evolved later, produce microtubules even though the produce microtubules even though the produce microtubules even though the produce microtubules even the produce m
are called pits (gastric pits) extending down into the inner lining of the stomach. This trading of segments of genes happens when sections of two homologous chromatids break at the same point, twist around each other, and then each connects to the other's initial position. When a person has a stroke, it is localized and often occurs in either the left
section, you learned about endocrine glands. Does scientific knowledge change with more experimentation? The least expensive way of producing large amounts of factor IX is to use transgenic sheep. People who have untreated diabetes have sufficient glucose in their blood, but not in their body cells where it is needed. Let's consider Mendel's
will be physiology, which is how the various organs and tissues within your body function. Because the characteristic of poison resistance was favoured in the rat population, it is now much more common in the population. Notice that various combinations were attempted. Parasympathetic nerves return the system to normal. Independent
help shape the molecule. afferent arteriole efferent arteriole glomerulus (fenestrated capillary bed) filtrate basement membrane 471 11 Animal physiology Ultrafiltration is the term used to describe the process by which various substances are filtered through the glomerulus (and its fenestrations) under the unusually high blood pressure in this
their food. They have been a key element in our past and will be equally important in our future. The marker tells us that there is a mutation in the melanocortin 1 receptor (MC1R) gene. Is there enough scientific data to back up the diagnosis of ADHD? Ideally, 50 or more observed values would be better. • Use straight lines and a ruler. Do they use
the same methods to infer and deduce what the past was like? Research has shown that there has been a decrease in stomatal density in many land plants on most of the Earth's continents. The hatchling is modifying the inherited template. Three aspects of cellular respiration were discussed: • glycolysis • anaerobic respiration • aerobic respiration
Factors which may affect transpiration rate and may be measured using a potometer include light intensity, wind speed, temperature, leaf surface area, and stomatal density on the surface of different types of leaves. The idea is to maintain two different phenotypes within the population. One is the ocular lens and the other is the objective lens
at the various types of data on this page. On either side of the capillary are portions of two alveoli, one on the left, one on right. The differences between a horse's and a lizard's. Crossing over produces new combinations of alleles on the
chromosomes of the haploid cells. • Who owns knowledge? • Dominant alleles mask the effects of recessive alleles but co-dominant alleles have joint effects. Some of these enzyme-catalysed reactions function to convert large, complex molecules (like many of the foods that we eat) to smaller, simpler molecular forms. Millions of spermatozoa can be
produced in a single day, and mitosis replaces the cells that become spermatozoa. That bond will always be a nitrogen atom bonded to a carbon atom, with that carbon atom also doubled bonded to an oxygen. As we have seen in Chapter 4, these differences can arise as a result of mutations. Wouldn't that be a more logical explanation? Substances
leave the tubule filtrate and are taken back into the bloodstream via the peritubular capillary bed. Freeman (Nelson, D. CHALLENGE YOURSELF 2 Show the outcome of a cross between two homozygous parents: AABB × aabb. Because it is dominant, all it takes is one H allele in a person's genetic makeup to cause the condition. 439 10 Genetics and
evolution Worked example Calculating allele frequency, part I Let's consider a disease caused by a recessive allele t. When there are disagreeing sides, which one should we believe? They looked to see whether an organism had hair or feathers, legs or wings. (a) Grassland ecosystem: grass grasshoppers (b) River ecosystem: algae mayfly larvae (c)
Marine ecosystem: diatoms copepods 5 toads snakes juvenile trout herring seals hawk kingfisher great white shark From the following information, construct a food web: • grasshoppers, and mice • rabbits are eaten by hawks • toads are
eaten by hognose snakes • hognose snakes are eaten by hawks. • Educating the public on scientific claims: scientific studies have shown that high-density lipoprotein could be considered 'good' cholesterol. If the fish stock is too small, there are not enough adult fish to produce sufficient young fish. The enzyme
that is inhibited and reactivated is an allosteric enzyme. In order to be approved, various safeguards have been put in place to prevent this potato from mixing with conventional potato plants. Because the distances are measured carefully, this is especially interesting in cases where we want to see if there is a relationship between the distribution of
organisms that live along the transect and an abiotic factor that changes along the transect, such as temperature, humidity, and light levels. Stewart was criticized for her work and had trouble getting funding for subsequent projects. Each time the blood passes through the liver, hepatocytes attempt to remove the alcohol from the bloodstream. The
opponents of GM plants object to the transfer of genes to another species. 11 Using the knowledge you have gained about how organisms change over time, describe how this may have occurred. In other words, the action potential does not have to undergo the time-consuming and energy-expensive ion movements in the area of the membrane
underneath the myelin material. Using a culture of Chlorella, design an experiment that would allow you to see what colour (wavelength) of light this organism prefers. At the bottom of that same strand notice that the 3- or 3-prime (3) carbon is unattached. (c) The five amino acids that contain either a carboxyl or an amine group as part of their R-
group. Use the hotlinks to find ancient sequences of base pairs to compare between species of prokaryotes. Because of this, the mitochondria are often called the powerhouse of a cell. Rods and cones CHALLENGE YOURSELF 11 The next challenge is to learn the parts of the retina using Figure 12.24. For one thing, it can reveal a lot about how
populations have migrated and interbred in the past, but it can also reveal other things about our health. At the end of a meal, when you have eaten a sufficient quantity of food, you have reached a state of satiety, and that is when most people stop eating. The single ring of follicle cells begins to divide and form a fluid. gametes from one parent
possible genotypes of offspring The purpose of a Punnett grid is to show all the possible combinations of genetic information for a particular trait in a monohybrid cross. We are all different. At the end of this phase, each pole of the cell has a complete, identical set of chromosomes. (a) The cell cycle can be divided into two parts: interphase and
mitosis. cap vinyl tubing Biogas may be directly combustible and used in boilers, turbines, or fuel cells. CHALLENGE YOURSELF One quantitative study done over a 30-year period by Rosemary and Peter Grant showed differences in beak sizes of ground finches, Geospiza fortis, from two islands of the Galapagos: Daphne Major and Santa Cruz. A.3
Perception of stimuli Understandings: Receptors detect changes in the environment. You can find a link to this activity in the hotlinks box at the end of this section. neurone 2 activated receptor SERT vesicles axon of neurone 1 MDMA initially affects the serotonin neurones in the following manner. Notice that there are four products: the three water
molecules as well as the triglyceride. Homologous chromosomes called homologous chromosomes. (1) (c) Describe the importance of stem cells in differentiation. 407 09 Plant biology Once the zygote is formed it
develops with the surrounding tissue into the seed. Erwin Chargaff (Austrian) had determined that the numbers of adenine and thymine bases were equal, as were the numbers of cytosine and guanine bases. The sodium-potassium pump, has five stages. The
earliest seed plants relied upon wind as their pollen vector. Amino acids with non-polar side chains are hydrophobic. When a hovering bee sees a female he pursues her and tries to mate with her. In the figure below, the top line indicates the number of larvae caught (per 5000 l of seawater). G How are the two strands of DNA held together? Skill:
Production of an annotated diagram of the digestive system. 120 mm Hg = 16 kPa 80 mm Hg = 16 kPa 80 mm Hg = 11 kPa The mean population blood pressure varies widely from country to country. Exercises 12 Briefly explain why enzymes and substrates are specific for each other. For example, P. This results in the two membranes being held so tightly together that
most molecules cannot pass between them and must be transported first into and then out of the epithelial cells lining each villus. The types of archaeans that prefer extreme conditions are called extremophiles (methane-loving), and halophiles (salt-loving). When positive sodium ions are diffusing
into the postsynaptic neurone, then the message is being carried along 555 12 Option A: Neurobiology and behaviour the nerve. 20 10 0 A B AB blood group O frequency Height in humans is an example of a trait that shows continuous variation. This kind of reproduction is called parthenogenesis. As Mendel's experiment in this example had
thousands of results, we can use this test with confidence. Facts score points in a biology exam. Many enzymes are involved to enable the formation of products that protects the plant. Enzymes are very complex protein molecules with high
molecular weights. • The compounds within the algae were then separated. Now when a flock of birds arrive to eat the moths, which kind gets eaten and why? This string of ribosomes is called a polysome or polyribosome. 2004), reproduced with permission from American Society for Microbiology; Figure 13.20 from Bioremediation of automobile oil
effluent by pseudomonas sp., Advanced Tech (now SciTech), June, 34, fig. The second stage of photosynthesis is a set of reactions in which ATP is used to help bond carbon dioxide and water molecules together to create a sugar, such as glucose. In the human body, there are neurones that extend from the lower portion of the spinal cord all the way to
the big toe: single cells that extend a distance of about 1 m! Of course, not all neurones are quite short. Today, a migration towards urban centres has greatly reduced the amount of daily physical activity. Several paths could be explored, such as better education, international agreements and policies, higher
taxation of unsustainable activities, or discussions of population control to limit human impacts. The designed investigation must show a certain amount of variation of feeding organisms. Taxonomists classify species using a hierarchy of taxa. As a result, anaerobic conditions are created, which allows certain
types of microorganisms to grow but prevents the growth of microorganisms that we grow but prevents the growth of microorganisms that we grow but prevents the growth of microorganisms that we grow but prevents the growth of microorganisms that we grow but prevents the growth of microorganisms that we grow but prevents the growth of microorganisms that we grow but prevents the growth of microor
patients. Complex architecture Put a clean glass slide in a pond and almost immediately a film will begin to form on the slide. Those events were initiated by an action potential from a motor neurone. The postsynaptic neurone is depolarized locally (just in that area) by the influx of positive sodium ions. • Special microscopes can find the luminescent
quantum rods and thus find the cancer cells. Rough endoplasmic reticulum is a site of protein synthesis. Waterlogged soils become nitrate depleted and plant (crop) growth is reduced significantly. The study concluded that fish population densities can be improved by regulations aimed at both recreational and commercial fishers. 17 How does this
information affect the mitotic index of the two sets of cells? Once you carry out your experiment, any successful new plants that grow will be clones of the original plant. Synovial joints allow certain movements but not others. In the discussion be open to the ideas of others, remembering that this is a key characteristic of a successful scientist. Figure
7.16 As the ribosome moves towards the 3 end of the mRNA, the amino acid chain is assembled. For example, if all the students in a year group got 5s and 6s as their marks in a test, the standard deviation would be low, whereas if the results ranged from 2s to 7s, the standard deviation would be higher. Practice questions 1 What is a community?
Cladistics is, therefore, an example of natural classification. A nuclear membrane (envelope) begins to re-form around each set of chromosomes. Transducin protein synthesized, colour vision possible. In the case of measuring the lengths of DNA strands, the DNA forming during replication is given a radioactive form of a molecule called thymidine
ATP is synthesized from the bonding of adenosine diphosphate (ADP) to a phosphate (P) group. 1 2 3 bat (fruit bat) 4 5 222 Bird Human Horse Dolphin Turtle Description of phalanges (finger bones) (short/long, wide/narrow) 3 horse CHALLENGE YOURSELF Figure 5.3 Pentadactyl forelimbs from various animals. An equal amount of solution
containing the metabolite of interest is withdrawn. Two-way paper chromatography was used for this separation. Many of these collisions. Like all fossil fuels, however, peat takes a very long time to form and is not considered to be a
renewable source of energy. Consider these two types of scientific investigation. • Aerobic cell respiration requires oxygen and gives a large yield of ATP from glucose. For example, when comparing a bird that has a long, thin beak to another with a short, fat beak, it is difficult to imagine that they are both descendants from the same species. You
can review information on BMI in Section 2.3. The numbers of people overweight and obese have continued to increase in the last few decades. This bacterium adds a methyl group to mercury, converting it into highly toxic methyl mercury. Instead, phenylalanine builds up in tissues and the bloodstream. Correlation and cause are extremely important
in scientific research. 3.2 9.5 4.4 6.2 7.9 4.4 9.4 7.3 4.4 In the ICT section of this chapter, you can learn how to use a spreadsheet to calculate the mean and many other values for your data. Lactase is the enzyme that digests the disaccharide lactose into two monosaccharides (glucose and galactose); the monosaccharides are much more readily
absorbed into the bloodstream, surfactant (moisture film) secreted by type II pneumocytes Figure 6.14 Microscopic view of a small area inside a human lung. Not everyone builds up plague in their arteries at the same rate.
provides minerals to the plant as well as the water necessary to carry out photosynthesis. The body of data stored in databases is increasing exponentially. These pigments are organized on the membranes of the thylakoids. All human populations, whatever slight differences their genomes may have, deserve equal esteem as human beings. Net
photosynthesis was calculated by subtracting the rate of respiration in the dark from gross photosynthesis. Solution In order to lead a healthy lifestyle, specifically designed to minimize the risk of CHD: • do not smoke or be in an area where cigarette smoke is present • eat a healthy diet minimizing saturated fats, trans-fats, salt, and sugar, while
increasing your intake of fruits, vegetables, and complex carbohydrates • attempt a reasonable amount of physical activity as often as possible • attempt to lower high blood pressure by natural means or, if necessary, by taking prescription medicines • keep cholesterol and other blood lipids in a normal range by eating a healthy diet and/or taking
prescription medications • make lifestyle choices that will lead to weight loss, if necessary • avoid lifestyle choices that could lead to type II diabetes, or control the disease as much as possible. You can see how environmental factors affect birth, death, immigration, and emigration. O H N H Gly Phe Val Ala Arg Ser C OH The primary structure
determines the next three levels of protein organization. A recent study using EST data analysis discovered three genes expressed in human prostate cancer. Rafts of floating islands of plants and their biofilms can reduce the levels of pollutants in small bodies of water. Ferns are recognizable by the absence of flowers and by their triangular fronds
made up of many smaller long thin leaves. The model they produced was an actual physical model, using wires and symbols representing atoms. Once you have done that for DNA, do the same for RNA. The mould may just grow over the top of the bacteria and kill the colonies. These two strands are therefore said to be antiparallel to one another. The
high levels of water on peatland force out the air that would normally be between the soil particles. This is not true: the percentage of gases in the air does not change as altitude increases, it is the air pressure that changes. Could reducing variety in the foods we grow and eat increase risks of famine and other global health crises? An example is the
human and mouse. It was very tricky before the databases used in bioinformatics were constructed. In general, if it is possible to tick 'yes' or 'no' for a trait, that trait does not show continuous variation, for example dry versus wet earwax (see Section 3.1). Skill: Analysis of diagrams of the pathways of aerobic respiration to deduce where
decarboxylation and oxidation reactions occur. • Probes are used to monitor conditions within fermenters. Molecular biology is the chemistry of living organisms The majority of molecules within all living organisms can be categorized into one of four biochemical groupings. 177 04 NATURE OF SCIENCE Classification is all about looking for patterns
and grouping organisms together according to those patterns. GenBank is the largest public database of DNA sequences. A paradigm shift is a fundamental change in the way we see or understand something. In Figure 8.23, spheres are used to represent the carbon atoms so that they can be tracked through the cycle. See Figure 2.34. Application:
Treatment of kidney failure by haemodialysis or kidney transplant. The polypeptide chain bends and folds over itself because of interactions among the R-groups and the peptide backbone. Vascular tissue in plants carries water and a variety of dissolved substances. B I and II only. Anthony J. (Total 3 marks) 5 A blood clot contains a network of protein.
Not everyone is convinced that climate change is happening, or that it is caused by human activity. A man is injected with an antivenom after being bitten by a poisonous snake, coli bacterium undergoing reproduction. This signal is sent to the SA node; it does not change the mechanism of how the heart beats, just the timing. Examples of autotrophs
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include: • cyanobacteria • algae • grass • trees. J. Helen Cooper and her team at the Queensland Brain Institute have identified signalling molecules that may be used to promote the birth of new neurones, which will then migrate to damaged regions of the brain. coli that a change in genes can affect the pathway and produce a desired product, the
metabolite of interest. • The following locally available from pharmacies). We will explore the relationship between eight organisms by using the small changes that are present in their beta haemoglobin chains
as a basis for comparison. The two areas of the brain important for language are named after these scientists: Pierre Paul Broca and Carl Wernicke. Recall from Section 3.2 (Figure 3.11) that autosomal means that the gene causing the trait is found on one of the 22 chromosomes that are not the sex chromosomes. Figure 8.21 The lightdependent
reaction of photosynthesis. Three standard, disc-shaped red blood cells, and one sickle-shaped cell. A genome How do we know all that we do about genes? For example, many species of birds rely on a courtship display in order for one sex to copulate with the other. 

Application: Use of the pupil reflex to evaluate brain damage. To test this
hypothesis, the bacterium is introduced into a Petri dish along with small disks of paper that are soaked in different types of antibiotic. Early in pregnancy, the embryo begins to produce a hormone called human chorionic gonadotropin (HCG). There is no such thing as a strong impulse or a weak impulse: if the minimum threshold for that type of
receptor is reached, an impulse begins. Thermal properties Water has an acidic taste. Earth's surface can get very hot, and, during heat waves, the nights are not cool enough to cause the daytime temperatures to lower. 438 p2 T t T TT tt t T tt Figure 10.25 is why CO2 carbonated water has an acidic taste.
Annotated Punnett grid showing allele frequencies. That is the stuff of intellectual stimulation and growth. Tillage contributes to soil erosion by water and wind, soil moisture loss, and air pollution from dust. We will look at plants and animals, but be aware that there are other kingdoms not mentioned here. The inside of the artery slowly becomes
smaller and smaller as the plaque continues to form. The lower band had the heavier nitrogen, 15N. Eventually, the roots of the plants will grow into the water below. cuticle epidermis palisade mesophyll epidermis that allow gas exchange
This agglutination of pathogens helps macrophages and other phagocytic cells find the pathogens for destruction. As sodium ions are actively transported to the outside of the membrane, they diffuse in when a channel opens. Exercises 13 Describe the factors that can influence the sigmoid growth curve of a population. Chuang Tzu Taoist text (written
more than 2000 years ago) Can we here on Earth possibly know of worlds beyond our own? Today, experiments that were previously conducted in vivo (in live cells) are now conducted in vivo (with a computer). Amniocentesis involves using a hypodermic needle to extract some of the amniotic fluid around the developing baby. An allergic response
occurs when a non-pathogenic substance, called an allergen, is encountered by certain leucocytes. inner lining As you learned in Section 6.1, the stomach is not only a 'holding place' for ingested food, but it is also the site where the early steps of digestion occur. Communities A community is a group of populations living and interacting with each
other in an area. The radioactive 3H molecule is used as a radio marker to keep track of where those thymidine molecules are, because it leaves traces of its presence on photographic film. Then assumptions about bacterial tolerance to temperature differences were applied. O" NAD! C O C O CO2 CH3 pyruvate Cytosol coenzyme A NADH transport
protein S CoA C O Figure 8.10 The link reaction. You will notice that virtually all the images you see of atoms and molecules are in the form of models. Phillips 277l, David M. An EST is a small fragment of cDNA typically present in a DNA library. It does not take much of a temperature drop to produce a glaciation: it is estimated that the last ice age
was caused by a global average temperature reduction of 5°C. 538 Learned behaviour An interesting story of imprinting involves the first ethologist (someone who studies animal behaviour under natural conditions), Konrad Lorenz, and how he ended up with baby graylag geese (goslings) following him around! Why would geese become attached to a
scientist? • A marker gene tells the scientist if the construct has been successfully taken up by bacterial plasmids that will carry it to the plant. Role of phagocytic white blood cells (leucocytes) are the cells in our bloodstream that help us fight off pathogens that enter our bodies, and also provide us with immunity for the many
pathogens that we encounter more than once. Physical and chemical clean ups do not degrade the oil satisfactorily. In this case, epithelium refers to layers of cells that line hollow organs and glands. After doing so, try to classify each of the named molecular components as a carbohydrate, lipid, protein, or nucleic acid. Exercises 4 Look at these food
chains again. Autoradiography Autoradiography Autoradiography is a technique in which radiation from a substance is captured on photographic film or by a camera sensor. To learn more about how enzymes only work with specific
substrates. These include: • storing glucose as the polysaccharide glycogen in liver and muscle tissues • storing triglyceride lipids within adipose (fat) cells. This is typical of plant growth in populations in southern latitudes where the climate is warmer. Many species of birds of paradise have evolved on the island of New Guinea, a place with abundant
food and no mammalian predators. The strategies used by the coho salmon involve both the bright coloured, fierce and large 'hooknose' males and the smaller, camouflaged, sneakier 'jack' males. Exactly which individuals survive and which ones do not is not based on chance alone but determined by their surroundings and the compatibility of their
characteristics with those surroundings. Technology has also given us the ability to collect data on how neurones migrate in the developing brain and communicate with each other. The plasma protein enters the blood plasma. • Application: Causes and consequences of occlusion of the coronary arteries. Use the hotlinks at the end of this section to
find a diagram you can label as an interactive task, PCR is used to solve the problem of how to get enough DNA to be able to analyse it. B The same species of the same genus. These substances need to be 'rescued' by reabsorption back into the bloodstream. At the end of each cycle the amount of target DNA has been doubled. Yet exposure to the vast
majority of pathogens does not result in a disease. Pollination and fertilization are two very different processes in plants. The population of cane toads has grown exponentially. Addicted animals: • want more of the substance • spend lots of time and energy getting the substance • spend lots of time and energy getti
withdrawal symptoms upon withdrawal of the substance of a villus. People with haemophilia have trouble with blood clotting and are at risk of bleeding to
death from what most people would consider to be a minor injury such as a bruise, which is a rupture of many tiny blood vessels. About 50 years ago, ornithologists (bird watchers) noticed that some blackcaps were going to the WK for the winter instead of Spain. Make sure you maximize the surface area of the paper clip on the water if you try this.
oil = oxidation is loss (of electrons) • rig = reduction is gain (of electrons). 6 (a) Has a segmented body.
                                                                                                                                                                             In another experiment, Berthold interbred birds from both groups. Solutions occur throughout the body in various types of spaces: intracellular spaces occur inside cells; extracellular spaces occur
outside cells; interstitial spaces occur between cells; intravascular spaces occur within blood vessels. If the results are plotted as a graph, it will produce a bell-shaped distribution curve. 284, reprinted and electronically reproduced by permission of Pearson Education, Inc., Upper Saddle River, New Jersey; Figure 13.28 from Life Sciences Learning
Center, DNA microarrays (gene chips) and cancer, . Paul Broca discovered the language function of this area. Optimal conditions in the fermenter Optimal conditions in a deep-tank fermenter are maintained by: • a fed-batch method, which is ideal to keep Penicillium producing penicillin • probes, which measure the pH, temperature, and oxygen
levels • oxygen, which is added by the sparger (see Figure 13.2) because Penicillium is an aerobic organism and needs an oxygen supply for fermentation • a cooling jacket, which reduces the heat given off by metabolism • NaOH, to maintain the correct pH of 6.5. 582 Fermenters are limited by their own waste products When penicillin builds up in
the fermenter, the excess penicillin inhibits an enzyme in the penicillin-producing pathway, so production stops. They are metabolically diverse. The resulting sound when heard through a stethoscope is often described as a 'squishing' sound and is known as a heart murmur. The curve on the 40 60 80 100 120 140 0 20 right shows what happens to
haemoglobin in actively pO2 /mm Hg respiring tissues that are giving off carbon dioxide as a waste product. Proteins called elongation factors assist in binding the tRNAs to the exposed mRNA codons at the A site. (Keep it polite, of course.) Now try these two statements. In Figure 1.14 note that the 'backbone' of the membrane is a bilayer produced
from huge numbers of molecules called phospholipids. Two intercalated discs are shown (vertical orange lines). Results of modern brain imaging studies have demonstrated that the recovery of language function can occur well beyond this period. nucleolus nucleous ralled phospholipids. Two intercalated discs are shown (vertical orange lines). Results of modern brain imaging studies have demonstrated that the recovery of language function can occur well beyond this period.
diagram of beta-D-glucose: H HO C H C C H O OH H OH HO C H H C Figure 2.6 Beta-D-glucose. In the language of the immune system, these foreign proteins are called antigens. 6 190 From the food web you have drawn, what is the trophic level of the toad? This is a good example of an original hypothesis that was disproved and falsified by
experimentation. When scientists completed the Human Genome Project, they discovered that most human genetic variation occurs in just a very few, small, DNA sequences. As you will see, the introduction of new genes into crop plants can be done by physical methods, or by using a microorganism as a vector. For example, bloods
stem cells have been introduced routinely into humans to replace the damaged bone marrow of some leukaemia patients. This spermatozoon then donates its paternal set of haploid chromosomes to the maternal set already contained in the ovum. All the steps become more frequent and exaggerated when you are exercising and thus breathing deeply
● Applications and skills: ● ● Application: Crick and Watson's elucidation of the structure of DNA using model making. Another example of gene transfer is found in Bt corn, which has been genetically engineered to producers. One step
of the muscle contraction sequence given above reads: 'The myosin heads then attach to binding sites on the actin.' This important step determines when a muscle contraction occurs, as the binding sites on the actin are not always available. 3 4 5 6 44 The chromosomes start to elongate to form chromatin. This creates the mosaic effect referred to in
the fluid mosaic model. + O2 The sugar on the right-hand side of the equation (in green) is a source of food, not only to the autotrophs. The inhibition of the first enzyme in the pathway prevents the build-up of intermediates in the cell. A primary tumour is one that occurs at the
original site of a cancer. Microorganisms in biofilms cooperate through quorum sensing. The result is that the red blood cells are unable to carry oxygen, which is their
normal function. A gene occupies a specific position on a chromosome. Notice in Figure 13.30 how the cDNA matches up with the DNA on the microarray. Look back at the hypothesis and decide if the data confirm or refute it. 1 Covalent bonds between sulfur atoms to create disulfide bonds. Similar to the plant examples (strawberries and potatoes)
hydra are also capable of sexual reproduction. Ageing is not the mechanism that causes an increase in the child's body mass; on the contrary, good nutrition, genes, and growth hormones are more likely candidates for causing the increase. The result is that blood glucose levels remain abnormally high because cells are not receiving the glucose for
normal metabolic activity. We must be evermindful of this balance and must continually work towards its maintenance. Lysosomes fuse with old or damaged organelles from within the cell to break them down, so that recycling of the components can occur. When sharing needles, addicts risk contracting human immunodeficiency virus (HIV) as well as
hepatitis B and C. • Porifera: this phylum consists of the sponges. Biofilms cost billions of dollars a year in product contamination, damage to human health, and equipment damage. Also, when examined closely by experts in statistics, some of Mendel's results seem too good to be true. • What about two populations that could potentially interbreed,
but do not because they are living in different niches or are separated by a long distance? For pasting genes, the enzyme used is called DNA ligase. Which ones does each organism contribute to, and which ones does each depend on? In Section 8.3 the most common form of photosynthesis was explained in detail. If isotonic solutions occur on either
side of a partially permeable membrane, no net movement of water is evident. (a) (b) (c) (d) (e) (f) Binding of neurotransmitter to receptor protein on postsynaptic neurone. The body must have a mechanism to ensure that the rate of transport of these respiratory gases meets the needs of the increased demand. • Design and create a data table
showing all the relevant processed data. You will be designing your own experiments, so this information will be very useful to you. Plants often produce hundreds or thousands more seeds than necessary to propagate the species. For our hypothetical (pretend) newly identified protein sequence, use the letters of the name of one of the authors of your
textbook as the FASTA sequence. Enzyme catalysis involves molecular motion and the collision of substrates with the active site. If only the number of chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because there are two possible chromosomes in each haploid cell (n) is considered, the calculation is 2n because the calculati
Anaesthetics Anaesthetics are a very helpful type of drug that have been used by most people, even children. People are no longer routinely vaccinated against smallpox because there is no one left to transmit the virus. Throughout this chapter there are a certain number of case studies; as good practice, it is worth analysing some of them based on
the knowledge framework. Archaeans are currently being studied for the types of organic molecules they can produce, and some of them may hold the key to fighting diseases for which we do not yet have a cure. From peanut farmers in West Africa, to computer technicians in California, to fishermen in Norway, to businesswomen in Hong Kong, all
humans carry inside them a common genetic heritage. 109 02 To learn more about photosynthesis, go to the hotlinks site, search for the title or ISBN, and click on Chapter 2: Section 2.9. Molecular biology Exercises 25 Explain why a blue object appears to be blue to the human eye. • Patients with gastritis (and therefore infected with H. A final
summary of the two reactions is shown in Table 8.7. Table 8.7 Photosynthesis Light-dependent reaction Occurs in the thylakoids Occurs in the thylakoids Occurs in the stroma Uses light energy to form ATP and NADPH uses ATP 
oxygen to the atmosphere Returns ADP, inorganic phosphate, and NADP to the light-dependent reaction Includes two electron transport chains and Photosynthesis, it is clear how important the chloroplast is to the overall process. 3731-3737
(Chaffiol, A. Troponin and tropomyosin, the proteins that help control when a sarcomere contracts are also shown. The two types of molecules do not mix because they are not soluble. The active site is the region on the enzyme that binds to a particular substrate or substrate or substrates. If you take off those glasses and try on a different pair, in other words if
you embrace a different theory, you might see the same scientific evidence in a totally different light. Let's look at the top line. In other words, characteristics acquired during an organism's lifetime cannot be passed on to the next generation and so do not have a part in the theory of evolution by natural selection. (2) (Total 5 marks) 5 What is
removed during the formation of mature RNA in eukaryotes? Obviously, individuals whose genotype is aa can only make gametes that contain the a allele. Figure 10.18 The highlighted chromatids show new combinations of alleles that were not observed in the original parents' chromosomes. The grey form is well camouflaged against light-coloured
surfaces, such as tree branches covered with lichens. For most people, a small cut or scrape on their growing in their quadrat, they recorded a 1, if not, a 0. Those connections that are reinforced by experience remain as learning
and memory. colourless substrate 617 13 Option B: Biotechnology and bioinformatics The steps for doing a direct ELISA test are as follows. smooth ER has many unique enzymes embedded on its surface. A large number of pharmaceuticals have been developed to treat these conditions based on our knowledge of how synapses and
neurotransmitters work. This is a karyogram showing all 23 pairs of chromosomes. To produce offspring, two gametes are needed, and the chances that both parents produce two identical offspring (apart from identical twins) is infinitesimal. • The amino acid sequence of polypeptides is determined by mRNA according to the genetic code. This allows
the organism, whether unicellular or multicellular or multicellular, to survive. Be specific and factual. That sequence is given below. Meristematic tissues occur near root and stem tips and are composed of rapidly reproducing cells that produce new cells capable of becoming various types of tissue within that root or stem. Each corner of the sugar rings has an
'unshown' carbon atom. Preparations made with figwort were given to patients who suffered from this infection, which was associated with tuberculosis. This is accomplished with figwort were given to patients who suffered from this infection, which was associated with tuberculosis. This is accomplished with figwort were given to patients who suffered from this infection, which was associated with tuberculosis. This is accomplished with figwort were given to patients who suffered from this infection, which was associated with tuberculosis. This is accomplished with figwort were given to patients who suffered from this infection, which was associated with tuberculosis.
rapidly by the polymerase chain reaction (PCR). and Cerdeira, Antonio L. Mollusca (a) Four limbs present, with articulated digits...
                                                                                                                                                                                 . There is a continuous stream of water from the roots to the upper parts of a plant. nucleus Nuclear membrane Ribosomes are small structures, free in the cytoplasm or associated with the
endoplasmic reticulum (ER). Just because two things show a relationship and have a strong r-value, does not mean one causes the other. The oocyte is accompanied by the inner ring of follicle cells of the Graafian follicle. As a result of this, the haemoglobin molecule has different properties that cause the complications associated with sickle cell
disease. 509 Key 30 nic + acet nic acet saline 20 10 0 1 2 3 4 days 5 B 40 Key 30 C 200 nic + acet nic acet saline total 5-day intake experiments with nicotine and acetaldehyde. Just think of the various water-based fluids you already know, such as cytoplasm, intercellular fluid, blood, and digestive juices. A T C ddA G? In reflex conditioning
experiments, the subject responds to a stimulus in a new way. The ribosome that has only one tRNA in it now moves one codon triplet down the mRNA molecule. The answer is muscles, specifically smooth muscles. It promotes the release of oxygen within body tissues and the binding of oxygen environment where carbon dioxide partial pressure is
high. This is an advantage for the plant, because there is no need to rely on pollen to fertilize the flowers, but it can be a disadvantage, because if all potato plants in a population are clones, it means that not only do they have the same weaknesses. 738 D.4 The heart Understandings: Structure of cardiac muscle
cells allows propagation of stimuli through the heart wall. The vast majority of these organisms do not cause disease and are not pathogenic (diseasecausing). within the lungs, both situations using the same molecules, only one origin is necessary for replication of
the bacterial chromosome. Figure 8.12 Then a 5-carbon acetyl CoA compound is formed. The colour of skin in humans is an example of continuous variation and it is thought that the intensity of pigment in skin is the result of the interaction of
multiple genes. 1 2 3 4 5 6 7 254 (a) No differentiated tissues, no symmetry or identifiable organs.. What is the secret? 260 Another example of an analogous characteristic is fins in aquatic organisms. Below you can see an illustration of a capillary (in section) (running in/out of the page). Medical scientists saw the possibilities of using such cells to
treat certain human diseases. Flowering in so-called short-day plants such as chrysanthemums is stimulated by long nights rather than short days. CHALLENGE YOURSELF 11 Based on the evidence shown in the autoradiogram to the right, deduce which child (C1, C2, or C3) is most likely to be the child of the father whose track is being pointed to
(F). Strick, from the Department of Neurobiology, Pitt School of Medicine, suggests that this indicates that extensive practice induces changes in the primary motor cortex. If that minimum intensity is not reached, no action potential begins. The following diagram (Figure 13.16) is a representation of a transgene, an artificially designed construct,
containing the necessary components for integration into a plasmid and production of a protein. (c) Compare and contrast the salamander's forelimbs (Figure 5.4) to the organisms in Table 5.1. Be sure to address the idea of number of digits and locomotion. Human physiology 6.2 The blood system Understandings: Arteries convey blood at high
pressure from the ventricles to the tissues of the body. Remember that mRNA is the molecule that takes the message from the DNA. The sense of touch is caused by pressure receptors that are sensitive to strong or light 521 12 Option A: Neurobiology and behaviour pressure. 137 03 Genetics Metaphase II prophase II 1 Nuclear membranes
disintegrate. People take some drugs to alleviate symptoms of mental illness, and other drugs just for pleasure. Another way of thinking about stabilizing selection is to think of it as selection towards the mean. In this phase, the bird is silent but listening to the song of an adult of his species. Gel electrophoresis
This laboratory technique is used to separate fragments of DNA in an effort to identify its origin. Prophase I Anaphase I
chromosomes in a pair called a bivalent. Two tests commonly used are the electroencephalogram (EEG) and a cerebral blood flow (CBF) study. Consider Karl Popper's quote about swans, which illustrates clearly the problem of induction.
potential harm of labelling common to that which sometimes occurs for human beings and that which may occur for biological features? Partly because of a lack of understanding of how to use viruses safely to deliver genes, the decision was made to stop all testing of gene therapy on human patients in the USA in 1999, when an 18-year-old patient
died after a virus had been injected into his body. Redox reactions play a key role in the flow of energy through living systems. It has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, such as reptile teeth and a bony tail, but it also has some features of a dinosaur, and the dinosaur and a din
Because the alleles for both colour blindness and haemophilia are found only on the X chromosome, the letter X is used when representing them: • Xb = allele for the ability to clot blood • Y = no allele present on the Y chromosome. ADH
is secreted from the posterior lobe of the pituitary gland and, like all hormones, circulates in the bloodstream. Unfortunately, they are often the basis of discrimination and misunderstanding. The halving of the chromosome number Whereas mitosis produces diploid (2n) nuclei containing 46 chromosomes (organized into 23 pairs), meiosis produces
ACU CCU GUG GAG 117 03 Genetics Using Figure 3.4 and the mRNA sequences given on page 117, showing which codons are associated with which amino acids, fill in the names of the missing amino acids (a) to (h) in Figure 3.5. Figure 3.4 Codons and their Second base U First base UUU UUC U UUA UUG Figure 3.5 Using Figure 3.4 and the
jump to the conclusion that Archaeopteryx is the 'missing link' between dinosaurs and birds. It has a single c-terminal end and a single n-terminal end and a single n-terminal end. However, when the hand is actually placed in the glove, there is an interaction that results in a conformational change of the glove, thus providing an induced fit. 

Electron microscopes have a much
higher magnification than light microscopes. Or, on the contrary, is this a private, personal thing that no one else needs to know about? Molecules that are classified as non-polar are said to be hydrophobic, or water 'fearing'. Most of our information about how the growth cones of an axon find their way to the target cell comes from the study of
neurones that have travelled to a muscle from the spinal cord. 729 15 Option D: Human physiology Adaptations of villi epithelial villi cells, and are absorbed into either a capillary or a lacteal on the interior of each villus. In the case of phototropism, auxin is actually
produced in all the cells in this region of the plant. The early stages of meiosis involve pairing of homologous chromosomes and crossing over followed by condensation. Look at Figure 10.4 as a template, make an annotated biological drawing including the
Evolution and biodiversity not just a coincidence but evidence that the organisms in question have a common ancestor. Glycogen stored in the liver and muscles will be exhausted very quickly as a source of glucose. Pollen from insect-attracting flowers is relatively heavy and is unlikely to be in the air and to be a cause of allergic rhinitis. If prepared
(see Figure 4). Figure 3.27 A second filial generation. The mammalian immune system helps eradicate the pathogen, but it cannot protect the body from the pathogen completely because the steps of the primary immune response take time. Structural plasticity refers to the fact that the brain can actually change its physical structure as a result of
learning. Next a large page of information will be displayed. Error bars can be used to show either the range of data or the standard deviation (SD) on a graph. Another well-documented function of hepatocytes is the production of many types of proteins that are added into the bloodstream. The two proteins would be treated as antigens by the
are found here); BB, brush border (the collective name for all the microvilli); TJ, tight junction; M, mitochondrion; RER, rough endoplasmic reticulum; LY, lysosome (organelles that contain digestive (hydrolytic) enzymes for use within the cell); CM, cell membrane. 2001), fig. The investigation should involve participants simulating organisms using
their mouthparts (the tweezers, for example) to fill their stomachs with food. It was decided in 1922 that the number of chromosomes in humans was 48 (24 pairs). (Total 4 marks) energy 2 The graph to the left shows the energy changes in a chemical reaction. Although it is true that Earth's climate has seen warming and cooling in the past, those
changes were relatively slow, taking place over thousands or millions of years. Haemoglobin is not saturated until it is carrying (bonded to) four oxygen molecules. Figure 13.34 Enzyme-linked immunosorbent assay (ELISA). Colour blindness or haemophilia, in contrast, are sex-linked disorders; their gene loci are both found on the X chromosome and
both diseases affect males significantly more than females. The study of neurogenesis in the embryonic brain has provided us with data showing that neurones are producing and responding to chemical messages. Your vial can be considered as a sample of the entire population. Some of these you may be familiar with, but others you probably do not
know much about. A C T C T G C C G G T A G G A C C sis T e helicase A h G G A Synt f G G o A T tion T T C C direc C C A G A C G T T P C C A C T A C G A G T C C G G T A A T C C G G T A A T C C G G T A G G A C C sis T e helicase A h G G A C G S T T P C C A C T A C G A G T C C T Sis G G T A A A G T C C G G T A A T C C G G T A G G A C C Sis T e helicase A h G G A C C sis T 
May. Previous classification Current classification Current classification Influential scientists at the time, including Nobel laureate Salvador Lurid and eminent evolutionary biologist Ernst Mayr, opposed splitting the prokaryotes in this way. A cormorant. There are many methods for carrying out seed germination experiments. The spindle microtubules pull individual
chromatids to opposite ends of the cell. (a) Great white shark (b) Walrus (c) Penguins (d) Marine sea turtles. In a very similar way, the disaccharide lactose is formed by the condensation reaction between alpha-Dglucose and the monosaccharide lactose is formed by the condensation reaction between alpha-Dglucose and the monosaccharide lactose.
iodine added to it, thus it is sold as 'iodized salt'. Why is it that scientists only publish successful investigations and not their failures? Not every cell will be the best partner. 23 Why does the pH of blood lower when you are exercising? The major difference between them is that one chromosome in the bivalent came
from the person's mother and the other chromosome in the bivalent came from the person's father. Most developing countries cannot afford it. When these cells divide, one cell remains meristematic while the other is free to differentiate and become a part of the plant body. • The process must be repeated many times – for A, for T, C, and G. Such
structures had never been observed in P. One type involves a change of the sequence of bases in DNA. The capillary bed inside each villus is clearly visible. Hepatitis B vaccine production from tobacco plants NATURE OF SCIENCE In order to make sure that the plasmid has transferred to the agrobacter cell, agrobacter is grown on culture media
containing an antibiotic. The bacteria is hardly reproducing at all, but making large quantities of penicillin. All you have to do is input the raw data. The two binding sites of each antibody are identical to each other and are capable of binding to the same type of antigen. It typically takes many years after the initial infection by HIV before an infected
person loses his or her specific immune response capability, but when it does happen the resulting immune disease is called AIDS or acquired immune deficiency syndrome. 377 08 Metabolism, cell respiration, and photosynthesis Practice questions 1 Where is carbon dioxide produced in the mitochondrion? 1999), p. Mushrooms produce millions more
spores than ever grow into new mushrooms. 30 What does black indicate? Although it was an ingenious idea, the company lost so much money from the project that it was abandoned a few years later. Can it be used to predict future events? Between one and three healthy embryos are later introduced into the woman's uterus for implantation. In the
example of transducin and colour vision above, a single base pair difference between the most common allele (with a T at position 235) and the rare mutated allele (with a T at position 235) is all that is takes to determine whether you can distinguish colours or not. This is the energy that allows the addition of phosphate and energy to ADP to form
ATP. A hydra is capable of natural cloning called budding. But the data show that there is a positive correlation between developing type II diabetes and the occurrence of obesity. In effect, many of their internal organs are bathed in this blood. The value of r can vary from +1 (completely positive correlation) to 0 (no correlation) to -1 (completely positive cor
two beta chains. The brain also controls body temperature, blood pressure, and fluid retention. But knowledge questions arise. • T wave: the AV node is repolarizing (ions are returning to the resting potential), getting ready to send the next set of impulses for the next cardiac cycle. Normally, the code should be preserved. CHALLENGE YOURSELF 2
Try to verbalize the events that lead to the following. These follicle cells begin to produce and secrete another hormone, progesterone. Therefore, the wrapping or packaging of DNA brings about a regulation of the transcription process. Here is a brief summary of the replication process (see Figure 7.6). His idea worked, because all of the children
DNA • meiosis • sexual reproduction. Once the neurotransmitter is in the synaptic cleft, it binds to specific receptors on the postsynaptic membrane. Rather, a line of best fit or a trend line has been placed over the graph showing an overall trend in the data. The natural production of kerogen is a long process, and the right conditions have only
occurred in certain parts of the world. • Characteristics used for classification Table 5.4 shows some types of characteristics that botanists and zoologists might study in order to help them decide how to classify an organism. Application: Detection of chemicals in the air by the many different olfactory receptors. Are the debates about height
differences between North and South Korea simply being used as a political tool to criticize the policies of the Pyongyang regime? Each spot has multiple copies of a known gene. The reason we do not think of many of these substances as being toxic is because our bodies have efficient mechanisms in place to process and eliminate them. The clade
shown in yellowy green is divided up into a sister group, a group showing the closest relatives, and an outgroup, which is a group that is less closely related to the others in the embryo. Skill: Evaluation of data showing
the impact of MDMA (ecstasy) on serotonin and dopamine metabolism in the brain. The neural pathways for vision travel to the primary visual cortex. The sum of the heights is 56.7 cm. 15 What do many of the proteins of the primary visual cortex. The sum of the heights is 56.7 cm. 15 What do many of the primary visual cortex.
melatonin during the daytime, and is at peak production after dark, with maximum production occurring between 2 a.m. and 4 a.m. The natural circadian rhythm is altered when a person alters his or her period of exposure to light over a short period of time, especially when coupled 309 06 Human physiology with a disruption of their normal sleep
schedule. In the end, the US Supreme Court found it unconstitutional to patent a DNA sequence found in nature. Pedigree charts are diagrams that are constructed to show biological relationships. This water, and the remaining dissolved solutes, enters the descending portion of the loop of Henle. Can you see why an antibiotic like penicillin works
more effectively against Grampositive bacteria? The strategies can be classified into two types. Figure 13.2 A fermenter. 80 70 60 50 adult (mother's) haemoglobin has a greater affinity for oxygen than adult haemoglobin in the range of partial pressures typical of human
tissues. Fe·S: This protein contains an iron-sulfur complex. They continue to move to the discharging or opposite side, the trans side. There are billions upon billions of viruses, bacteria, and other microbes in our world. In this section we will focus on DNA and RNA. The brain exhibits two types of plasticity: functional and structural. 13 Draw a
pedigree chart of the two generations described in question 12. When some of the birds arrived in Britain instead of Spain, they found many UK gardens with winter bird feeders available to them. Here are some suggestions from a health professional on how to prevent hearing loss in teenagers. How is a single chain of DNA made up? • The bondings
mentioned with each molecule, such as 1,4 linkages, refers to the carbon numbers of the glucose molecules that create the covalent bond. In many cases, it is the one factor that is in 'shortest' supply. They are, in sequence: • prophase • metaphase • anaphase • telophase. At the lower end of the normal range (about 35 mm Hg or 5 kPa), only about
50% of the haemoglobin is still saturated with oxygen. The graph aims to answer the question of whether or not there is a link between asthma and air pollution. The relative contribution of each of these forms to overall CO2 transport varies considerably depending on activity, as shown in the table below. Under conditions ideal for the formation of
coal, the sedimentation continues until the carbon-rich deposits are not only under huge pressure but also exposed to high temperatures because they have been pushed far below Earth's surface. State the genotype of the mother and father. If a cell is blue, it is dead so don't count it. Copy the entire sequence for all eight organisms onto your
clipboard. Either way, the blood pH is being buffered to remain within its Cl! chloride shift to normal narrow range of pH. Combination is possible when fitting occurs. Availability of phosphorous may become limiting to agriculture in the future. Several transport mechanisms are used in order to accomplish reabsorption. This is where we will begin
our 'mapping'. Alcohol acts similarly to benzodiazepine in that it increases the binding of GABA to the postsynaptic membrane, and causes the neurone to become hyperpolarized. The only way to have the disease is to have the genotype ff, so James and Helen do not suffer from cystic fibrosis but they can pass it on to their children. The UCS of food
elicits the UCR of salivation. Stir well until completely dissolved. A B C D NATURE OF SCIENCE Certain plants show interesting chromosome numbers and hybridizations (recall from Chapter 3 that a hybrid can be formed by mating two individuals of different species). When
the chromosomes are at the poles of the cell, the cytoplasm divides to form two cells distinct from the SA node. The muscle tissue is dense with relatively large mitochondria, and has a very generous blood supply (it is said to be highly vascular). This step in the immune response is
the beginning of the antigen-specific immune response leading to antibody production. You will find out more about isolation and speciation in Section 10.3. Autotrophs and heterotrophs A sheep eating grass is an example of a heterotroph (the sheep) feeding on an autotroph (the grass). NATURE OF SCIENCE Use theories to explain natural
phenomena: the theory of evolution by natural selection can explain the development of antibiotic resistance in bacteria. If the border of the area is reached before the designated number of steps has been taken, you should 'bounce' off the border like a ray of light off a mirror, and continue in the direction dictated by an angle of incidence that is the
sap. rRNA proteins are generally small and are associated with the core of the RNA subunits. Some homes and businesses are equipped with carbon monoxide monitoring devices to protect occupants from this silent and odourless killer. For example, as seen in the distribution curve in Figure 10.21, the average height for males is 1.83 m in the
pool, the frequencies of each allele T and t is 50%. 282 NATURE OF SCIENCE Have you ever thought about how difficult it would be to convince everyone around you that something they and everyone else had been taught about how difficult it would be to convince everyone around you that something they and everyone else had been taught about how difficult it would be to convince everyone around you that something they and everyone else had been taught about how difficult it would be to convince everyone around you that something they and everyone else had been taught about how difficult it would be to convince everyone around you that something they are thought about how difficult it would be to convince everyone around you that something they are thought about how difficult it would be to convince everyone around you that something they are thought about how difficult it would be to convince everyone around you that something they are thought about how difficult it would be to convince everyone around you that something they are thought about how difficult it would be to convince everyone around you that something they are thought about how difficult it would be to convince everyone around you that something they are thought about how difficult it would be to convince everyone around you that something they are thought about the something they are thought about the something they are the something the somet
second messenger inside the cell. The receptor notifies us of the pain. Have you visited the waste treatment plant in your community? Doctors reading about the clinical trials will never be informed, however, that the trials were stopped early. (b) ...AA ATC TGA AGT GAT CC... (c) ATC ATT AAT TTT TGC C... The gene you are looking for in the
database will be an open reading frame (ORF). You should be able to differentiate between xylem and phloem in both stem and root cross-sections. 

Bioinformatics plays a role in identifying target genes. In eukaryotic cells, the enzyme DNA gyrase stabilizes the DNA double helix when helicase unzips the molecule at multiple sites. Over the years,
breeders have learned to choose the males and females with the most desirable genetic characteristics and breed them together. First, a tRNA binds with the A site. Otherwise, do a search for keywords such as 'make your own ecosphere' or 'sealed terrarium'. Health officials are concerned that, without internationally coordinated efforts, these super
bugs could be spread from one country to another as patients get transferred across borders for treatment. Adhesive properties Water molecules are certainly not the only molecules in nature that exhibit polarity. Note: This lab is designed for a class to be divided into three groups, each assigned one of the following questions. All the bonds within the
nucleotide involve the sharing of electrons, and are therefore referred to as covalent bonds. For example, both cell types contain mitochondria that possess cristae, a matrix, and a double membrane. They are important because they affect our ability to learn and remember. Scientists have developed methods to engineer this plasmid, called a Ti
plasmid (tumourinducing plasmid), and make it a vector for carrying genes of interest into plants. There is a direct relationship between the rate of photosynthesis and the change in colour from blue DCPIP to its reduced, clear form. This energy is transferred through several accessory pigments until received by a chlorophyll a (P700) molecule
Would you want to know if there was a chance that your life could be suddenly shortened by the presence or absence of a certain gene? As these common plants do not have showy petals to attract insects, they rely on the wind for pollination. But why do we want to make longer chain alcohols? After a few days, leaves can be cut and vaccine collected
This sequence of nucleotides making up the length of the mRNA is typically enough information to make one polypeptide. Because the genome of all the bases A, T, C, and G in human DNA. 307 06 Human physiology Homeostasis The
human body typically stays within certain limits for many physiological variables. Applications and skills: Skill: Drawing diagrams to show chiasmata formed by crossing over. The enzyme uses the energy from the hydrogen flow to couple phosphate with ADP to produce ATP. These receptors affect several mental and physical activities, including:
learning • coordination • problem solving • short-term memory. A false-colour transmission electron micrograph (TEM) of a capillary containing erythrocytes (red blood cells). What is the function of this protein? Such exchanges are called fluxes and carbon fluxes in this table are expressed in gigatonnes of carbon per year (GtC yr-1). collecting duct
distal convoluted tubule Try to associate something that you already know to help you learn new knowledge. The vast majority of animals in this phylum have a bony backbone, such as birds, mammals, amphibians, reptiles, and fish, although some fish such as sharks have a cartilaginous spine instead of one made of bone. This creates the different
hydrogen ion concentration on the two sides of the cristae membranes, mentioned above. This helps plants to grow better when it is cold outside, which is one of the main reasons why farmers and gardeners use greenhouses. The apical meristem and the surrounding developing tissue are known as the shoot apex. Regulation of nutrients in the blood
Solutes that are dissolved in blood plasma vary a little in concentration, but each type of solute has a normal homeostatic range. An EST is a short piece of cDNA (copied DNA) sequence that is single-stranded. To be sure that no possibilities are forgotten, write out all three possibilities and decide by a process of elimination which genotype or
some cases, the branches of the phylogenetic tree can become spaced so far apart that the species, although once closely related, do not physically resemble each other anymore. The side position is characteristic of plant cells because these cells often have a large central vacuole. Another major difference is that no RNA nucleotides contain thymine
instead there is a nitrogenous base unique to RNA, called uracil. The tertiary structure is the further folding of the polypeptide stabilized by interactions between R-groups. Use your biological knowledge to support or refute these two claims. Or, on the contrary, are science and art diametrically opposed ways of interpreting nature? Use your
critical thinking. 6 At which letter is hydrostatic pressure the greatest? 2007), Copyright © 2007, with permission from Elsevier; Figures 13.27, 13.29, 13.33 and 13.36 from Introduction to biotechnology, Pearson Education (Thieman, William J. C I and III only. The nine heights of plants have been put in order below. (b) In a monomer, what number
carbon is always attached to the phosphate group? Both strategies work, but having two strategies increases the genetic variation in a population. The severity of symptoms as a result of this immune response varies depending on several factors, but is frequently serious as often the patient is receiving blood because of an already severe medical
situation. It refers to an unexpected but positive discovery and happens when someone is looking for the answer to a completely different question and accidentally finds the answer to a completely different question and accidentally finds the answer to a completely different question. (Total 1 mark) 2 The scarlet cup fungus, Sarcoscypha coccinea, obtains its nutrition from decaying wood by releasing digestive enzymes into the wood
and absorbing the digested products. Transferrin binds to the transferrin receptor that is overexpressed in many types of cancer cells. Now look at Figure 2.31, in which five nucleotides are connected together. Where do you stand? heavy (15N) nitrogen strand heavy (15N) nitrogen strand Figure 7.5 Bacteria grown parent light (14N) nitrogen strand
products of first replication in a medium with heavy nitrogen (15N) have DNA that contains only heavy nitrogen. outer surface migrating neurone Closure of the human neural tube seems to be controlled by a combination of genetic and environmental factors. Birds are also characterized by the fact that their jaws are in the form of beaks with no
teeth, and they usually build nests for their young, albeit in a variety of places, such as in trees, on the ground, on cliff faces, and on urban structures. Dedications To my father, the late Dr William A. blood type O Autosomal genetic diseases in humans parents' alleles How is it possible for two healthy parents to have a child who suffers from a genetic
disease? Kidney disease is also common. This explains a small amount of the information you can see using BLAST. If the collection of proteins the macrophage encounters on a cell is determined to be 'self', then the cell is left alone. To work out if the father is HH or Hh, consider the fact that some of his children do not have the trait. This group of
birds is one of the most prominent avian examples of sexual selection. An individual rat cannot adapt and evolve into a resistant rat. Thus the line of communication is: Macrophage presents antigen helper T lymphocyte becomes activated B lymphocyte
series of cell divisions. No. Companion cells. Cell theory The cell theory was discussed in Section 1.1. We mentioned that the current theory has three main parts: 1 2 3 all organisms are composed of one or more cells cells are the smallest units of life all cells come from other pre-existing cells. However, there is a type of stem cell treatment that has
been used successfully in humans for many years. One of the most energetic proponents of neo-Darwinian ideas is the evolutionary biologist Richard Dawkins. Classification of living things. They do not need mechanisms
to take in or to eliminate water, as water moves in and out freely because of the osmotic balance. Some poisons that affect metabolism act by establishing alternative pathways through the membrane, thus preventing ATP production. The DNA wraps twice around these eight protein molecules. The coefficients (numbers) in front of each compound
involved show what it takes to produce one molecule of a 6-carbon sugar. Part of the environment and 'locking it up' in a substance for an extended period of time is called carbon sequestration, and when it happens
naturally it is called biosequestration. Food enters the stomach from the tubular oesophagus. Day 5 should be on Monday. Two isopods used to study kinesis are the woodlice Porcellio scaber and Armadillidium vulgare (see Figure 12.31). The top diagram shows a fast-acting transmission. If you know someone who appears
to have the eating and exercise behaviours characteristic of anorexia, try to encourage him or her to get help because his or her life could be in danger. There are three major processes that allow mineral ions to pass from the soil to the root: • diffusion of mineral ions and mass flow of water in the soil that carries these ions • the action of fungal
hyphae • active transport. The entire muscle is composed of many muscle fibres all running in the same direction and thus all able to contract in unison when necessary. (1) The heterotrophic community can be divided into food webs based upon herbivores. Most lemurs are active during the day (diurnal) but
some are nocturnal. Chromosome replication Before meiosis can occur, the cell must prepare for cell division during interphase. Another common reason is to 'teach' a bacterium to produce proteins that are useful in medical applications, as we saw with insulin. Even a persistent infection of a cut in your skin can be because of a biofilm. Blood is the
most common transport medium in animals, and is largely made up of water. 274 The entire structure creates a tremendous surface area for absorption. He was the first person to die as result of gene therapy treatment. Record your 24-hour results in the table. Isopods live in damp places and die if exposed to dry conditions for a long period of time.
Modern technology has made it easy for blood and urine tests to be taken, with reasonably accurate and reliable results. The epicotyl is the region above the attachment point of the cotyledons to the stem. The breakdown of the blood vessels of the endometrium leads to the menstrual bleeding (menstruation) of a typical cycle. The bird forces air past
a membrane in the syrinx that vibrates and results in sound. 5 Next add 3 ml of yeast solution to each test tube. It can also mean that one species gets protected by ants from attacks by predators. Among a myriad of other possible problems, the extra body mass present in obese patients puts a
strain on their heart and lungs. To learn more about protein pump inhibitors, go to the hotlinks site, search for the title or ISBN, and click on Chapter 15: Section D.2. Option D: Human physiology cavity of the stomach. X A Combining with an amino acid and then binding to an anticodon. The cerebral hemispheres are responsible for higher order
functions. There are two mechanisms for replication: continuous synthesis and discontinuous synthesis are too complex and show too many combinations to be determined by one gene. They may be free in the cytoplasm or associated with the
surface of the endoplasmic reticulum. Why do some substances present in the bloodstream show up in urine samples and others do not? Over the decades, human activities have produced enough carbon dioxide to considerably raise the percentage of this gas in the planet's atmosphere. Bacteria can be divided into two groups based on the structure
of their cell wall; the Gram stain differentiates between the two types. Some of the important events are labelled on one of these impulses caused by sound perception are transmitted to the brain via the auditory nerve. A variety of innovative technologies are now available that allow us to use pharmaceuticals derived from genetically
engineered plants and animals to treat disease. (Total Total 6 marks) 493 12 Option A: Neurobiology and behaviour Essential ideas A.1 Modification of neurones starts in the earliest stages of Active neurones in the brain are communicating using chemical messaging. TOK These stimulate thought and consideration of knowledge issues as they arise in
context. The current bag limit is two grouper per person per day. In an effort to protect the secret technique from being stolen by competing clinics, the staff refuse to reveal how they do it. However, genetics is not always this simple; 147 03 Genetics sometimes there are three or more alleles for the same gene. In case you have not quessed, it refers
to an anteater, and this one happens to be the giant anteater of Central and South America. Starting at the omega carbon, count the carbons until you reach the first double bond. To learn more about DNA replication and transcription and to find a codon chart, go to the hotlinks site, search for the title or ISBN, and click on Chapter 2: Section 2.7.
CHALLENGE YOURSELF 12 Imagine that an mRNA leaves the nucleus of a eukaryotic cell with the following base sequence: AUGCCCCGCACGUUUCC AAGCCCCGCGG. 2.7 Genetic information in DNA can be accurately copied and can be translated to make the proteins needed by the cell. • Excited electrons from Photosystem I are used to reduce
NADP. This would be a good time for you to review what you learnt in Chapter 3 by drawing a generalized one-chain portion of DNA. A small number of fish, such as lampreys, are jawless and use their mouths as suckers to stick onto a surface. For example, the genus Allium, which includes plants you probably know well, such as onions, shallots,
leeks, and garlic, as well as some popular ornamental flowers, shows polyploidy. The glycogen is then stored as granules in the cytoplasm of the hepatocytes. They also give us information about our internal body environment.
atria and then the walls of the ventricles. The best treatment of lung cancer is achieved when the disease is diagnosed early in its progression. Note that this equation gives mathematical support to the idea in Mendelian genetics that the
chromosomes are the same length, they have their centromeres in the same position, and generally they contain the same loci. Blood is ultrafiltered within Bowman's capsule Each nephron contains a very small branch of the renal artery known as an afferent arteriole. The term precursor in biochemistry refers to a molecule
that precedes another in a chemical reaction or metabolic pathway. Identifying the role of different brain parts The study of the complex information processing system that includes the brain and the nervous system is called neuroscience or neurobiology. Supporters of this view argue that the fossil record shows a succession of small changes in the
phenotypes of species, indicating that the process of speciation is a steady, ongoing one, with transitional stages between major changes in a phylogenic line. chapter. What are some of the limitations of this approach? + A To transfer hydrogen to the electron transport chain. bicep relaxes radius ulna Figure 11.7 The human elbow in
section. 39 01 Biology is concerned not only with life, but also anything that affects life. Sometimes the body is able to eliminate the early cancerous growth, but not always. Aquatic systems are likely to be more successful than terrestrial ones. C The conversion of food into growth by an organism is not very efficient. • Memory and learning involve
changes in neurones caused by slow-acting neurotransmitters. The very early rise in progesterone is secreted by the ovary (corpus luteum), but the source of most of the progesterone is the placenta. Do your kidneys function in the same way as the kidneys in a small animal, like a rabbit? 1.4 Membranes control the composition of cells by active and
passive transport. Hybridization: the DNA is cooled slightly to let the primers hybridize with the DNA at the 3 end. Figure 3.21 This drawing shows you a pair of chromosomes showing a homozygous state, AA. Therefore, the water moves through the plants was
heterozygous. There are many, many places in the world where a clean water supply is desperately needed. However, some of the larger monomers, such as fatty acids, are absorbed first into a lacteal. Application: Gene transfer in bacteria using plasmids makes use of restriction endonucleases and DNA ligase. 

Surplus cholesterol is converted to
bile salts. Some prokaryotes also have plasmids but eukaryotes do not Escherichia coli, like many prokaryotes (bacteria), have small loops of DNA that are extra copies of some of the genetic material of the organism. The bubbles eventually fuse with one another to produce two identical daughter DNA molecules. pylori infection may well be the most
common bacterial infection in the world, as it is estimated that more than 3 billion people are infected. Salivation in dogs is a reflex response to the presence of food in the mouth. (1) (c) Explain the pH differences shown in the data. This splitting process is known as lysis. These chromatids, now chromosomes, move towards the opposite poles of the
cell. This is a hot spring called Morning Glory in Yellowstone National Park, USA. When stimulated, the sense organs send a message to the central nervous system. A procedure known as paper chromatography can separate the pigments present in most modern plants. What happens when blood glucose begins to rise above the set point? To
represent more than just two alleles (I and i) superscripts are introduced. 1999), adapted with permission from American Society for Microbiology; Figure on page 637 adapted from Characterization of microbial consortia in a terephthalate-degrading anaerobic granular sludge system, Microbiology, 147, pp. Both either produce or require a type of
nucleic acid called RNA, which was discussed in Section 2.6. light nitrog heavy (15N) nitrogen strand Transcription produces RNA molecules The sections of DNA that code for polypeptides are called genes. The filtered blood drains away from the kidney by a blood vessel known as the renal vein. The battery-operated device gives off a very small
electrical shock at regular intervals, each shock triggering a cardiac cycle. Each pyruvate first loses a carbon dioxide molecule and becomes a molecule known as acetyl-CoA. Adhesion counteracts gravity Tension occurs in the columns of water in
the xylem This is because of the loss of water in the leaves and the replacement of that lost water by xylem water. Animal behaviour is another fascinating area of research. Dr Pieter Tans, NOAA/ESRL (www.esrl.noaa.gov/gmd/ ccgg/trends/) and Dr Ralph Keeling, Scripps Institution of Oceanography (scrippsco2.ucsd.edu/) 201 04 Ecology Worked
example You be the scientist: have a look at this graph from the website of the National Oceanic and Atmospheric Administration (NOAA), showing atmospheric carbon dioxide levels in recent years. During depolarization, the inside of the neurone develops a net positive charge compared with the outside. Ninety per cent of brain cells are glial and
have many functions. Light-coloured objects, such as ice and white sand, have a high albedo, so very little light is absorbed and such objects do not heat up as much as dark-coloured rocks and black sand. The cells that carry this information are called neurones. So far, only four ATPs have been gained, six are generated (four
from glycolysis and two from the Krebs cycle) but two are used to start the process of glycoproteins called the zona pellucida. Dominant alleles are always expressed in the phenotype. Just outside the plasma membrane is a layer of glycoproteins called the zona pellucida.
(3) (Total 7 marks) 572 10 (a) Label the diagram of the retina below. processes. Even though both plant and animal hormones in several ways. The features that scientists originally compared were physical features. And yet, you could swear that you can
remember the event clearly. During this process, the DNA is copied, the two daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes become attached to different regions on the plasma membrane, and the cell divides into two genetically identical daughter chromosomes attached to different regions on the plasma membrane.
Fossils are the petrified remains or traces of animals and plants, and the fossil record is the accumulation of evidence from these remains and traces, such as skeletons and footprints. Most animals are unaffected by albinism and traces, such as skeletons and footprints. How we provided the fossil record is the accumulation of evidence from these remains and traces, such as skeletons and footprints. How we provided the fossil record is the accumulation of evidence from these remains and traces, such as skeletons and footprints.
tubule hypotonic filtrate distal convoluted tubule Cortex Medulla distal convoluted tubule of another nephron extends down into the medulla region of the kidney. (b) If the axon shown is myelinated, where along the axon did these voltage
changes occur? Some synapses do not persist Just as you would not use any passwords that do not work, the neurone will not keep any synapses that do not work. If a person eats an omelette for breakfast, for example, the eggs were made indirectly with energy from sunlight. Without this functioning immune system, most patients with SCID die by
the time they are teenagers. Once this diagnosis has been made, the patient may still be maintained on a ventilator, but a brain-dead person will not recover brain function. Some plants have specialized outgrowths of hair-like structures called trichomes which allow retention of water by slowing water loss from the plant. Like amphibians, reptiles are
ectothermic; they cannot regulate their body temperature. A sink is a plant organ that uses or stores sugar. 615 13 Figure 13.33 The polymerase chain reaction (PCR). If you recall, there are many internal bonds holding proteins in these three-dimensional shapes, including numerous hydrogen and ionic bonds between non-adjacent amino acids. The
investigators measured the growth of the plants over a 5-year period in various ways, including: • biomass (how much dry organic material is produced in a year) • height • stem diameter. This is called a conditioning film, and it occurs in seconds as microorganisms attach to barren substrates. The temporary removal of hydrogen ions carbonic
hydrogen ions from these solutions is called pH buffering. Table 12.13 tables summarizes innate and learned behaviour. We frequently hear about this abuse during some of the larger international competitions, such as the Olympics and the Tour de France. Although Archaea do not have a nucleus, they have enough differences compared with
prokaryotes to set them apart from other bacteria. The halving of the chromosome number allows a sexual life cycle with fusion of gametes. Whatever pressure does, volume will do the opposite. DNA from each tube is placed in a separate lane of an electrophoresis gel and electrophoresis is carried out. B After a change in the environment a species
will evolve adaptations to the new conditions. In a cell, the rate of heat and waste production, and rate of resource consumption, are functions of (depend on) its volume. • Leaf discs. Discuss the role of creativity in scientific investigations as well as in art. • The medulla oblongata controls automatic and homeostatic activities, such as swallowing,
digestion, vomiting, breathing, and heart activity. The way these recombinants form is through the principle of parsimony is applied: we
look for the simplest, least convoluted explanation. It is easy for us to guess how the behaviour of an animal might influence its chance of survival and reproduction, but experimental evidence from carefully controlled trials is needed to back up our intuition. A good example of this is a person exercising beyond his or her normal pattern or routine.
CaCO3 + CO2 + H2O Other organisms as well as coral polyps use calcium carbonate to build shells around their functions Rubisco The short-hand name for the enzyme that catalyses the first reaction of the carbon-fixing reactions of photosynthesis Insulin A
protein hormone produced by the pancreas that results in a decrease of blood sugar levels and an increase of sugar inside body cells Immunoglobulin Another name for an antibody that recognizes an antigen(s) as part of the immune response Rhodopsin A pigment found in the retina of the eye that is particularly useful in low light conditions Collagen
The main protein component of connective tissue, which is abundant in skin, tendons, and ligaments Spider silk A fibrous protein spun by spiders for making webs, drop lines, nest building, and other uses Given the myriad of functions of proteins, they have to be capable of assuming many forms and structures. We have seen that light energy can be
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converted into chemical energy by the process of photosynthesis. 34 For site A, the prediction was that macroalgae would be dominant in the competition for percentage cover with elevated nutrients. These are aerobic reactions carried out by two autotrophic bacteria that are beneficial to the environment. (b) Measure the temperature conditions in
which the experiment is taking place with a Vernier probe. This number allows us to know where to look in the table of critical values for 2 (Table 5). A vaccine is typically composed of the chemical components of a pathogen after eliminating the disease-causing abilities of the pathogen. Notice how only one sex can be a carrier. CHALLENGE
YOURSELF 12 Here is another opportunity to learn the parts of one of your receptors, the ear. 2.9 Photosynthesis uses the energy in sunlight to produce the chemical energy needed for life. A Fibrin B Fibrinogen C Haemoglobin D Thrombin (Total 1 mark) 320 6 What happens during inhalation? 88 In Figure 2.32, it is essential to note that one strand
reflex • Receptor cells receive the stimulus. As the name implies, it is a skeleton that is found on the outside of the animal; it is made of a material called chitin rather than bone. In humans, 23 homologous pairs of chromosomes (46 in total) become 23 individual chromosomes. Ernest Rutherford What did Rutherford mean by the above? In other
words, autotrophs can take light energy from the Sun, combine it with inorganic substances, and obtain a source of chemical energy in the form of organic compounds. When letters of different sizes end up in the same box, the big one goes first. About 95% of the bile salts that enter the small intestine are reabsorbed into the blood in the last portion
of the small intestine. A Radiation and mutagenic chemicals increase the mutation rate and can cause genetic diseases and cancer. This comparison will show quite effectively the more rapid cell division found in cancer tissues. Give evidence to support your answer. Unlike the other 22 pairs of chromosomes, this is the only pair in which it is possible to support your answer.
to find two chromosomes that are very different in size and shape. The balance of water and some ions can also be regulated by adjusting which fluid on dialysis membrane has a greater concentration of each substance. B nicks created by endonucleases chiasma two sister chromatids attached by a centromere
B b segments of non-sister chromatids exchanged When crossing over is complete, the segments containing the locus of the gene have been swapped and the alleles have switched places. 211 04 Ecology Challenges from critics Possible responses from climatologists Your models predicted even more of a temperature increase than is actually
happening. To be accurate, you should repeat the sampling technique at least five times (10 times is even better). A 95% probability is statistically significant in statistics. Drawings or photographs of specimens are often enlarged. Each type of mineral has one or more specific role in making anatomical structures (e.g. calcium in bones) or a
physiological role because it is incorporated into important molecules (e.g. iron within haemoglobin). The importance of plasmids in prokaryotic cells will be discussed fully in Chapter 3. Although evolution is generally considered to be a long-term process, the mechanism of natural selection can sometimes be quick, taking place over months, years or
decades, rather than millennia. 331 07 Nucleic acids Replication proteins The basic processes of DNA replication were worked out with research using E. Examples of biochemically important molecules that are predominately nonpolar are the fatty acids found in triglyceride lipids and phospholipids. B The internal intercostal muscles contract and the
diaphragm relaxes. Yaszemski, a biomedical engineer, was able to create such scaffolding. There are many categories of antibiotics, depending on the biochemical pathway that is being targeted. When a second infection are still circulating in the
bloodstream. Biofilm drug resistance: Persister cells, dormancy and infectious disease Nature Reviews Microbiology, 5, January, pp. 703 14 Option C: Ecology and conservation Analysing data using mathematical models Mathematical models are used to turn all of the data into a form that can be used by the fishing industry and governments to plan
the future of the fish in our oceans and lakes. Type I diabetes is an autoimmune disease. The oil gushed out of the Deepwater Horizon oil rig under the Gulf waters for days. Consider the following expressions. This single cell layer is composed of two different types of cells called pneumocytes. 6 Cover each tube tightly with parafilm (clingfilm).
Thyroxin The gland that produces and secretes thyroxin is a 'butterfly'-shaped gland located in your neck called the thyroid gland. It is also difficult to maintain the pathogen-free environments that are essential for culturing meristematic tissue (which is used for many types of micropropagation). From this it should be clear that, at any time an allele
frequency is estimated, it is only a snapshot of the alleles at that time. This behaviour is as specific to this species as the number of spines they have on their back. Because this is in the reward pathway, it leads to euphoria. It is also clear how ATP plays a crucial role in active transport. The bacterium Escherichia coli uses a metabolic pathway to
produce the amino acid isoleucine from threonine. Nucleosomes help to supercoil the DNA. This is why the term Latin name is often used, although this is an oversimplification because other languages are also involved. (4) (b) Compare the processes of mitosis and meiosis. Figure 2.11 In liquid water, water molecules form 'split second' hydrogen
 accurate model of DNA was produced by James Watson (American) and Francis Crick (British) in 1953, many other scientists from around the world contributed pieces of information that were instrumental in developing the final model. starch + (many) water (many) glucose 3 Hydrolysis of a triglyceride lipid to glycerol and fatty acids (see Figure 1).
2.2). Follow all additional teacher safety directives.* This practical will develop your skill in using a microscopic allow you to observe some common cells microscopically, and demonstrate ways to calculate the size of cells and cell parts.
(e.g. leaves, with vascular tissue to transport liquids around a plant) and that evolved early on in the history of the organisms being studied. It is also common to use yeast in the production of ethanol as alcohol to be drunk. Wash your hands thoroughly with soap and water after each day's procedures.* Follow these instructions to determine the
osmolarity of tissues by bathing samples in hypotonic, isotonic, and hypertonic solutions. 50 The Bohr shift is a good example of an evolutionary adaptation that benefits organisms at a molecular level. Small-scale studies such as this would in fact have little credibility by the standards used today to judge the validity of experimental work. This is a
lower leaf surface showing epidermal cells, stomata, and guard cells. Don't practise drawing them in their entirety, but use the step-by-step process as shown above. Mutations can sometimes produce genes that lead to genetic diseases, and can have devastating effects on the survival of some individuals in a species. Carbon dioxide has an
estimated lifetime of 50-200 years in the atmosphere. Each of these is also influenced by environmental components. What seems to be more important in the motor cortex, the head or the knee? 13 Why does a diet high in plants and plant products?
These techniques have allowed scientist to be able to treat and diagnose many genetic diseases. The binding site is where an antibody attaches itself to an antigen. • GFP can be spliced into the genome of an organism in the region that codes for a target protein. You will learn (or have already learnt) that the genetics of becoming male or female
 depends on whether you inherit an X or a Y chromosome from your father. Back in 2005, the World Health Organization's Obesity Task Force estimated that 400 million people were obese and 1.6 billion were overweight. During the winter season, the days are shorter and the angle of sunlight is less direct, so Earth's surface cannot warm up as much
At the beginning of G1, the cell is the smallest it will ever be. On the one hand, this makes cladistics scientific, but on the other hand, if it is going to be changing in the future as new evidence arises, it could be criticized for its lack of integrity. EST stands for expressed sequence tag. Wash your hands thoroughly after completing this lab.* The plant
species Impatiens wallerana has translucent stems because of the presence of large, thin-walled cells. Examples include the soil community in a forest and the fish community in a forest and t
same torch from far away does not hurt your eyes. This division was not immediately accepted by scientists. NATURE OF SCIENCE Developments in areas such as bioinformatics have enhanced the research into metabolic pathways. The picture below shows an image of several Volvox seen in a microscope field of view. There are 12 pairs of crania
nerves. The hormone produced and secreted from the pineal gland is called melatonin. This is because the electrons that are flowing from one molecule to the next are carrying energy with them. • Slow-acting NTs can regulate the efficiency of the postsynaptic neurone (the receiver). Each nephron consists of: • a capillary bed, called a glomerulus
which filters various substances from the blood • a capsule surrounding the glomerulus, called the Bowman's capsule • a small tube (tubule) that extends from Bowman's capsule, consisting of the proximal convoluted tubule, loop of Henle, and distal convoluted tubule • a second capillary bed, called the peritubular capillary bed, that surrounds the
threepart tubule mentioned above. Lung cancer is caused by one or more carcinogen (a substance that is known to cause cancer) that enters the lung tissue and mutates cells into a cancerous growth. Benedict's reagent is a chemical reagent commonly used to detect the presence of simple reducing sugars. For example, a gene that produces a protein
to help balance cholesterol levels in the body and prevent heart problems. An artist's drawing of the ventral view of a healthy digestive system. • Click on Download - UniProt FTP sites. Should evidence collected in this way be used legally in court as evidence? They survive better in some places than others. There are two antagonistic sets of these
muscles: external intercostals, which are used when breathing in, and the internal intercostals, which are used when breathing out. By birth its brain has become the walnut-like structure we would expect to see. Dolly can be used as an example of somatic-cell transfer. It contains sweat glands, capillaries, sensory receptors, and dermal cells, which
give structure and 284 strength to the skin. This entire structure is now called a Graafian follicle (see Figure 11.24). Independent assortment and meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments in the mid-1800s, he did not know anything about meiosis When Mendel was performing his experiments.
and exert their effect at low concentrations. Even these five groups leave the mimulus on the outskirts: mimulus is still unclassified. One way antibodies function by certain types of leucocytes. (d) In the lower right hand corner is a dark shape. The liquid portion of blood is called blood plasma. Even
this calculation is an oversimplification, however, because it does not take into consideration the additional variety that results from crossing over. 83 02 Molecular biology problem is to invent ways to trap the enzymes in place and prevent them from getting washed out with the products. Some can locate target sequences that are sets of four base
pairs, others locate sets of six pairs. Work out how that changes the blood flow within the foetal circulation, and why foetal circulation has evolved such a pattern. Because the fatty acid 'tails' do not attract each other strongly, the membrane tends to be fluid or flexible. It can determine whether there is any HIV antibody in the blood. Both conditions
can have serious symptoms. In some cases, another, more desirable, gene is put in its place, while in other cases only the introduction of a new gene is needed, no DNA has to be removed. The photograph does not show the 'lower' portion of each of the cells where the basal labyrinth is located. As long as there is light entering the system, the column
will continue to maintain a healthy microbial ecosystem for many months. • • Guidance Terminology relating to embryonic brain areas or nervous system division is not required. Harvested eggs are mixed with the sperm cells in separate culture dishes. The most popular theory for the mass extinction that wiped out the dinosaurs (and many other
organisms) at the end of the Cretaceous period, is that the Sun's energy was blocked by particles in the air after a large object smashed into Earth. Remember that the right and left sides of the heart are working in unison, therefore there are four heart sounds even though the four heart sounds even th
sicula, were introduced to the small island; when researchers returned in 2004 they were astounded to find the island covered with them. It is not possible to come up with a specific length of time that everyone should spend in sunlight to allow the synthesis of sufficient vitamin D. When glucose runs out, the behaviour of the older rats indicates that
there is a large deficit in learning. These two structures receive sensory information. 255 05 NATURE OF SCIENCE Falsification of theories with one theory being superseded by another: plant families have been reclassified as a result of evidence from cladistics. Human
spermatogonia are diploid and contain 23 homologous pairs of chromosomes. • Ask yourself, 'Am I pushing myself a little bit outside my comfort zone and exploring other ways of seeing an issue?' If so, you are on your way to scratching through the surface and getting to the interesting issues. Passing on successful characteristics It should be obvious
that an individual that never reaches maturity will not be able to pass on its genes to the next generation. 2007, p. Option D: Human physiology Cardiac muscle cells that are joined together by intercalated discs form fibrous units that repeatedly branch. Build-up of plaque in arteries leads to atherosclerosis Atherosclerosis is a slow build-up of
materials in the arteries that is collectively called plaque. Finally, the word population is in the definition because the changes do not affect just one individual. features enough to base such a decision on? The visual cortex is the part of the brain that receives information from the cells in the retina of the eye. To prevent this, the first spermatozoon
penetrating the plasma membrane of the ovum initiates a series of events called the cortical reaction. It is a database that predicts gene location and displays it. root apical meristems In seasonally growth. 510 The autonomic nervous system has two divisions The brain is
part of the central nervous system (CNS). Chemical exchanges always occur through the single-cell thickness of capillaries, because the walls of arteries and veins are too thick to allow molecules in or out efficiently. This is reflected in the idea of parsimony: seeking out the least convoluted solution. An ELISA identifies which containers hold a pure
 colony of B cells that are producing the type of antibody desired. Occlusion in coronary arteries can lead to a heart attack The heart muscle with oxygen-rich blood. Ask yourself: 'What events led up to and resulted in this ovulation?' and 'What will now happen after ovulation?' ovulation?' ovulation luteal
corpus luteum degeneration oestrogen steroid levels progesterone endometrium thickness 2 4 6 8 10 12 16 18 20 22 24 26 28 days ovulation. B II only. There may be as many as 100 000 replicates of a certain type per
genome. As a result, you do not need to look up the critical values in the table. Look at the drawing of the fluid mosaic model (Figure 1.14) to see the location of these proteins. It also has an eyespot at the anterior end that is stimulated by light. As you can see in Figure 11.16, the tubule is composed of a single ring of cells. The inside lining of an
artery is known as the endothelium. Populations can become isolated If a group from a species it might find itself evolving in a different way compared with the rest of the population. Forest fires and hot gases burned everything in sight. The Science article quotes other studies that show that having protected from the rest of the population.
zones, like marine reserves, restores biodiversity, and also restores populations of fish outside the protected areas (see Figure 14.41). Why does this kill the plants and prevent their return for a period of time? It holds on to items we are actively thinking about. This coral reef death is called bleaching and it interrupts the food chain, causing many of
the organisms that live there to seek food and shelter elsewhere. The confidence level is 95%. Put simply, the reaction can be summarized as: ADP + Pi Metabolism is best thought about from a molecular perspective. Oogenesis produces four cells as the 'end products' of meiosis, as does spermatogenesis. Catching younger and smaller fish lowers
reproduction rates. Composting is one method of recycling phosphorus; however, composting is not easily done on a large scale. • Note down the observed values (O) and decide what the null hypothesis will be (in genetics problems, the null hypothesis usually states that the ratios should be the ones calculated in Punnett grids). • G-protein is
activated and stimulates the adenyl cyclase enzyme that is also embedded in the cell membrane of the postsynaptic neurone. in the format Educational/Instructional Program via Copyright Clearance Center; Figures 14.18 adapted from Species dynamics and nutrient accumulation during early primary succession in coastal sand
dunes, Journal of Ecology, 81, pp. Epidermal cells occur between the guard cell-stomata structures. Alan Damon To my children and grandchildren. You are my future even when I am gone. Animals such as reef-building corals and molluscs have hard parts that are composed of calcium carbonate and can become fossilized in limestone. Examples:
glucose, and amino acids under certain circumstances. II A I would increase. Yeast extract is a source of nitrogen; corn steep liquor provides peptides; buffers resist pH changes; and minerals are needed by the mould for nutrients. Wash your hands thoroughly with soap and water before and after handling the plants.* A potometer is a device for
 investigating transpiration rate (water loss per unit time). This causes the DNA to unwind. There are major structural and biochemical differences between prokaryotic and eukaryotic and eukaryotic cells. This discovery came after mining the data for groups of related compounds that showed activity in the liver. The difference in temperature between the ballast
 waters and the receiving water was calculated (see Figure 13.26). Interesting fact These give background information that will add to your wider knowledge of the topic and make links with other topics and subjects. later generation 1 2 235 05 Evolution and biodiversity It is important to note that, in this example, we cannot say that the rats become
immune to the poison. 63 02 Molecular biology Table 2.3 Common aqueous solutions Aqueous solution Location Common reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions Nucleoplasm Fluid inside cells but outside organelles Glycolysis/protein synthesis reactions organelles Glycolysis/protein synthesis reaction organelles Gly
independent reactions of photosynthesis Blood plasma Fluid in arteries, veins, and capillaries Loading and unloading of respiratory gases/clotting Examples of water as a solvent in plants and animals The properties of water make it an excellent medium for transport. A similar phenomenon occurs when a protein is placed in a pH environment that is
not close to its optimum pH. It is this anticodon that pairs with a specific codon of mRNA. Much medical research relies on biotechnology and bioinformatics. The colleague of a famous scientist dies unexpectedly and a student of his decides to publish extracts from the laboratory notebooks. Other senses may be enhanced. When a pathogen enters the
body of a mammal, the immune system responds and attempts to eradicate the potentially disease-causing agent or organism. Only as recently as 2010 was this idea shown to be false. Figure 11.22 The stages of spermatogenesis. 'Partially hydrogenated' means that this is a product that contains trans fats. We can make up the sequence because it is
newly identified. At the top of this tube it is possible to see adult flies and lower down (near the label) we can see them at earlier stages in their life cycle. (1) (c) Explain the relationship between the seasons and the concentration of phytoplankton. Each carrier molecule has a slightly different electronegativity, and, therefore, a different attraction for
electrons. In the diagram what does label X identify? Recognition simply requires a decision about whether or not something has been encountered before. You will recall that a plasma membrane (or any cell membrane) is a double layer of phospholipids (see Section 1.3). They used data from many different sources to construct this model
successfully. The cells that remain meristematic are referred to as initials, while the cells that begin differentiation are called derivatives. This means that there is a change in one (single) nucleotide that can exist in several (poly) shapes. The returning echo indicates the presence of a shoal of fish. 781 Mathematics, and information and
communication technology skills An important part of being a good scientist and of being a citizen in today's information-rich world is to be number-savvy and tech-savvy. Alcohol consumption damages liver cells over time People who drink alcohol, especially often and in high volume, can expect liver damage. Examples: glucose and amino acids. 337
07 Prokaryotic mRNA does not require processing because no introns are present. Prior to this, strong arguments were being presented that supported protein in this role. Skill: Explore chromosome 21 in databases (for example in Ensembl). When the virus infects your cells, it brings the normal gene with it. Look at a can of tomatoes in your food
cupboard and you will probably see citric acid on the label. Later in this chapter you will learn more specifically about what happens during a transfusion if a person receives a blood type that is not compatible with his or her own. How can the environment affect characteristics supposedly determined specifically by transcription and translation? Even
cells that make up the outer boundary of an organ typically allow molecules to move between cells. More recent studies are showing some possible links to the 'colony collapse syndrome' being experienced by honeybee colonies. Scientists use the term theory to represent a well-substantiated explanation of a natural phenomenon that incorporates
tested hypotheses and laws. The RNA copy then directs the production of proteins at the ribosome by controlling the sequence of amino acids. As you learned for the reproductive system, the target cells of LH and FSH are the gonads of both females and males (see Section 6.6). This is neural pruning. This prevents the surface from getting as hot as
the Moon's maximum temperature of +120°C, even on the hottest of summer days. Unlike respiration, where some of the steps occur outside the mitochondrion, all of the photosynthetic process occurs within the chloroplast. If the sum of the signals is inhibitory, then the impulse is not carried forward. When drawing these, and other complex organic
molecules, it helps to draw them in a sequential pattern. The antisense strand is the strand that is copied during transcription. (a) (b) (c) (d) Movement of the radius and ulna up towards the face. One is very large and the other is very small. This works well when there is a physiological factor such as body temperature or blood glucose that needs to
be maintained within a fairly narrow homeostatic range. They used radiometric dating to determine this age. Quaternary structure. Observations have revealed that jacks will sneak up on a female while the larger hooknoses are fighting with each other. For example, if a few people break the law, they are
often treated as criminals and punished; but if everyone cheated all the time, society would break down. Once you have carried out your procedure, determine whether your data verify your hypothesis. As the fish are recaptured, the total population can be estimated. This means that water absorbs a great deal of heat when it evaporates. This
resistant bacterium is part of a growing number of super bugs, among which we find MRSA. Famine and economic hardship in the 1990s contributed to widespread malnutrition in North Korea, leading to stunted growth, whereas South Korea has enjoyed economic expansion in recent decades and has seen a continued increase in height amongst its
youth. Given this constant addition of wastes, such as urea, the bloodstream needs to be continuously filtered and cleansed over again, the rat learned to associate the food with the pedal. Exploring DNA DNA is at the very core of what gives
animals and plants their uniqueness. It is passed from one trophic level to the next, and when it leaves the ecosystem it is not reusable. A neurone is an individual cell that carries electrical impulses from one point in the body to another, and does so very quickly. When the new males move in, they kill or chase out all the cubs. By prolonging the
existence of the corpus luteum, the endometrium does not degenerate, so the embryo can implant itself into the rich vascular tissue. It has been shown that of the energy consumed by the decomposer food webs. Let's consider glucose as an example. To find the cause of this observed correlation requires
of a chloroplast to its function. When the egg and sperm cells meet, there is a great deal of chance involved. A small group of people lived inside for 2 years in the early 1990s, and they learnt a great deal about sustaining life in a closed system. This indicates that there is variation in genetics from one geographical location to another. In batch
fermentation, we need to duplicate the starvation mode so that the mould will make large quantities of penicillin. • Their DNA is not enclosed within a membrane and forms one circular chromosome. Some of the energy that is released from the breaking of these bonds is used to form a small number of ATP molecules. In this situation, the person's
pulmonary and cardiovascular systems (lungs and heart) supply as much oxygen to the body's cells as is physically possible. Figure 11.17 Ions move out of the ascending portion of the loop of Henle. We now know that biofilms affect virtually everything around us. 8 If ATP synthase was not present in the cristae of a mitochondrion, what would be the
effect? C A B D E H F G I J K Solutions 1 2 Figure 3.34 This pedigree chart shows how pink flowers can arise in purebred snapdragon plants. So 495 people out of the 500 should have the healthy phenotype. Rods and cones are photoreceptors located in the retina. It is difficult to know how many thousands of generations in the past we would need to
pairing. 478 11.4 Sexual reproduction Understandings: Spermatogenesis and oogenesis both involve mitosis, cell growth, two divisions of meiosis, and differentiation. Regardless of how a model is produced, it is always subject to modification as more experiments are conducted and more data are collected. There are 60 letters to this part of the
sequence that you are typing. Movement is said to occur along a concentration gradient. Cytokinesis in animal cells involves an inward pinching of the fluid plasma membrane to form cleavage furrows. One is the drastic lowering of oestrogen as a result of the birthing process, and the second is the high levels of oxytocin that stimulated the uterine
a codon or codon triplet. For example, only the experiments that gave evidence supporting the famous man's hypotheses were considered and the others that refuted the hypotheses were ignored. When placed in a damp environment, they move slowly. L. In contrast, exergonic reactions occur when the products of a chemical reaction have less energy
than the reaction's reactants or substrates. A primer sequence is added to help start the process. d d Now imagine the opposite. Today, many models are produced using computer-based mathematical models. As a result, if you could look at the locus of the transducin gene on one of the two copies of your first chromosome, for example, you would find
measurements • using an online calculator that outputs the BMI after the height and weight measurements have been input. Many decades later, the pollution has taken its toll on the lichen, and the soot in the air has blackened trees near industrial areas. Type II diabetes is most often characterized by body cell resistance to the normal effect of
insulin, as well as a decrease in insulin production. The technique has been well studied in sea urchins. • Anything higher than 85 dB can cause damage. What factors contribute to the success of a paradigm and what factors might cause a paradigm shift? You can see that Na+ is moving through a gate in the postsynaptic membrane. Here are all the
possible genotypes for colour blindness: • XBXB gives the phenotype of a non-affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of an affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of a non-affected female • XBX gives the phenotype of a non-affected female • XBX 
respond to a change in temperature. The anatomy of the human digestive system is fundamentally a long tube called the alimentary canal with two accessory organs (the pancreas and liver) that are connected by ducts into the canal. 79 02 Molecular biology Exercises 9 Study the amino acid chart (Figure 2.20) and find the
amino acids that meet the following criteria. The ganglion cell is located in the optic nerve. Key to information boxes A popular feature of the book is the different coloured boxes interspersed throughout each Nature of science This is an overarching theme in the course to promote concept-based learning. This supported the hypothesis with even more
from an ELISA test, try this example without referring to the explanation above. Notice that some occur within the ovary and some occur within the ovary and some occur within the extracellular
environment. The result is a high concentration of auxin in the intercellular space and a relatively low concentration within the adjacent cell. An example of a test cross is shown later in this section when we explore three generations of pea plants. (B) Adult rats (90 days old) did not demonstrate any preference. Option B: Biotechnology and
bioinformatics B.4 Medicine Understandings: Infection by a pathogen can be detected by the presence of its genetic material or by its antigens. A capillary bed is a network of capillaries that typically all drain into a single venule. Some of the proteins produced are enzymes. Decisions need to be made about new organisms that have been recently
discovered or old organisms that might need reclassifying because of new evidence about their ancestry. In most prokaryotic cells this wall is composed of a carbohydrate-protein complex called peptidoglycan. When there is a lack of calories in the diet, a person's body will first draw upon any reserves that it has for substances that are needed. Like
an endoskeleton, an exoskeleton also provides support and attachment points for muscles. Connecting a larger diameter blood vessel to a smaller diameter blo
common practice. To help you remember the difference between analogous and homologous, remember that these terms refer to anatomy (the flesh and blood) and that an analogy is used to compare very different things. This second signal goes to the thick muscular ventricles and results in their contraction. Then for the next 12 days or so she takes
hormone injections that include FSH. 19 After the Exon Valdez oil spill in Alaska, scientists dumped a lot of phosphates and nitrates (inorganic fertilizer) on one of the beaches and the oil was quickly cleaned up by naturally occurring Pseudomonas. An example of metastasis is a brain tumour that is in fact composed of breast cancer cells. Do stations
in different parts of the world agree or disagree about trends in carbon dioxide emissions? Then lower the pipette or glass tube back into the water. 7 Why is the process that allows wastes to move from the blood to the dialysate referred to as passive? It can diagnose influenza A and B and H1N1 flu viruses. This idea has been refuted. But in order to
get all the other types of molecules needed to keep us healthy, we need to consume other living things. Some bacteria have flagellum (singular), which are longer than pili. You may remember from earlier science classes that like dissolves like. If a company decided to publish the positive as well as the negative results of its drug
trials, what do you think might happen to the sales of their drugs? All of these functions can be controlled for a patient without a functioning brain. This computer graphic image shows pepsin, an enzyme that helps to digest proteins. Their tasks on-board include: • recording the number and kinds of fish that are thrown back • tagging and releasing
 some fish • developing questionnaires for fishermen about their perception of the catch • reviewing the ship logbooks, which provide data on catch per unit effort (increased effort for the same catch indicates that fish are getting scarcer). Much of the reabsorption process occurs from the proximal convoluted tubule. Second, do not forget that, when
the sister chromatids are pulled apart, they become individual chromosomes ready to inhabit their newly forming cells. • Guidance • Students should understand the differences between pollination, fertilization, and seed dispersal but are not required to know the details of each process. Some trial runs will probably be necessary to refine your
method. Milt contains millions of spermatozoa. This is because a glucose molecule forms two pyruvate molecules are interested in seeing how the brain reacts to different advertising campaigns. lacteal capillary bed microvilli Figure 6.4 The structure of an intestinal villus. This solvent layer should reach between the tip of the
paper and the pencil line for the pigment. The structure labelled chloroplast is especially important in this process. The relative space that the human body parts occupy in the sensory cortex can be illustrated by a 'cartoon-like' homunculus (man). However, there are major problems that have to be overcome. A female fish lays hundreds or thousands from the pigment.
of eggs but only a handful survive to adulthood. Do aquatic organisms move with or against the current? Also, in both cell types, the mitochondria function in the production of ATP for use by the cell. Use a search engine to research consumer information reported by food companies concerning lipids. See the Internal assessment chapter in the eBook
for help with variables. The proton pump may be used to transport mineral ions and solutes such as potassium ions, and even simple sugars. Both DNA and RNA are polymers of nucleotides. This stimulates the bacteria in the population to transcribe their genes all at the same time. It can be engineered to be non-pathogenic but
still have the ability to insert DNA in to a plant. Active muscle tissue consumes much more carbon dioxide than muscle tissue at rest. A granum is made up of numerous thylakoids stacked like a pile of coins. With the Human Genome Project, biological research switched from an individualistic approach to that of largest number of the project is the stacked like a pile of coins. With the Human Genome Project, biological research switched from an individualistic approach to that of largest number of the project is 
interdisciplinary teams encompassing engineering, informatics, and biology. 9 In your country, is this an acceptable use of technology? Possible reasons for this decline include widespread use of pesticides, deforestation and destruction of colony habitats, and pathogens. A cardiac cycle is initiated by the SA node impulse and includes all the heart
events that follow until another SA node signal begins a new cardiac cycle. Remember the example of the giraffes: those who were born with the alleles to make necks long enough to access better food sources had a greater chance of surviving and passing on those alleles, whereas those with short-neck alleles had more trouble finding enough food
and were less frequently able to survive to pass on their alleles. 80-111 (Dowling, J. A better understanding of the causes of emphysema and lung cancer has led to massive campaigns to educate people about the dangers of smoking. • A neurotransmitter called acetylcholine is released into the synaptic gap between the neurone end buttons and the
sarcolemma of the muscle fibre. By the time our ancestors reached adulthood, their bodies had stopped being able to digest milk; more precisely, humans could not break down the disaccharide in milk called lactose. Flowers vary greatly in size. When we look at a flowering plant such as a cherry tree, we are looking at the sporophyte generation. The
problem is that mammals do not have enough of each type of B cell for the amount of antibody secretion that may be needed. + H methane CH4 The polar covalent bonds within water give rise to the polarity of the molecule. 1 20 0 Despite regulatory approval by the EU, on 16 January 2012 BASF announced that it is pulling its genetic engineering
division out of Europe and stopping production of its GM Amflora potato for the European market. The acetyl group is then oxidized with the formation, be sure to start with the aim, research question, and three types of
variables, before establishing the step-by-step method. It will be interesting to see whether countries all over the world will continue to burn fossil fuels until the last drop of crude oil is gone. Risk is an inescapable reality of clinical research. Inside the liquid, some of the baby's cells can be found and used for the preparation of crude oil is gone.
a karyotype. Each villus is composed of many cells whose primary job is selectively absorbing molecules found in the lumen of the small intestine. If we can figure out a system that makes waste useful, then it will be a sustainable system, and all the waste will be put to a new use as part of a cycle. A C C loops include unpaired bases anticodon Each of
the 20 different amino acids will bind to the appropriate tRNA because of the action of a particular enzyme. Guidance Students should know that amylase, lipase, and an endopeptidase are secreted by the pancreas.
thick, and the pressure exerted during ventricular systole is very high. Essential ideas 3.2 Chromosomes carry genes in a linear sequence that is shared by members of a species. Specific molecules from the neurones and muscles facilitate these connections. Once they are attached at their chiasmata, the chromatids repel each other and twist around
to make interesting shapes, depending on where and how many times they are attached (examples are shown in the photo). A valve located at the other end of the stomach remains closed for a period of time to allow gastric secretions to act upon the ingested food. From an evolutionary point of view, this advantage has increased humans' ability to
survive harsh climatic conditions. Table 12.3 E:S correlation between the weight of the brain and the weight of th
1:2496 Hippopotamus 1:2789 Table 12.4 Encephalization quotient (EQ) data Species EQ Man 7.44 Cat 1.00 Dolphin 5.31 Horse 0.86 Chimpanzee 2.49 Sheep 0.81 Rhesus monkey 2.09 Mouse 0.50 Elephant 1.87 Rat 0.40 Whale 1.76 Rabbit 0.40 Dog 1.17 515 12 Option A: Neurobiology and behaviour CHALLENGE YOURSELF We can agree
transmission. After sterilizing chicken broth (soup) by boiling it, Pasteur showed that living organisms would not 'spontaneously' reappear. The heart is composed of cardiac muscle cells Skeletal muscle is muscle that moves your bones to create various body motions. Typically, a patent filed today is limited to 20 years. 499 12 Option A: Neurobiology
and behaviour Axon growth As the neurone grows, it will send out one long axon moving towards a distant area. People who have one gene that is for disc-shaped cells and one for sickle-shaped cells and one for sickle-shaped cells and one for sickle-shaped cells are neurone grows, it will send out one long axon moving towards a distant area.
knowledge that are unknown now because the technology needed to reveal them does not yet exist? What if a biotech company finds a useful human gene in your body? DNA is sequestered (locked away) in the nucleus. 396 Worked example Look at these diagrams of tissue from a section of phloem and xylem. To interpret the results you will have to
do a bit of research to find out what the different colours mean. Because of random orientation, the chromatids could be pulled towards either of the newly forming daughter cells. While using the lowest power objective lens, move the graduated slide until the graduated slide until the graduated slide scale align. This has been done with the blood
protein haemoglobin, with a mitochondrial protein called cytochrome c, and with chlorophyll, to name just three proteins. Notice how the trophic levels link together into a food web. An enzyme called RNA polymerase is used as the catalyst for this process. Some are just modified, while some are proved to be completely false. The fistula is a
surgically implanted 'window' that does not harm the animal. Now laboratories perform tests such as the microarray and PCR, and many others, to look for metabolites that indicate disease. Discontinuous synthesis occurs on the lagging strand and DNA polymerase III adds
nucleotides. 6.3 The human body has structures and processes that resist the continuous threat of invasion by pathogens. As there are 20 amino acids to use within a polypeptide. large subunit P site E site small subunit A site E P A
mRNA binding site small subunit The triplet bases of the mRNA codon pair with the complementary bases of the triplet anticodon of the tRNA. To accomplish rapid DNA replication in these cells, multiple replication origins are needed. In a graph of this type, it is okay to rearrange the bars anyway you want. In humans, as well as many other
organisms, this carbon dioxide diffuses out of a respiring cell and eventually enters a nearby capillary bed. A study on vampire bats was carried out at the University of Florida to answer that question. Haemoglobin is a conjugated protein. Planning steps necessary before beginning Determine a safe exercise that can be accomplished by everyone that
is happy to be a test subject. Lower concentrations of the end product result in fewer bindings with the allosteric site of the first enzyme, and, therefore, activation of the enzyme. Vacuoles are storage organelles that are usually formed from the Golgi apparatus. Further research established that the lipids were phospholipids. Printed in Italy
by Lego S.p.A. Acknowledgements The publisher would like to thank the following for their kind permission to reproduce their photographs: (Key: b-bottom; c-centre; l-left; r-right; t-top) Alamy Images: 19th era 2 223t, age fotostock Spain, s.l. 247, All Canada Photos 253, amana images inc. Take into account your geographical location and try to find
plants that can be acquired locally and that will be in season in your area at the time you are carrying out the experiment. Neurogenesis and migration of neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of the central nervous system (CNS) in the developing vertebrate embryo originate in the neurones of t
chromosome as sister chromatids, while they are attached to each other by a centromere in the early stages of mitosis. These hemispheres are connected by a thick band of axons called the corpus callosum. For example, the intercostal muscles are the muscles that are found between the ribs. Viruses are not classified as living organisms. Use this
general formula for calculating magnification: magnification and ulna) to accomplish the rotation. Your internal body heat results in perspiration, and the perspiration then evaporates from your skin. Calcium ions
development of female reproductive organs and female secondary sexual characteristics during puberty. Three sperm are shown, but only one will fertilize the ovum. This is the case for the alleles that determine the ABO blood type in humans. The knee jerk response can still be functional. One common use is pregnancy testing. There are now two
separate migratory patterns in this species of bird. Marie Curie In what ways are theories and myths similar and different? CHALLENGE YOURSELF 7 In Section 7.1, the packaging of DNA into nucleosomes was explained. Researchers in Canada and Austria set up experiments to test the learning of blue tits and to try and determine whether the
overall functions of a cell, you should focus on the distinctions between living and non-living factors in the environment. The process of producing proteins utilizes a DNA code that is universal in all organisms. The two most common configurations of the secondary structure are the alpha-helix ( -helix) and the betapleated sheet ( -pleated sheet). 1
 Place a number of paramecia into a Syracuse dish or an evaporating dish with positive and negative electrodes of low-voltage electrical charge on opposite sides. When a nerve impulse is being self-propagated along a neurone, that is happening because each successive area of the neurone membrane has reached its threshold and is causing the next
is convenient to write down which organism eats which by using an arrow. To complete a test for colour blindness, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: Section A.3. Information from the right field of vision from both eyes is sent to the left part of the visual cortex, and vice versa Review the information in Section
A.2 on the human brain and the visual cortex. Why or why not? That first contraction will signal the hypothalamus to signal the posterior pituitary to release slightly more oxytocin. Damon, a man of principle, an intellectual giant, and a dear friend. Features of prokaryotic cells Study the figure of a prokaryotic cell (Figure 1.3) and make sure you can
genotypes of the tall plant as either TT or Tt. If she gets a mix of tall and short plants as a result of the cross, she can conclude that the tall plant is heterozygous. Nature of science(s) All science is either physics or stamp collecting. • Under basic BLAST click on protein blast. 4 Which letter represents the source, and which letter represents the sink?
separation into two single strands is called helicase. In the early days of classification, all known organisms were classified into only two kingdoms: plants and animals. Will the cells grow if they do not have the plasmid? • • Applications and skills: Application: Withdrawal reflex of the hand from a painful stimulus. Polypeptide chains can include
tracking everything we do with our computers and smartphones, it can be 780 780 argued that the kind of privacy our grandparents had no longer exists. Porifera Sponges are marine animals that are sessile (i.e. they are stuck in place). From the C6H12O6 molecules, autotrophs can manufacture other compounds. This causes the polypeptide chain to
be attached to the tRNA at the A site. 787 Mathematics, and information and communication technology skills Table 2 t-values Degrees of freedom Probability (p) that chance alone could produce the difference 788 0.50 (50%) 0.20 (20%) 0.10 (10%) 0.05 (5%) 0.01 (1%) 0.001 (0.1%) 1 1.00 3.08 6.31 12.71 63.66 636.62 2 0.82 1.89
1.35\ 1.77\ 2.16\ 3.01\ 4.22\ 14\ 0.69\ 1.35\ 1.76\ 2.15\ 2.98\ 4.14\ 15\ 0.69\ 1.32\ 1.72\ 2.08\ 2.85\ 3.82\ 22\ 0.69\ 1.32\ 1.72\ 2.08\ 2.85\ 3.82\ 22\ 0.69\ 1.33\ 1.73\ 2.10\ 2.88\ 3.92\ 19\ 0.69\ 1.33\ 1.73\ 2.09\ 2.86\ 3.88\ 20\ 0.69\ 1.33\ 1.73\ 2.09\ 2.85\ 3.85\ 21\ 0.69\ 1.32\ 1.72\ 2.08\ 2.83\ 3.82\ 22\ 0.69\ 1.32\ 1.72\ 2.07\ 2.82\ 3.79\ 24\ 0.69\ 1.32\ 1.71\ 2.06\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80\ 2.80
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1.66 1.99 2.63 3.40 100 0.68 1.29 1.66 1.99 2.63 3.39 Worked example Two groups of barnacles living on a rocky shore were compared. In those new areas the immigration started a new polypeptide. Thomas Henry Huxley Is there any
science that can be pursued without the use of technology? It is largely up to chance. An enzyme modifies the glucose slightly, then a second enzyme modifies this molecule every more. The cytochrome c sequence studied in Section 3.1 is one example. D.6 Red blood cells are vital in the transport of respiratory gases. Although fish can have limbs in
the form of fins, none of the limbs have digits (fingers). Insectivorous plants such as the pitcher plant derive their nitrogen from trapping and consuming insects. 

Application: Polygenic traits such as human height may also be influenced by environmental factors. Remember that when the mould is starving it makes penicillin. 12 120 10 % of asthmatic factors.
sufferers 8 ozone (ppb) 6 4 2 100 80 carbon monoxide (ppb) 60 40 carbon particles (µg m-3) 0 1982 1986 ppb = parts per billion 1 140 nitrogen oxides (ppb) 1990 level of pollutants 14 asthma sufferers (% of population) Figure 1 Large quantities of data give us superpowers: they allow us to see things other people cannot see. 432 157 161 165
worldwide average height of males 169 average height of males in the Netherlands 173 177 181 height of males/cm 185 189 Differences in height between one country's population and another could be explained in part by genetic factors, because people living on different continents have differing genetic backgrounds. The answer is simply because
kangaroo rats are tied to their evolutionary past. The complete genomes of some organisms have been worked out. Alcohol also helps to increase the release of dopamine by a process that is not well understood. Aplysia learns to retract its gill when its siphon is stimulated as a protective device. Skill: Annotation of a diagram of embryonic tissues in
Xenopus, used as an animal model, during neurulation. Some strains of bacteria have evolved with genes that confer resistance to antibiotics, and some strains of bacteria have multiple resistance to antibiotics, and some strains of bacteria have multiple resistance.
phase, G2, the chromatin (elongated DNA and histones) begins to condense. Could you live on the Moon or on another planet such as Mars? The ratio of calcium loss between the control rats and the rats that were given a supplementary food was calculated. The active site of each enzyme allows a fit only between a specific amino acid and the specific
tRNA. • A community is formed by populations of different species living together and interacting with each other. The question is: does that pose a problem? This makes it difficult for the enzyme lipase to digest the lipids as very little surface area of the 'clump' is exposed. haploid ovum nucleus ovum plasma membrane % Fusion of membranes
results in cortical reaction. Knowing the properties of greenhouse gases, as discussed earlier, it is clear that an increase in carbon dioxide levels will lead to warming of the atmosphere, because it would increase the greenhouse effect. Q: Cyt a 3 This is coenzyme Q, also called ubiquinone; it is not a protein. Another two important concepts to
understand are the degrees of freedom (d.f.) and how the idea of probability (p) is used. Under no circumstances should we consider that the 'tick-tock' of the evolutionary clock, which is made up of mutations, is as constant as the ticking of a clock on the wall. Ions such as chloride ions, potassium ions, and sodium ions have a great deal of difficulty
crossing membranes passively, as do large molecules such as glucose and sucrose. B C [S] = substrate concentration; V = reaction rate; Vmax = maximum reaction rate; Vmax = maximum reaction rate and sucrose. B C [S] = substrate concentration; V = reaction rate; Vmax = maximum 
body parts occupy in each cortex. Calculating allele frequency, part II In a study of 989 members of the population from example 1, it was found that 11 people had the disease. Each one of these systems is closely linked with the others, and some, such as the biosphere, cannot exist in their current form without the other three. Osmosis is another
type of passive transport: movement occurs along a concentration gradient. This TEM shows the two centroles of a centrosome. William Harvey's insights were considerable, but lacked information about the earliest embryonic development stages. 1 2 3 4 Look at the first section of the key, which has a pair of sentences. (a) and (b). describing
characteristics. It recognizes the parts of the base sequences that are supposed to be linked together, called the sticky ends, and attaches them. Under normal circumstances much of the water remains in the filtrate awaiting a control mechanism that will determine how much water the body can afford to eliminate in the urine. So how does the DNA
code get to the ribosomes? All living things are composed of a great deal of water, and so you can think of your water content as a temperature stabilizer. The other part of the nervous system is the peripheral proteins. Examples of this type of secretion
to the surface of the body are tears (lacrimal fluid) secreted from lacrimal glands and taken to the skin surface by small ducts, and milk produced by the mammary glands and taken through ducts to the nipple opening in lactating mothers. 72 Lipids have
another advantage as a long-term energy storage molecule: they are insoluble in water (such as in the agueous environments of cytoplasm, intercellular fluid, and blood plasma), and so they do not upset the osmotic balance of solutions. For example, if the EQ of a certain species is 3.0 then the species has a value of C three times as high as a mammal
of comparable weight with average encephalization (the ratio between actual brain size and predicted brain mass for an animal of a given size). The heights of the bean plants grown in the sunlight. The results for only one bottle are shown; duplicate enrichments behaved
similarly, Primer, primase, and DNA polymerase III are required to begin the formation of the lagging strand, and to begin the formation of the brainstem has been removed
in order to show the location of this small gland associated with sleep/ wake cycles. Examples include fungi, protozoa, and bacteria. Because ecosystems are made up of lots of respiring organisms, each losing heat, heat is lost from the ecosystems are made up of lots of respiring organisms, each losing heat is lost from the ecosystems.
also increases. • The chemical message stimulates the sensory neurone. As you saw in Chapter 10, to use this statistical test it is important to note down carefully all the observed results (E). I was right! More babies on nights when there is a full moon.' Two weeks later, on another busy night, she looks out the window
and what does she see? Standard vehicles cannot use more than 25% ethanol and need 75% or more gasoline (this mix can also be called gasohol), but vehicles specially adapted for biofuels can run solely on ethanol. • Chemoreceptors are sensitive to changes in blood pH. This is a long-term project, so make sure you have somewhere that you can
leave the bottle for many weeks or months. They receive the stimulus of light, even very dim light, and synapse with a bipolar neurone. If so, the rate of carbon dioxide taken in by the plant and the rate of oxygen released will also be very high. Orcas (killer whales) may have larger brains by actual volume, but when brain size is compared using a
formula that takes body size into account, the human brain is three times as large as that of a chimpanzee and more than twice as large as that of an orca. The cellular invaders, such as bacteria, have proteins that are embedded in their outer surface. These molecules have a role in determining membrane fluidity, which changes with temperature.
Methane is a greenhouse gas that contributes to global warming. Vertebrates, which include fish, amphibians, reptiles, birds, and mammals, are all therefore considered as possible animal models. The population may have been growing exponentially until a sudden freeze. Crossing over occurs, 730 Some of the molecules absorbed through the plasma
membranes of the villi are absorbed using an active transport mechanism. Aerobic cell respiration breaks down (or completely oxidizes) a glucose molecule and the end-products are carbon dioxide and water plus a much higher number of ATP molecules than anaerobic respiration yields. In genetics, lactose intolerance is called the wild-type (the most
common phenotype in a natural population). Tetramers have four such units. Early development: implantation into the endometrium by the blastocyst Fertilization stimulates the zygote to begin a mitotic division, and the first division typically occurs approximately 24 hours after fertilization. The experiment by Hershey and Chase used a
bacteriophage known as T2 and the bacterium E. This produces a chain of DNA. Consequently, all we have is an average, an estimation or a proportion, rather than an absolute time or date for speciation events. This is called the struggle for survival. • Application: Breeding strategies in coho salmon populations as an example of behaviour affecting
chances of survival and reproduction. If the fish stock is too large, annual reproductive rates may be low because of competition for food. On the contrary, a white egg or vellow-bodied chick would be zero.
Treatments are centred around slowing further damage by stopping the exposure to the causality? The battery life of pacemakers is currently on average 7 years. However, as knowledge about enzyme action
has increased, Fischer's model has been modified. Pairing of homologous chromosomes and crossing over Meiosis is a step-by-step process by which a diploid parent cell produces four haploid daughter cells. Recall that RNA (which includes mRNA) is a single-stranded molecule. This results in the activation of enzymes within the neurone that
contribute to the elongation of the axon. The competitive inhibitor must have a structure similar to the substrate to function in this way. Such structures are seen in both vertebrates and invertebrates and invertebrates and invertebrates. Figure 15.1 The two essential fatty acids shown in abbreviated form. 4 Calculate your own BMI after measuring your height and current weight. To
understand these complex pathways, it is essential to understand two general types of chemical reactions; oxidation and reduction. These interactions are strong because many hydrophobic side chains are forced inwards when the 
examples of density-independent factors that affect a population growth curve. If the population is attacked by a pathogen such as potato blight, it could wipe out the population. Having too many offspring and not enough resources is a problem of supply and demand. Taxes are identified by the type of stimuli to which the organism is responding. This
would facilitate the accuracy that is necessary to pass on the DNA information from one generation to the next. DNA and RNA are involved with the genetic aspects of the cell. These thin-walled, muscular chambers are called atria. Do not draw or write outside the box as this area will not be scanned or marked. We will be considering the structure
and action of skeletal muscle, niger could efficiently produce citric acid. The answers to these are given in the eBook at the end of each chapter. Top up the water periodically if it gets low. Photographs of human cells from long before the 1950s clearly show 46 chromosomes, ddC? (e) As a control, set up a pair of Petri dishes that have no difference
in humidity. 26 Learned behaviour can spread through a population or be lost from it more rapidly than innate behaviour. Despite this important exception, there are very many molecules containing carbon that are classified as organic. 18 Explain the processes involved in memory. It has a flagellum that propels it quickly through the water. One of
the early events of DNA replication is the separation of the double helix into two single strands. (Total 1 mark) 6 Which phylum does the plant below belong to? • Application: Calvin's experiment to elucidate the carboxylation of RuBP. The neurotransmitter binds with a receptor protein on the postsynaptic neurone
membrane. We can recognize SNPs when they express an abnormal protein that causes a disease, for example sickle cell anaemia. NATURE OF SCIENCE Scientists have a role in informing the public: scientific research has led to a change in public perception of smoking. Using a dichotomous key When biologists encounter a species they do not
recognize, they use a dichotomous key to establish which taxa it belongs to. Some of this iron is stored within the liver and some is sent to bone marrow to be used in the production of new erythrocytes. This ensures that some will have a winning combination and could become successful new trees. Hints for success These give hints on how to
approach questions, and suggest approaches that examiners like to see. The transport mechanism is facilitated diffusion, and it works by a mechanism that exchanges one hydrogen carbonate ion moving out of the erythrocyte into the blood plasma. It also causes dopamine
release. An enzyme is used in PCR that is stable at relatively high temperatures. Another product that is very commonly used and made by a mould is citric acid. (Total 1 mark) 4 Outline the significance to organisms of the different properties of water. Classifying all algae as autotrophs is also a challenge, because some species live as parasites and do
not actually use their photosynthetic capabilities. Two animals that are both vertebrates, but not the same class of vertebrates, would be expected to show less similarity in their internal organs. 20 Why can a mother and her foetus have different blood types, yet there is no immune response if the blood types are incompatible? 551 12 Option A:
Neurobiology and behaviour Sedatives Benzodiazepine reduces anxiety and can also be used to prevent epileptic seizures. The body's own immune system attacks and destroys the cells of the pancreas so that little or no insulin is produced by individuals with type I diabetes. For example, discs removed from tobacco plants are incubated with the
genetically engineered agrobacter for 24 hours. We have just learned about two common vectors that are used to indirectly transfer genes to plants. Answers may vary: anywhere a horizontal line comes to a "T" with a vertical line. HIV is the abbreviation for a virus called human immunodeficiency virus. The leading cause of emphysema is smoking. 8
Does xylem or phloem tissue have hollow tubes with the greater diameter? B. 9 Explain the environmental impact of these numbers. 535 12 Option A: Neurobiology and behaviour Reflexes Worker honeybees are female bees that have their ovipositor modified into a stinger. The swelling is from the trapped sugar solution from the leaves.
3.34 times more round green peas than wrinkled green peas in his experiment. cork living phloem vascular cambium hardwood The movement of organic molecules in plants is called translocation.
active transport peritubular capillary intercellular fluid (movement of ions, water, glucose, etc.) filtrate lumen microvilli The total volume of your blood is filtered by your kidneys about 25 times each day. NATURE OF SCIENCE When and how did we find out that X-rays were not a safe and healthy way of performing prenatal (during pregnancy)
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examinations? Eric Kandel is a neuroscientist who began by studying the nerve cells of a model animal, the giant marine snail Aplysia. 2.6 The structure of DNA allows efficient at absorbing digested nutrients and passing those
nutrients on to the bloodstream or lymphatic system? The name given to the generation produced by a cross such as this is the first filial generation, usually referred to as the F1 generation produced by a cross such as this is the first filial generation. The second phase is a motor phase, in which the young bird practises singing the song that he has heard. Organisms living in the water die and leave behind
their remains. • Wash again to remove all unbound antibodies. 1 Experimental guidance shows that lowering the diversity of an ecosystem lowers the abundance of fish. Ecologists who study human interactions with the non-living components of the environment, are concerned about our future.
and think that international cooperation is necessary to solve complex global issues such as insufficient drinking water supplies, overfishing, global climate change, loss of forests and topsoil, bleaching of coral reefs, and the depletion of countless other natural resources. The first stage of photosynthesis is a set of reactions that 'trap' light energy and
convert it to the chemical energy of ATP. New connections are formed every day of our lives. Application: Blocking of synaptic transmission at cholinergic synapses in insects by binding of neonicotinoid pesticides to acetylcholine receptors. Pathogens include viruses, bacteria, protozoa, fungi, and worms of various types. If you have ever been to a
museum full of fossils classified by their age, you may have noticed a few things that palaeontologists have discovered that provide convincing evidence for Earth's evolutionary past. Sucking behaviour is innate in human infants. Reclassification As noted before, Linnaean classification was limited to observable characteristics, and in Linnaeus's time
little effort was made to classify organisms by their ancestry because nothing was known about the genetic connections between species. There are many sarcomeres in a series, and when all of them become shorter, the entire muscle fibre becomes shorter. Is there as significant difference in males and females of the same age? If a feeding insect is
anaesthetized, the body can be cut from the stylet with a laser. Follow these general procedures. In a biofilm community are greater than the properties of the biofilm community are greater than the biofilm community are greater than the properties of the biofilm community are g
the species of staple crop being grown, this 724 situation can lead to an overall imbalance of too many carbohydrates or a more specific deficiency of one or more essential nutrients. Many of the food plants we eat today are hybrids, including corn, Zea mays. Just remember that the letters, Z, B, J, O, U, and X, do not occur in protein sequences. This
genetic condition causes severely debilitating nerve damage but the symptoms do not show until the person is about 40 years old. The separation of the two opened sides of a zipper. For one thing, it tells you how many extreme values are in the data. For example, Yang Wang, a radiologist from the School of
Medicine in Indiana, is using functional magnetic resonance imaging (fMRI) to study the brains of young adults watching violent video games. Fortunately, as a result of implantation, the embryo and the maternal endometrium soon begin to create a structure known as the placenta. The number of ova produced by females for internal fertilization is
typically far less than the number of ova laid by species that use external fertilization. 725 15 Option D: Human physiology Applications and skills: Applications and skills: Application of stomach acid secretion by proton pump inhibitor drugs. When we study monkeys and apes, even more folds are found in their cortex. pylori in the stomach. Are you able to tell
the difference between birdsongs? Any base sequence is carried from the nucleus to the ribosomes by mRNA. You might think that the yield in food energy would be the top priority. Many websites have tests for colour blindness. (1) C2 (iii) List one product other than carbon dioxide formed in this stage of respiration. How do the valves within these
artificial devices 'know' when it is time to close and open? As bacteria are prokaryotic cells, you can see that such cells play a large role in the world today. It is not an antibiotic but a food additive. Drawings of steroids are not expected. • Exposure to passive smoking increases the risk of CHD by 25%. Robin Warren and Barry Marshall won the Nobel
Prize for this discovery. • Click on Vega. Discontinuities in the fossil lineages are a challenge for scientists to explain. Some plants are annuals and complete their life cycle in one year and then die. Their plea is that we need to adopt international policies to limit human impact and maintain sustainable practices. • Guidance Drawings of prokaryotic
cells should show the cell wall, pili, and flagella, and plasma membrane enclosing cytoplasm that contains 70S ribosomes and a nucleoid with naked DNA. When you first begin to exercise, the cardioinhibitory centre stops causing an increase in heart rate. Application: Structure-function relationships of phloem sieve tubes. The term 'homo' means
same, so homologous refers to anatomically similar things. Many of these factors are not controllable, such as age, ethnic origin, and family history. • The liver intercepts blood from the gut to regulate nutrient levels. In replication, helicase unzips the DNA and both strands become templates for the formation of two daughter strands of DNA.
Genome size is the total length of DNA in an organism. (a) Sister chromatids are pulled to opposite ends of the cells. Each chromosome contains many smaller sections called genes. 'A psychologist put the animals in a box and looks out at the animals.' Learned versus
innate behaviour As we have discovered in last few sections, learned behaviour is not genetically programmed. Nicotine stimulates transmission in cholinergic synapses, which is why it has a calming effect on the body and personality. To find out more about GMO, GenBank, and NCBI, go to the hotlinks site, search for the title or ISBN, and click on
Chapter 13: Section B.2. NATURE OF SCIENCE Developments of scientific research follow improvements in apparatus: using tools such as the laser scanning microscope has led researchers to deeper understanding of the structure of biofilms. False-colour SEM of liver cells with cirrhosis. Some prominent scientists say there is not. The parasite
attacks the person's red blood cells and produces symptoms of high fever and chills, and can result in death. Seven principal taxa In order to classify the hundreds of thousands of different types of organisms on Earth, scientists have agreed to use a seven-level hierarchy of taxa. The hepatic artery is a branch of the aorta and carries oxygenated blood
to the liver tissues. Proponents argue that GM plants will increase crop yield and help us feed 9.2 billion people. • Step 2 - Parents' genotypes, and oranges are all examples of angiosperm seeds and their coverings. Careful observation should reveal the thick walls
with pits or pores that allow lateral and vertical movement of water. For example, DNA coding for lysine is AAA. The embryo was placed in the womb of a surrogate mother sheep. B.1 Microbiology: organisms in industry Understandings: Microbiology: organisms in industry Understandings mother sheep. B.1 Microbiology: organisms mother sheep. B.1 Microbiology: organism 
similarities and differences in the objects that surround them: hot or cold, delicious or foul-tasting, dangerous or safe, and so on. This temperature is warm enough to maintain a good molecular movement and, with the aid of enzymes, it provides enough activation energy for metabolic reactions to occur, including digestion. Food webs and energy
levels in trophic levels If you look back at the three examples of food chains earlier in this chapter, you will notice that they are all either four or five organisms long. Because half are ts, the allele frequency for 437 10 Genetics and evolution t t T t T T t each is 50%, or 0.50. For one thing, when looking at a gene that every living thing
should have, such as a gene for how to make ribosomes, the number of mutations a species has in that gene compared with another species gives insight into how closely they are related to each other. 479 11 Animal physiology A light micrograph of a nearly complete section of a seminiferous tubule. They include: 399 09 Plant biology •
environmental factors, such as day length and water availability • receptors, which are chemical messengers. Remember, when a cell enters the phases of mitosis, replication of DNA has already occurred. The table below shows the outcome of
crosses between a plant heterozygous for both characteristics and one that is homozygous recessive for both characteristics. 1 2 3 A child is given a vaccine called MMR (measles, mumps, rubella) to confer protection from those three diseases. The photon energy excites one of the chlorophyll a electrons to a higher energy state. • Sunken stomata on
thickened leaves reduce water loss by creating a higher humidity near the stomata. They take care of the cubs in groups; all lionesses suckle all cubs and protect all cubs. It is a truly remarkable process, and no consumers could survive on this planet without the initial production of food by autotrophs. This portion of the transcription process is often
referred to as elongation. B I and III only. It is only expressed in the normal cell. This is an innate, synchronized response to the loss of the cubs. 9.4 Reproduction in flowering plants is influenced by the biotic and abiotic environment. Carbon monoxide poisoning can be fatal. Factors such as latitude and sunlight intensity, seasonal variation, and
genetic skin pigmentation have to be taken into consideration. If both the beginning and the end of a gene are cut, the gene is released and can be removed from the donor organism. Because 7324 seeds in total were collected and we expect 3 out of every 4 offspring to be round, then the expected value for round seeds is 5493, as shown in Table
10.2. 433 10 Genetics and evolution Table 10.2 Observed and expected proportions 3 out of every 4 offspring from a total Observed phenotypes (E) 3 out of every 4 offspring from a total offspring from a tota
of 7324 = 5493 of 7324 = 1831 Difference (O - E) -19 19 Difference squared (O - E) 361 361 (O - E) 2 E 0.066 0.197 2 7324 0.264 The fourth and the expected values, and their squared values. 6 Suggest some ways this procedure could be improved.
The inner membranes of the mitochondria have numerous copies of an enzyme called ATP synthase. number of echinoderm phytoplankton 1 0.1 0.01 Dec Mar Jun 1993 Sep Dec Mar Jun 1994 Sep Dec Adapted
from Stanwell-Smith and Peck 1998 (a) State the trophic level of echinoderm larvae. Fish and seabirds are being driven south. Pushing the pedal for food then becomes a deliberate act. When studying simple invertebrate animals, innate behaviours can be measured as the animals respond to environmental stimuli. In economic periods when oil prices
are high, peat can be a competitive energy source, but when oil prices are low this is not the case, and there have been decades during which many countries decided to drain their wetlands to replace them with forests and farmland. Which of these yellow pollen grains on the bee's body will pollinate the next flower it visits? In some instances, the
complex inhibits transcription, and in other cases the complex promotes transcription. Naguro 101b, R. A black spot indicates that the gene was not expressed in either type of cells. Hypothesis for question 3: the optimum substrate concentration for lactase by mass to 1 part lactase by mass. • STM holds a small
amount of information for a short period of time. Variation and success Variation is closely related to how successful an organism is. Figure 5 This graph shows a normal distribution. In November 2006, the United Nations (UN) launched its project on bird migration routes in Africa and Eurasia. PCR is used to detect strains of flu virus How do
scientists take a minute dot of blood from a crime scene and amplify it so that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology: innovation in technology: innovation in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in scientific research follow improvements in technology: innovation in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in scientific research follow improvements in technology: innovation in technology: innovation in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in technology that it can be used as evidence? 609 13 NATURE OF SCIENCE Developments in the science of t
RNA polymerase rewinds the DNA strands. In order to get the action potentials to reach all of the muscle cells in the ventricles (see Figure 15.12). Water makes this phase change at a much higher temperature (0°C)
because, when the molecular rate of motion becomes low enough, hydrogen bonding locks water molecules (like amino acids). 

Applications and skills:
Application: Deep-tank batch fermentation in the mass production of penicillin. When food enters the stomach, the walls of the stomach become distended (expanded as a result of internal pressure). 541 12 Option A: Neurobiology and behaviour Storage The ability to store information allows us to maintain the knowledge gained for a certain period of
time. Inside the inner membrane is a semi-fluid substance called the matrix. (b) 388 p.p.m. and 397 p.p.m., respectively. The complete set of an organism's base sequences is called its genome. 6 7 Methods of inserting recombinant DNA into plants Recombinate Recombination Recombinant DNA into plants Recombinate Recombination Recombinatio
heterotrophs that obtain organic nutrients from detritus by internal digestion. • Comparison of the significance of hydrogen bonding in water and methane assists in the understanding of the significance of hydrogen bonding in water. Remember that water is the solvent of life, and living cells typically have an aqueous environment both inside and outside their
plasma membrane. tissue sample 1 Isolate mRNA mRNA molecules A DNA microarray. 77 02 Figure 2.22 Simplistic example of a polypeptide's primary structures shown in the diagram of a Paramecium (Figure 1.1) are involved in
excretion or internal water concentration regulation. Spindle fibres made from microtubules form. Factors affecting seed germination *Safety alerts: Wear protective eyewear and an apron. Trees that produce seed cones and have needle-like leaves are conifers. Linked genes In the fruit fly Drosophila, the gene for body colour (grey or black) is in the
same linkage group as the gene for wing length (long or short) (see Figure 10.15). The Museum of Comparative Anatomy in Paris, France. The symptoms of Huntington's disease include difficulty walking, speaking, and holding objects. The weeds are killed and the soybean crop benefits. With a new gene there is a new product, and we are interested
in that new product. Commercially available lactase has been formulated to still be active in the stomach and so is not sensitive to alterations in various acidic pH environments. Biotechnology has been used for centuries to bake bread, make cheese, and brew alcoholic beverages. Thymidine is a component of a DNA nucleotide made up of a pentose
sugar bonded to thymine; it is represented by the letter T in the genetic code. Also, Myriad could charge high fees because they had no competition in the market. 200 maternal blood concentrations (ng/ml) of: progesterone oestrogen 100 0 0 70 140 210 280 days of gestation Figure 11.32 A graph showing the levels of progesterone and oestrogen in a
pregnant human female during the entire gestation. DNA polymerases can only add nucleotides to the 3 end of a primer. Notice that the 147 letters correspond to the letters of the chart of amino acid codes used for BLASTp. If you copy the sequence on your clipboard and save it, then you will have it for the next activity. The 30 ATPs generated by
cellular respiration account for approximately 30% of the energy present in the chemical bonds of glucose. When this happens, transcript is detached from the DNA. Notice that a control group received no MDMA. • The product of the pathway is now a long-chain (5-carbon) alcohol made by the E. Large portions of this
chapter have dealt with carbon dioxide concentrations: how and where are they collected? An artificial pacemaker is a small battery-operated device that is implanted under the skin, typically in the upper chest area. Replication of DNA is remarkably accurate. Glucose is the starting point for making other organic compounds that are not
carbohydrates, such as lipids and amino acids. First, a neutral stimulus (e.g. a musical note) is introduced to someone. Apply a vacuum to help force the bacterial solution into the air spaces between the plant cells. 11 Make a table with four columns headed Bryophyta, Filicinophyta, Coniferophyta, and Angiospermophyta. During oil exploration, by
products of the extraction process are very salty water, called brine, and benzene. Researchers have found that continuous-batch fermentation only yields 65% of citric acid. If the offspring of the test cross are all grey, long-winged flies, the
 unknown fly used in the cross must be homozygous (GGLL) for both traits. • Switch to headphones: headphones isolate the background noise, so that you can hear the music with less increase in volume. These fats are generally solid at room temperature. It appears that any cell can lose its usual orderly pattern of division, because we have found
cancer in almost all tissues and organs. • Fertilization involves mechanisms that prevent polyspermy. If you were able to zoom into leaf cells and look around, you would see that the only structures in a leaf that are actually green are the chloroplasts. From goldfish to sharks, fish are a class of very diverse aquatic organisms that possess gills to
absorb oxygen, and have skulls made of bone or cartilage. Rationalism = the belief that reason allows us to acquire knowledge. 10.1 Meiosis Understandings: Chromosomes replicate in interphase before meiosis. This short fragment contains seven codons with a total of 21 bases represented by letters. Some steps involve chance, such as variation in a
population, or certain aspects of sexual reproduction, such as which gametes participate in fertilization and which do not. cfm?p=viewimage&id=77 Courtesy: National Human Genome Research Institute To help you remember a list of procedures like the one for SCID, shorten the steps and then make a mnemonic device for yourself. Pests such as
this corn earworm, Helicoverpa zea, are responsible for reduced yields in traditional corn crops. Decisions, decisions ... Should experiments be performed to answer fundamental questions, or should they only be done if they have a useful application in our everyday lives? Many researchers think the ECM is involved in directing stem cells to
differentiate. 14 Are humans osmoregulators or osmoconformers? One area is water soluble and polar, and is referred to as hydrophilic (water-loving). Citric acid are made every year by the simple mould Aspergillus niger. The doctor prescribes a different antibiotic
that (hopefully) works. The gene is pasted into the plasmid using DNA ligase. 9.2 Transport in the phloem of plants Understanding: Plants transport organic compounds from sources to sinks. A fun activity to do in a classroom is to have someone unknown to the students barge in during a lesson, say something, take something off the teacher's desk,
and leave, after which the teacher asks each student to take out a sheet of paper and write down a description of the person, and what he or she said and did. They breed in Germany in the spring and summer, and spend the winter in Spain. For example, bacteria reproduce by binary fission (splitting) and can reproduce in 30 minutes. • The amino
acids are released back into the bloodstream and become available to any body cell for protein synthesis. The secondary sex characteristics of males that arise as a result of increased testosterone production at puberty are: • growth of facial, underarm, chest, and pubic hair • enlargement of the larynx and associated deepening of the voice •
increased muscle mass • enlargement of the penis. • Most flowering plants use mutualistic relationships with pollinators in sexual reproduction. The origin of cells Understandings: Cells can only be formed by division of pre-existing cells. B.2 Crops can be modified to increase yields and to obtain novel products. and Fathepure, Babu Z. Each of the
beads is a nucleosome. Based on this, Woese and his colleagues suggested a classification level called a domain. The Human Genome Project required more than identification of DNA, it required an actual representation of the nucleotide sequence in humans. Annelids have bristles on their bodies, although these are not always easily visible. Cells use
 enzymes in order to increase the likelihood that a collision will lead to a useful reaction. Initiation of translation involves assembly of the components that carry out the process. The alleles are B = black and b = brown. When B cells are grown together in the proper environmental conditions, a few of the cells fuse together and
become a hybrid cell called a hybridoma. 82 Effect of pH The active site of an enzyme typically includes many amino acids of that protein. Notice that the branch length is the same for each animal (Figure 13.39). 2 From Figure 4.1, pick three organisms and determine how many other organisms each one depends on. The problem is that it is difficult
to remove enzymes from liquid products in solutions so that the enzymes can be used further. 45 01 Cells A Micrograph of root tip cells from an onion undergoing mitosis. (4a) One possible consequence is a second messenger molecule that promotes or inhibits a gene, leading to more or less of a polypeptide being synthesized. Figure 10.8 The part of
the flower to prepare is a crosssection of the pollen sacs. Once all the previous steps have been completed, drawing the actual grid is simple. This involves therapeutic cloning. aorta right atrium pulmonary veins left atrium pulmonary veins left atrium pulmonary artery inferior vena cava right atrium pulmonary veins left atrium pulmonary artery inferior vena cava right atrium pulmonary veins left atrium pulmonary vein
left ventricle left semilunar valve direction of blood flow through the right side of the heart aorta (emerging from behind heart) Figure 6.6 Human heart anatomy and blood flow. 496 From these layers, one of the first organs to develop is the neural tube, which will eventually become the brain and spinal cord of the frog. The symptoms of sickle cell
disease are weakness, fatigue, and shortness of breath. An imbalance in the any of above could have a harmful effect on the growth of the microorganism that is producing the metabolite of interest. Another way is for antibodies to use their two binding sites on two antigens. Fatty acids Although they have similarities in their molecular structure, not
all fatty acids are identical. Burning fossil fuels to produce fertilizer is an important source of fixed nitrogen. This technique was used by John Cairns in 1962 to demonstrate that a bacterium's chromosome is made up of a single circle of DNA and that it is replicated by being unzipped. This means that they should be able to pass on to the next
generation either with or without the other. Nitrogen oxides represent just over 320 p.p.b., so they are about a fifth the concentration in the atmosphere is more than 1000 times smaller than carbon dioxide
concentrations, so they are less of a concern. All aspects of eating and nutritional disorders are heavily infuenced by a person's culture. The harnessed energy in a form usable by the organism in question. Some bacteria are used to
break down oil spills, remove benzene from polluted waters, and eliminate toxic mercury. • A reduced number of openings through which water loss may occur. Dolly was born, and was presented to the world as a clone of the original donor sheep. Pathway or metabolic engineering is the practice of optimizing genetic
and regulatory processes within microorganisms for our use. A lysosome does not have any internal structures, Ensembl matches protein on a chromosome. This antihuman IgG antibody (blue) has an enzyme attached (peroxidase which is purple) that will change colour when a colourless substrate is
 added. SA node both atria contract AV node 0.1 second delay both ventricles contract Figure 6.7 Myogenic control of the heart rate. Sometimes deficiencies can exist for many essential substances, including the calories (energy) from foods. Then
second gametes are formed using the outside letters of each trait Ry, then inside ry, and last ry. One result of discussions between many zoologists has been the International Code of Zoologists has been the inside ry, and last ry. One result of discussions between many zoologists has been the International Code of Zoologists has been the Int
the hydrophilic and hydrophobic properties of the different regions of the phospholipid molecules cause them to form a stable bilayer in an aqueous environment. prolactin development of milk producing cells and secretion of milk breast CHALLENGE YOURSELF 2 For each of the following hormones, state where the hormone is produced, where it is
secreted, and the target tissue of the hormone. The human large intestine is populated with billions of bacteria. 19 What are the two major sets of reactions in protein synthesis? • Unsaturated fatty acids can be cis or trans isomers. 103 102 10 22) Fair (11-16) Total index count
                                                                                                                                                                                                                                                                                                                                                                                                           Good (17-22) Poor (B, C Elevated B Significant differences (p <
0.05) Crustose corallines 41.2 \pm 4.6 \cdot 1.8 \pm 1.8 Frondose macroalgae 20.8 \pm 4.3 \cdot 63.7 \pm 8.2 \cdot 0.6 \pm 0.3 \cdot 16.9 \pm 4.1 B > A, D > C Algal turfs 37.1 \pm 3.9 \cdot 14.5 \pm 4.7 D>B>C Predicted dominants Turfs Macroalgae Corals Corallines, which are beneficial algae that
from each parent. Scale bars are often used with a micrograph or drawing so that the actual size can be determined. The frequency of the various types of DNA sequence is shown in Table 7.1. 327 07 Nucleic acids Table 7.1 DNA sequences in the human genome Sequence is shown in Table 7.1. 327 07 Nucleic acids Table 7.1.
sequences called satellite DNA. MDMA and dopamine The theory of action of dopamine is as follows. Sometimes small farms use biogas fermenters. D Nucleosomes. The function of a protein is closely tied to its structure. Spider. The blink reflex also protects the eye from damage. Prepared slides may be used or you can make your own wet-mount
slides. Also, it is important to note that 18 ATPs and 12 NADPH are necessary to produce six RuBP molecules and one molecule of a 6-carbon sugar. After the injection, the animal is given time to go through a primary immune response. Only one of the categories of animals in these seven phyla has a backbone or vertebral column; they are called
vertebrates. (1) (b) Distinguish between the sense and antisense strands of DNA during transcription. At least some of the leucocytes cloned for the medulla oblongata contains a 'swallowing centre' that coordinates the muscles of the
mouth, pharynx (throat), and larynx (Adam's apple), so that a bolus of food will move down the oesophagus to your stomach during swallowing, and not down your windpipe (trachea). • The surface of the substrate contacts the active site of the enzyme. Although yeast cells can be used as host cells, the most popular candidate in genetic engineering is
the bacterium Escherichia coli. When a protein takes on a three-dimensional shape, it does this because of the interactions of the amino acids with each other. The capillaries and small blood vessels begin to rupture and menstruation begins. Such lines or curves do not need to pass through each data point, as we saw in the line graph. A fruit is a
structure that originates from the ovary of a flower. Place a drop on your slide and gently add a cover slip. • Insects: GM plants resistant to insects give a higher yield; examples of such GM crop plants include tobacco, tomato, potato, cotton, maize, sugar cane, and rice. 6.6 Hormones, homeostasis, and reproduction Understandings: Insulin and
glucagon are secreted by and cells in the pancreas, respectively, to control blood glucose concentration. freshwater 90 organisms 2 600 land 200 P moving from land to atmosphere. These hybrid cells have characteristics of both cells: they produce antibodies of a particular type and they are very long-lived (as are all cancer cells). • Prozac inhibits of both cells: they produce antibodies of a particular type and they are very long-lived (as are all cancer cells).
reuptake of serotonin and is used to combat depression. Triglycerides are formed by condensation from three fatty acids and one glycerol. Label structures I, II and III. The plasticity of the nervous system allows it to change with experience. The word cumulative is in the definition to stress the fact that one change is usually not enough to have a
major impact on a species. number of cases per 1,000 births Researchers wanted to find out what influences affected the frequency of Down syndrome. 

Nerve impulses are action potentials propagated along the axons of neurones. secondary wall brimary wall whenever a cell wall is present, it is involved in maintaining cell shape. Coloured
composite image of a magnetic resonance imaging (MRI) scan of the brain, and a three-dimensional (3-D) computed tomography (CT) scan of the head and neck, of a 35-year-old man. An organization called The International Council for the Control of Iodine Deficiency Disorders is attempting to solve iodine deficiency worldwide. Some of the
physiological responses involved in acclimatization are: • an increase in the number of erythrocytes and amount of haemoglobin • an increase in the capillaries in both the lungs and muscles • an increase in the number of erythrocytes and surface area for oxygen and carbon dioxide exchange • an increase in the capillaries in both the lungs and muscles in the capillaries in both the lungs and muscles in the
 essential amino acids, lysine and tryptophan. • The external processor digitizes the sound and transfers the electrical signal to the implant, which has been surgically placed in the cochlea. Further spermatozoa are repelled by the positive charge. • Fertilization in animals can be internal or external. In that case, note the scale of the image. The curve
on the left shows what happens 30 haemoglobin in environment to haemoglobin passing through the lungs, an where partial pressure of CO2 20 environment where the partial pressure of CO2 20 environment to haemoglobin in environment to haemoglobin passing through the lungs, an where partial pressure of CO2 20 environment where the partial pressure of carbon is relatively low. 2 Give an example of a mutation in an eagle's offspring that could be considered a beneficial mutation. DNA
RNA polymerase Sense or coding strand. One half of all sperm cells contains an X and one half contains a Y chromosome. There will be more about derived characteristics in Section 5.4. When genetic similarities are found, a genus can be established in which all similar species are placed. EST is an expressed sequence tag that can be used to
identify potential genes. Perhaps there are other phenomena that we simply cannot observe because no one has invented an apparatus to detect them yet. Fortunately for them, they receive a meal regurgitated from an altruistic bat. This node of cells is located in the upper wall of the right atrium, close to where the superior vena cava enters. The
outermost region of various cell type, as shown by the following table. Since 1985 all blood donations have been screened for HIV with an ELISA test. Note that this does not mean that 25% of the members of the population have the allele. Brain metabolism requires large energy inputs Neurones have a high energy
need because they are always in a state of high metabolic activity. O H triglyceride lipid C three fatty acids (CH2)27CH3 Hydrolysis of a polypeptide (protein) to amino acids. Before scientists understood the mechanisms of genetics, it was believed that acquired characteristics could be passed on from one generation to the next. If you scrunch up a
sheet of A4 paper, it has the same surface area but can take up less space than a flat piece of A4 paper. The techniques have been perfected to a point where it is possible to determine the identity of someone by examining cells found in the traces of saliva left on the back of a postage stamp on a letter. In vessel elements, water passes through pits in
the primary wall areas and through the end walls. Instantly the 'ready to go' myosin heads find an actin binding site and undergo the flex movement of the myosin heads, leading to the shortening of the sarcomere and thus the entire muscle. The minute it senses a damp environment, its random movements slow down. Myriad had a patent on naturally
occurring human genes called BRCA, which can be used to tell whether a woman has a genetically increased chance of breast cancer or ovarian cancer, two of the most common and deadly cancers in Western society today. Can you give some current examples? Other nutrients can be added to form complex organic molecules such as lipids and
proteins. The fungi and bacteria that are saprotrophs 176 are also called decomposers, because their role is to break down waste material. These products then move into the cisternae of the Golgi apparatus. It would be impossible for either the colour red or the colour white to be in the middle generation in this diagram. Now your name is a
hypothetical newly identified sequence. During the shuffling of alleles in meiosis, they are equally distributed between gametes. NATURE OF SCIENCE Serendipity and scientific discoveries: the discovery of cyclins was accidental. It differs from taxis in that the animal does not move towards or away from the stimulus. 

Materials not absorbed are
 egested. The former have nodes at the earliest splits of the cladogram, and the latter have nodes at the more recent splits. mitosis S phase G2 phase You may wonder what causes a cell to go out of control. In addition, oxytocin results in the contraction of smooth muscle tissue surrounding the ducts carrying the milk, which results in milk ejection.
Actin, on the other hand, is able to move, each side sliding towards the centre of the sarcomere and thus shortening the entire 463 11 Figure 11.10 The activity of one myosin head and one actin fibres within a single sarcomere. There are two general types of pollination: • self-pollination:
• cross-pollination. petal receptacle ovule sepal Flowers occur in a myriad of colours, shapes, and types. From there, water enters the peritubular capillary bed and is thus returned to the bloodstream to be made available to all body tissues. An example of software that we will use is BLAST. This gives you a great feeling! Pretty soon SERT catches up
W 0 WWW W0 Three out of every four offspring show the dominant red-eyed trait W = allele for white eyes; W = allele for white eye
understanding of social relationships, migrating patterns, and nesting habits, for example. The salt ions are first actively transported into the tubule cells and then into the intercellular fluid outside the tubule. Water with its dissolved solutes will move from the higher pressure area to the lower pressure area. The genetic code is degenerate, which
means that, for each amino acid, there may be more than one codon. This person is categorized as obese. Also, note that hydrogen ions are being pumped out of the matrix into the intermembrane space. Other scientists should be able to do the same experiment and get similar results. There are four 3 4 different dideoxynucleotides, just as there are
pituitary. • Excited electrons from Photosystem II are used to contribute to generate a proton gradient. You may want to return to that chapter for a brief refresher. 55-64 (Shankaran, M., Yamamoto, B. Some form of 'stomach' needs to be established, such as a Petri dish placed at a particular distance from the food source. Those who are affected are
the father, the second child (a boy) and the third child (a girl). Bacteria will then colonize the rafts and form sticky sheets of biofilm that coat the matrix and the roots of the plants. Females need more iron in their diet than males because the blood lost during menstruation leads to a loss of iron. Competitive inhibition substrate competitive inhibitor
enzyme Figure 8.3 A competitive inhibitor blocks the active site of an enzyme so the substrate cannot bind to it. In order to produce a total of four cells, the parent cell must divide twice: the first meiotic division makes two cells, and then each of these divides during the second meiotic division to make a total of four cells. (a) Sketch a single carbon
atom, add an alcohol group, fill in with hydrogen atoms. Have you learned how to play a new game, or play an instrument, or speak a new language? Blue tits and learning Can animals learn a skill and then forget it? (c) One of the sequences belongs to a horse and the other to a chimpanzee: which is species B more likely to be? Areas of the liver
showing cirrhosis no longer function. Neurones carry messages, while glial cells do not carry messages. This leads to a decrease in pressure inside the lungs, also known as a partial vacuum. The lighter coloured tissue on the upper portion of each kidney is an adrenal gland. 721 15 Option D: Human physiology family A 1 Figure 15.2 A pedigree
showing the inheritance of PKU. In order to ensure the proper timing for this, and to maximize the number of available ova, the woman undergoes about a month of hormone therapy. The wall of the proximal convoluted tubule is a single cell thick. Sometimes the greatly restricted diet is accompanied by excessive exercise. Many organisms, including
all animals, rely on the foods that they eat to obtain the building block molecules that make up their larger molecules. In a multicellular organism, all of the reactions within all of the reactions
permeable membrane would allow everything through). A resin cast image of airways in the lungs. Members of a species may be reproductively isolated in separate populations. Lemurs are primates found in Madagascar. Before considering a detailed description of these phases, it is essential you understand the chromosome. Figure 1.3 This is a
false- colour scanning electron micrograph (SEM) of the bacterium Escherichia coli. C3 (a) (i) Label pyruvate and acetyl coenzyme A on the diagram. Formation of hydrogen carbonate ions The cytoplasm of erythrocytes contains an enzyme known as carbonic anhydrase. They are true champions of diversity and adaptation because they have
conquered most habitats worldwide; there are more than a million species of arthropod. This initiates the action potential is now self-propagating). We have seen this with industrial melanism (Section 5.1), when the lighter-coloured peppered moth's
Biston betularia, frequency in the population decreased during the industrial revolution, while the darker phenotype increased in the population. The typical protocol to test for a specific protein (such as an antibody) is called an enzyme-linked immunosorbent assay (ELISA). When a trait is more common in one sex than the other, there is a good
chance that the trait is sex-linked, and that the locus of the gene is on either the X chromosome or the Y chromosome or the Y chromosome or the Y chromosome of the earliest stage of development. It should be clear that species 1 and 2 have the fewest differences between them, whereas species 1 and 4 have the most differences
Without a nucleus, cells cannot reproduce. This molecule is the basis of the coral reef, and it is sturdy like rock. Once again, recall that glycolysis is used by all cells to begin the cell respiration sequence. Many people have problems regulating blood solutes (solutes are substances that are dissolved in a solvent, in this case blood, to form a solution)
Because the atmosphere filters the sunlight, not all of it reaches the surface. The culturing of cells from the shoot apex often involves the use of nutrient agar gels and growth hormones to achieve maximum growth and quantity of particular types of plants. You may have read about the BP oil spill off the Gulf Coast of the USA in 2010. 2005), adapted
with permission from Journal of Experimental Biology, reproduced with permission of COMPANY OF BIOLOGISTS LTD. • Open the haemoglobin file. 2.5 Enzymes control the metabolism of the cell. Check out the section called Products. The second sequence shows only one difference with the first, but the fourth shows eight differences. On the foetal
side of the placenta a protective sheath called the umbilical cord will develop that covers three foetal blood vessels. Euglena lives in ponds and puddles. • The pollen tube completes its growth by entering an opening at the bottom of the ovary.
and fertilization promote variation in a species that leads to natural selection. Note the adaptations for efficient reabsorption: only one cell layer thick, microvilli present, numerous mitochondria for active transport (ATP), and close to the peritubular capillary bed. This explains the symptom described as 'shortness of breath'. Why is this important?
Calculate the value for 2 by determining the differences between the values (O - E), then square them, (O - E)2, and finally add them all up. • Why are people so worried about this new technology? Each sister chromatid will separate into se
gametes with the allele A in them. An example of a functional shift can be illustrated by studying a tennis player who has suffered a stroke and has a paralysed left arm. Fortunately, many copies of fragment 1 were made, so this is easy to check. As the vesicles fuse with the presynaptic membrane, they release the neurotransmitters into the synaptic
cleft (see Figure 12.38). However, most people who are diagnosed with emphysema have lung damage that is far too severe for self-repair. Experiment to demonstrate electron transfer in chloroplasts *Safety alerts: Use safety goggles and lab aprons. In the early 1980s, scientists found pluripotent or embryonic stem cells in mice. Bilirubin is formed
when haemoglobin molecules are processed from dying erythrocytes. You can see how this makes them excellent molecules to use for tracking. When short high-voltage electrical impulses are applied to a suspension of protoplasts, small microscopic pores are created in the cell membrane, enabling DNA to enter the cell and nucleus. The removal of
unneeded connections leads to improvement in brain efficiency. • • Basic leaf structure When studying water transport in plants, it is essential to understand the leaf's role in this process. As blood circulates through the sinusoids of the liver, these circulating haemoglobin molecules are ingested by Kupffer cells within the sinusoids. You might be
able to predict what it eats, how long it lives, whether or not it produces certain enzymes, or even certain enzymes, or 
processing can be a crucial addition to an effective conclusion on a lab report. In the bloodstream, leucocytes known as helper T cells can chemically recognize the antigen being presented and become activated. A light micrograph of a bronchiole and many alveoli within a lung. There are approximately 300 million alveoli in each of your lungs. BASFI and the companies of the comp
Plant Science has developed a genetically PRIVATE NOTE modified potato, Solanum tuberosum,, plant that is not to be consumed as a food product but to be used by industry. Heterotrophs Heterotrophs cannot make their own food from inorganic matter, and must obtain organic molecules from other organisms. As long as a person continues
breathing, and refreshing the gases within the alveoli, the concentration gradients of these two gases will ensure diffusion of each gas in the direction that the body needs for healthy gas exchange. For one thing, the vast majority of animal and plant hybrids are infertile. Interpretation of ELISA Look at the ELISA data from three patients tested for
HIV. By natural selection and the presence of some kind of barrier, a new species can evolve. In his print water seems to flow downhill on its way to the 'top' of the waterfall. If you adhere to a certain theory, observations you make will be interpreted with the objectives of the theory running through your head. These improper presentations have
included improper data reporting or even data fabrication. The translation process The mRNA will locate a ribosome and align with it, so that the first two codon triplets are within the boundaries of the ribosome and align with it, so that the first two codon triplets are within the boundaries of the ribosome. It removes the primer from the 5 end and replaces it with DNA nucleotides. two daughter DNA molecules Elongation of a new DNA strand
The production of a new strand of DNA using the templates exposed at the replication: Pressure changes in the left atrium, left ventricle, and aorta during the cardiac cycle. The ultimate goal of releasing energy in a controlled way is to trap the released
energy in the form of ATP molecules. Whether they are harmful, beneficial or neutral depends on what they are and what kind of environment you need to survive in. This is known as myogenic muscle contraction. This divisional process includes an elongation of the cell and a partitioning of the newly produced DNA by microtubule-like fibres called
FtsZ. These are called daughter cells. It gives printer paper a glossier look and makes concrete stick better to walls. The two single strands that make up the doublestranded molecule run in opposite directions to each other. • The relative numbers of parts are important. Governments and university laboratories investing money in research want their
 work and their discoveries to lead to healthier lives for people. This goes against everything the scientific method is supposed to represent. x 3 Practice questions are found at the end of each chapter. The villi epithelial cells are the cells in contact with the nutrients inside the lumen of the intestine. • Soon the quantity of inducer in
the population is high. Photosystem I is most efficient at 700 nanometres (nm) and is labelled as P680. • A very strong biofilm of cells and matrix are made as a response of all the cells working
together. • William Harvey failed to solve the mystery of sexual reproduction because effective microscopes were not available when he was working, so fusion of gametes and subsequent embryo development remained undiscovered. Antibiotic resistance in bacteria develops in several steps. Secondary organization The next level in the organization
of proteins is the secondary structure. The ephemeral hydrogen bonding between liquid water molecules explains a variety of events, including: • why water forms into droplets when it is spilt • why water is able to move as a water
'column' in the vascular tissues of plants. The × in the first column shows a cross between one variety of pea plant and another. (Total 2 marks) 215 05 Evolution of life on Earth. Learning can only be measured by performance. They have a double membrane: the
outer membrane is smooth, but the inner membrane is folded into cristae (singular crista). • • Applications and skills: A
repressors of auxin-responsive genes. 8 Why are rat and rabbit at the bottom in comparison with the other species? They are returned to the liver to be reincorporated into more bile. (b) This keeps the population of mutated dark moths at very low levels. Notice what happens in graph C: there is clearly an outlier at the top right. This explains the
response to light illustrated in Figure 9.18. • Extract mRNA from the cancer (cancer mRNA) and mRNA from the normal (normal mRNA) cells. When talking about enzyme action, we always refer to activation energy (AE). An enzyme is often defined as an organic catalyst that lowers the activation energy of a reaction. This is why it is still common to
isolate (or quarantine) people who have highly transmittable diseases. (Total 1 mark) 4 Several greenhouse gases occur in the atmosphere. • The hair cells, which are mechanoreceptors, release a chemical neurotransmitter across a synapse to the sensory neurone of the auditory nerve. application of fertilizer to soil 14 Movement of P between oceanic
glucose molecule is given off as a carbon dioxide molecule. Plasmids can also be found in Archaea as well as in bacteria. • The human cerebral cortex has become enlarged principally by an increase in total area with extensive folding to accommodate it within the cranium. (1) (b) Discuss the use of the pupil reflex for indication of brain death. In
multicellular organisms this allows growth to happen. • Go back to the HBB human entry P68871 and click on it. Are GMOs labelled in your country? 423 10 Genetics and evolution Figure 10.10 A Punnett grid for inheritance of roundness and yellowness in pea seeds. Learned behaviour is the process of gaining knowledge or skills. It can grow without
harming the host, but when it reaches a certain population size it becomes aggressive and the biofilm becomes resistant to the immune system of the host. Solution For one of the steps of the Student's t-test, we need to determine the degrees of freedom. The plant hormone abscisic acid causes potassium ions to diffuse rapidly out of the guard cells.
With enough evidence, it is sometimes possible to deduce the origin and approximate date of the original letter in a chain, even if that letter was never found. Because it is the females who decide who to mate with, the female behaviour dictates how the males evolve. Changes in the DNA sequences of genes from one generation 257 05 Evolution and
biodiversity to the next are partly due to mutations, and the more differences there are between two species, the less closely related the species are. This is a good example of natural variation in a population. Here, the word segmented refers to the fact that their bodies are divided up into sections separated by rings. Using these diagrams, outlines
three ways in which the structure of the small intestine is related to its function of absorbing food. At the time this model provided a good explanation of the specificity of enzyme action. The blood within the hepatic portal vein.
Almost all factors have an impact on one or more other factors. Another relatively new method for studying phloem sap is to use a radioactive form of carbon dioxide-fixing reactions of photosynthesis can be determined. WHO, http://www.who.int/tobacco/mpower/graphs/en/index.html A very interesting activity is to find
micrographs on the internet of various human tissues going through cell division. Glucose is completely catabolized and its original energy is now carried by NADH and FADH2 or is in ATP. The more fat stored in the bloodstream. But be specific, not general, when writing your answers. The
process of passing energy from one organism to another through feeding is referred to as the flow of energy through a food chain. Levels of polypeptide and protein structure Proteins serve a tremendous variety of functions in cells and organisms; Table 2.8 shows you just a few examples. This allows animal cells to have a variable shape and also
 allows the process of endocytosis (which is discussed below) to take place. Over time, if enough changes occur in a population, a new species can arise in a process called speciation. This includes the format Republish in a
book via Copyright Clearance Center; Figure on page 572 adapted from Organization of the primate retina: electron microscopy, Proceedings of the Royal Society of London. 35 Which of the patients are testing positive for Lyme disease? Cyanobacteria have been producers for many ecosystems. Homeostasis: blood glucose level within normal range
The receptor-hormone complex promotes the transcription of specific genes. Likewise, regarding questions of diet and nutrition, every few years nutrition experts change their minds about dietary advice. Cross-pollination increases variation and may result in offspring with better fitness. The carbon dioxide is entering the Figure 15.25 The Bohr
shift. When blood enters a capillary bed much of the blood pressure is lost. Does learning a second language make your brain more efficient? Less solar radiation reaching the surface to be converted into infrared. This is a model of dopamine. Reduction in
tillage improves soil structure, and results in reduced run-off and less pollution of rivers and streams. Certain plants, can send out horizontal structures to allow a new strawberry plant to grow a short distance from the original plant. For example, when measuring the light that a leaf might use for photosynthesis, a scientist
knows that the intensity of the light varies according to an equation relating intensity with the 792 Figure 10 A model of what the data should show (on the left) and the actual collected data (dots on the right), of which only one point is actually where it was expected to be. If you have the materials, the time, and the ambition, it is also possible to set
up a more complex aguatic ecosystem that is hermetically sealed. Table 6.1 Food molecules Molecular form ingested Molecular fo
Nucleotides When we digest food molecules, we hydrolyse them into their smallest components (as shown in the right-hand column of Table 6.1). Other seeds must be exposed to fire or smoke before they germinate. To learn more about excretion in different animals, go to the hotlinks site, search for the title or ISBN, and click on Chapter 11: Section
11.3. What changes do the kidneys make to the blood? When species are discovered they are given scientific names using the binomial system. Viruses lack a metabolism and cannot therefore be treated with antibiotics. Methane will not dissolve in water. These responses allow an organism to adapt to its environment. Another way of saying this
Oxygen dissociation curve showing adult is that the haemoglobin is induced to release (dissociate) haemoglobin in different CO2 environments oxygen within the capillaries of body tissues. The immune system kills some persisters (pink). The device is connected to one or more wires (leads) that are threaded into a blood vessel that leads directly into
the interior of the heart. • Surface area to volume ratio is important in the limitation of cell size. When a mutation is successfully passed on from one generation to the partic nerve. The mechanism used depends on the size and polarity
of the molecule transported. Exercises 7 Briefly describe the emergent properties of biofilms. One such potential mutagen is cigarette smoke, oviduct (Fallopian tube) ovaries Figure 11.28 A secondary oocyte is ovulated from one of the two ovaries and enters the corresponding Fallopian tube.
important molecules and their subcomponents (or building blocks). Amino acids can be linked together in any sequence, giving a huge range of possible polypeptides. Biofilms clean polluted waterways Can biofilms help us clean, small polluted bodies of water? 13 Outline the use of cochlear implants in deaf patients. Whenever ATP levels in the cell
are high, feedback inhibition will block the first enzyme of the pathway. Record this as raw data and be sure to keep track of the identity of each person and his or her 20-second ventilation rate. In order to show linkage, the following notation is used: G L == G L The two horizontal bars symbolize homologous chromosomes and show that the locus of
G is on the same chromosome as L. 408 cotyledons root apex (embryonic root) micropyle shoot apex (embryonic 
line showing the portion of each nephron in the renal cortex of the kidney and the portion of each that extends down into the renal medulla. 739 15 Intercalated discs contain structures known as gap junctions. Artificial and natural valves open and close depending on which side of the valve has the higher blood pressure. The World Health
Organization estimates that 3 million people die each year from diseases that could be prevented by vaccines. 2 Determine the parents' genotypes. Some of this heat will be lost to space, but some of the long-wave radiation will be directed down to the surface, keeping it warm. Doing this gives them the ability to stick together and attach. 350 1.5 300
250 carbon dioxide (parts per million) 1.0 200 150 100 50 average temperature (C) compared to 1805 0.5 0 0 -50 208 2.0 400 Figure 4.21 Two 1805 in C Ever since machines started replacing hand tools in Europe in the 1800s, humans have produced
increasing quantities of carbon dioxide from factories, transport, and other processes using fossil fuels, notably coal and oil. The first (inner) ring of follicle cells surrounds the oocyte, then there is the fluid-filled space, and then the outer ring of follicle cells. All of this dATP is toxic to certain cells of the immune system called T cells. Plants that were in
the Scrophulariaceae family have been given new families to belong to. 2 State the genotype for each individual. Could complex thought Researcher interpreting fMRI scans of the brain. A prediction that it would be just slightly lower is best. Complete the eight empty cells of the table. Most of our own DNA is identical to the DNA of other people.
Figure 14.41 Fisheries and biodiversity: the evidence. A leech can increase its body size considerably after feeding on a blood meal. Neuroblasts are immature neurones that are the precursor cells of neurones. That initial serendipitous discovery let to the development of penicillin as an antibiotic.
sections of the small intestine viewed with a microscope or in a micro
which acts as a promoter of flowering. This process is sometimes informally referred to as the circle of life, but the more scientific term is nutrient cycling. This suggests that this strain of Staphylococcus is resistant to those two antibiotics and cannot be stopped by them. The reason their blood does not clot is because they lack a protein called factor
IX. Golgi apparatus Starch granules are composed of carbohydrate stored in amyloplasts. Exercises 4 Using ideal ATP production numbers, how many ATPs would an individual generate if he or she consumed only pyruvate and carried one pyruvate and ca
less exact than physics or mathematics? C A G G T A G C T A C C A T C T A C C T A C G G T A T C G unzipped section A T G G A T G C A helicase moving T A G C Formation of two complementary strands are unpaired. Because the
offspring (the mules) are not fertile, no new species has been created. 758 Carbon dioxide transport in the blood Cell respiration is a process that links all living organisms: sugars, such as glucose, are oxidized in order to generate ATP molecules. (1) (ii) Identify which form of CO2 transport shows the greatest increase due to exercise. By comparing
homologous molecules from two related species, it is possible to count the number of places along the molecules where there are differences. Test farmland or a vegetable garden over a whole season to determine whether the
farmland/garden has just been fertilized. 3 Besides the nucleus, what other DNA source exists in eukaryotic cells that can be used for profiling? What effect would this drug have on a cell going through mitosis? 

Many genetic diseases have been identified in humans but most are very rare. If everyone around the table started cheating, the game
would break down completely. and Gudelsky, G. If one population of plants is triploid and another tetraploid, each population st a given
time. Thus the total amount remains the same. It is not broken down easily and causes release of dopamine in the reward pathway. The blast from the eruption knocked over massive adult trees as if they were straws. Locus for transducin gene on chromosome 1 You will recall that you possess two copies of each gene in your body: one copy from your
mother and one from your father. These intermediate steps are then carefully researched and imitated. Eventually using DNA sequences this will most likely become less common. (This could be an interesting example to use for one of the 2017 TOK essays) The readings at the end are more thorough accounts of the methods used and the changes
made to classification. This video is an interesting explanation of how 'endogenous retroviruses' can insert DNA into cells and how these segments of DNA can be used as independent evidence to trace evolutionary lines. An alternative is to use data logging hardware and software that is designed to measure ventilation rate and perhaps tidal volume
(the volume of air in a single breath). Although this is true for most cells, we have already seen the exception of haploid cells (n), and we will see later that some people can be born with chromosomes (45 or fewer) or with extra chromosomes (45
venom delivered from the snake will result in some degree of long-term immunity because memory cells will result from that active immune response. Look again at Figure 11.18 and you will see that the name, antidiuretic hormone, makes perfect sense. (b) Thinking about the structure of a chromosome, which has many nucleosomes, what DNA
would be available for the transcription process? These are genetically programmed behaviours, which ensure the survival of the animal. (Total 7 marks) 168 6 What does the karyotype below correspond to? • Treated waste water is collected through an underwater drainage system. Every organism has unique molecules on the surface of its cells.
When you hold your arm out from your body and turn your hand so that the palm is sometimes down, you are not using the hinge joint 460 humerus scapula triceps muscle contracts, forearm moves down (arm straightens) biceps muscle contracts, forearm moves down (arm straightens) biceps muscle contracts, forearm moves up Figure 11.6 The forearm moves down (arm straightens) biceps muscle contracts, forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the forearm moves down (arm straightens) biceps muscle contracts and the fo
action of the triceps and biceps. 

Guidance The detailed structure of the six proteins selected to illustrate the functions of proteins is not needed. In order to understand the context of Galen's teachings, you must imagine blood that is not flowing through blood vessels as we think of now, but rather seeping slowly from one location to another until
the blood in the body is 'used up'. With enough evidence, there may be a paradigm shift as a new theory has more evidence to support it. The males then follow her around until she is ready to mate. After the removal of the bark, called girdling, a swelling occurs just above the location of the girdle. This removal or addition of a variety of substances is
the job of the hepatocytes (liver cells). They consist of grana within the colourless stroma. By comparing the similarities in the polypeptide sequences of certain proteins in different groups of animals, it is possible to trace their common ancestry. (Total 1 mark) 5 What reaction, involving glycerate 3-phosphate, is part of the light-independent reactions
of photosynthesis? Eukaryotic DNA is linear, has histones, and has thousands of origins. After an appropriate period of time, the spleen of the animal is 'harvested' in order to obtain many blood cells. This is similar to the mark-release-recapture method. Cellular respiration from all trophic levels, including decomposers, produces carbon dioxide,
which is released back into the environment. A 2009 study published in the Journal of Biosocial Science found that pre-school children raised in North Korea are up to 13 cm shorter than children raised in South Korea. This kind of cloning is called reproductive cloning because it makes an entire individual. PCR is such a test. Exercises 21 Explain why
adult myoglobin and foetal haemoglobin need to have a greater affinity for oxygen compared with adult haemoglobin. The refore, each cell contains all the genetic information needed for the production of the complete organism. This layer protects the plant against water loss and insect invasion. The hypothesis was that, if there is no genetic variation
within this species, then the three populations of plants from different latitudes will have similar growth patterns when grown in Delaware, because the
lion is down on the ground. Species names are given around the outside of the circle. It's just that more is known about disease-causing genes than about things such as eye colour genes, because researchers spend their time and funds studying things that can help society. After exercise, the level of carbon dioxide in the bloodstream begins to
decrease and another signal is sent from the medulla. This has greatly increased our knowledge of human genetics and how to diagnose and treat human diseases. 749 15 Figure 15.16 An illustrated version of the general mechanism of a steroid hormone. Obtaining cells for karyotyping An unborn baby's cells can be extracted in one of two ways:
either by a process called amniocentesis or by removing cells from the chorionic villus. Figure 5.13 The garden pea, Pisum sativum, is the plant Gregor Mendel studied. If you are a supporter of the gradualism theory, as Darwin was, you will tend to see the fossil record through that pair of glasses. What is nature? For example, a value of p = 0.50 (or
50%) is not a significant difference in statistics. This drug was initially isolated from the Pacific yew tree, Taxus brevifolia. Carbon's name is derived from the Latin word 'carbo', meaning charcoal. • Fermenters allow large-scale production of metabolites by microorganisms. One of the philosophies that was widely held nearly two centuries ago was
called vitalism. One current line of research is dealing with genes that control ageing. • Protoplasts. Or, could it be that, if another scientist reads what one team thought was a failure but sees it for what it really Seeing is believing: but what if you cannot see? Myriad's argument was that, although DNA is found in nature, genes are all connected to
each other, whereas the isolated sequences for which they had patents could only be the product of a biotech laboratory using sophisticated equipment to do the separation and identification: therefore, the DNA sequences in question were not in their natural form. Especially something that has been believed for many centuries? Like all transplanted
organs cellulose-based and tissues, it is imperative that the tubing which is partially permeable patient's and donor's tissues match, in order to minimize rejection of the organ by the patient's immune system. Apical meristematic tissue, sometimes referred to as primary meristem, occurs at the tips of roots and stems. The same is true for haemophilia.
The benefits include a reduced need for the use of fossil fuel for tillage and a much lower use of other more toxic herbicides that affect our soil and water. Plant biology movement is based on a single principle: the movement is from a source to a sink. Echinoderm larvae feed on phytoplankton. Most eukaryotic cells possess a single nucleus, but some
do not have a nucleus at all, and some have multiple nuclei. This is a thin, almost bulbshaped, glass vessel with a supporting stem. carbon dioxide methane anaerobic decomposition releases methane manure biogas generator carbon dioxide absorbed by plants
through photosynthesis In an effort to reduce fossil fuel consumption, some countries, such as the USA and Brazil, have introduced biofuel programmes using ethanol made from crops such as the use quorum sensing
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to make decisions about new nest sites. For a variety of biochemical reasons, excess phenylalanine can result in mental deficiency, behavioural problems. There is clearly a 2 correlation in this graph: as age increases, body mass increases. 230 Sexual reproduction As we have seen, asexual reproduction
such as binary fission in single-celled organisms does not promote variety in the end, climatologists make a clear distinction between what is scientifically controversial and what is scientifically controversial and what is scientifically controversial and what is politically controversial and what is scientifically controversial and what is politically controversial and what is scientifically controve
ti e s on ts th es is o lul cel p es ira tio n carbon in consumers lul cel de co mp os i tio n ira or death exc ret ion p es on Earth. • Application: Comparison of the number of genes in humans with other species. Glucose enters a cell through the plasma membrane and floats in the cytoplasm. On the right is the same graph superimposed with
measurements taken in a lab. Sister chromatids separate in meiosis II. For example, a female horse and a male donkey can mate and produce a mule. Chlorella is a single-celled organism that has one very large structure called a chloroplast inside a cell wall. The materials produced are simple molecules, one of which is biogas. • Smokers have a
60% higher incidence of mortality as a result of CHD than nonsmokers. Which of the functions of life does this represent? Five years ago it was dying. Is he justified in saying that chemistry, biology, or other branches of science, are only there to catalogue and classify phenomena in nature? • The pathway involves substrate-level phosphorylation,
lysis, oxidation, and ATP formation. Later on, peripheral vision loss occurs, which eventually leads to blindness. 597 13 To learn more about bioinformatics and GenBank, go to the hotlinks site, search for the title or ISBN, and click on Chapter 13: Section B.2. Option B: Biotechnology and bioinformatics Identifying a target gene using bioinformatics
 Bioinformatics combines computer science and information technology in an attempt to understand biological processes. Make sure you are answering the whole question, not just telling a story. First, they chemically modify the toxin water
soluble. The chi-squared test helps us to see statistically whether or not there is a good fit between a theoretical model (in this case the expected ratios in a Punnett grid) and what really happens in nature. 400 Figure 4.17 Levels of 395 parts per million atmospheric CO2 from 2009 to 2014. The quaternary structure exists in proteins with more than
one polypeptide chain. It was first coined in a textbook of physiology written in 1897. Experiments have been done that show that if a bird is deafened for 100 days, he will only sing the crude template of the song. ATP has three attached phosphates. short wavelength energy Governments all over the world have been looking at various possibilities for
preventing climate change from getting worse. Synthesis of each new DNA strand then begins at the 3 end of the primer, and continues until a dideoxynucleotide is added. Two areas with different hydrostatic pressure produce a hydrostatic pressure gradient. Thyroxin is created from an amino acid and iodine, and exists in two forms, one called T4
and the other called T3. They are not wrong. This is known as insulin resistance. If the molecule is flattened, it has a two-dimensional appearance resembling a three-leaf clover. This is Penicillium again growing in a Petri dish. • The distinction between energy flow in ecosystems and cycling of inorganic nutrients should be stressed. This example
gives credibility to the theory of punctuated equilibrium. Plants contain such cells in regions of meristematic tissue. 103 02 Molecular biology Photosynthetic organisms produce foods that start food chains. Penguins are an example of a flightless bird, but their wings are well
adapted for swimming. Anabolism is the synthesis of complex molecules from simpler molecules from monomers by condensation of translation involves assembly of the components that carry out the process. Synaptic transmission Figure 12.37 At the
synapse, some presynaptic neurones excite postsynaptic neurones and others inhibit postsynaptic transmission. Fusion of gametes The results from the above example show the following: there is a 50% chance of producing offspring with genotype aa. C Photosynthetic pigments are highly
concentrated. A mushroom growing on a fallen tree is secreting enzymes into the dead tissue of the tree trunk, in order to break down the complex molecules within the tree tissue, and then the mushroom absorbs the simpler energy-rich carbon compounds that are released by the action of the enzymes. Most of the chemical reactions of life occur
inside a cell, and the size of the cell affects the rate of those reactions. Progesterone is a hormone that maintains the plant shown in the photograph could be pollinated by an animal. The insufficient quantities of potassium in sickle-shaped cells cause Plasmodium to
die. The sequence of mRNA nucleotides is the transcribed version of the original DNA sequence. When fully mature, it measures up to 0.9 m across and can weigh as much as 7 kg. 296 Causes and consequences of emphysema is a disease whereby the alveoli in the lungs are progressively destroyed. It is one or more of these secondary
infections that most often takes the life of someone with AIDS. The early embryo and placenta secrete hormones, go to the hotlinks site, search for the title or ISBN, and click on Chapter 11: Section 11.4. 490 When a female becomes pregnant, the early embryo secretes a hormone called human chorionic
gonadotropin, abbreviated to HCG. The allele containing G for wet earwax is much more common in European and African populations, while the allele containing A is much more common among Asians. Exercises 7 Why are some pathogenic viruses potentially lethal (e.g. HIV, Ebola), while others result in only fairly mild and temporary symptoms?
This rises to about 95% for ±2 standard deviations from the mean. The other two are more of a challenge. Does biology make any assumptions that are impossible to prove? The same effect occurs in muscles (see the TEM on the previous page).
Escherichia coli (an intestinal bacterium) is frequently in the news in the western world for causing outbreaks of food poisoning: it is spread by contaminated water and lack of handwashing. Taxis A taxis (plural taxes) is a directed response to a stimulus. As described earlier, the pancreas produces and secretes pancreatic juice, and sends that juice
into the first section of the small intestine, which is called the duodenum. A Seed dispersal C Fertilization D Germination (Total 1 mark) 2 How are fluids transported in the xylem and the phloem? Yet, within months of the eradication of the eradication of the eradication of the example in synaptic function, including new
connections. A A group of producers and consumers living and interacting in an area. Example: AA is a genotype of someone who is homozygous dominant, whereas aa is the genotype of someone who is homozygous dominant, whereas aa is the genotype of someone who is homozygous recessive for that trait. Ribosomes Ribosomes are unique structures that do not have an exterior membrane. As a result, we refer to the production
of ATP in photosynthesis as photophosphorylation. Among other effects, epinephrine causes the SA node to 'fire' more frequently than it does at its resting heart rate, and thus the heart rate increases, sometimes dramatically so. While the 6-carbon compound is oxidized, NAD+ is reduced to form NADH. In the old cladogram on the left, B, C, D, and E
are shown as being paraphyletic, whereas the new cladogram on the right is showing them as monophyletic. Tweedie 226t, Monica Schroeder 282 b, Monty Rakusen 623b, Nancy Hamilton 729t, National Library of Medicine 141, Natural History Museum, London 778, Niaid / CDC 13t, Nigel Cattlin 160b, Oak Ridge
National Laboratory / UD Dept of Energy 635b, Pan Xunbin 595bl, Pascal Goetgheluck 65t, 554, 633, 799, Pat & Tom Leeson 486, Patrick Landmann 155b, Paul D Stewart 244, Peter Gardiner 237, Phantatomix 90cl, Pixologicstudio 745, Prof. The rate of turnover in the phosphorous cycle is low Phosphorous is slowly released into ecosystems from
weathering rocks. neural fold neural plate notochord ectoderm Figure 12.1 Embryonic tissues in Xenopus. The terms producer, first consumer, and so on. 513 12 Option A: Neurobiology and behaviour • Movement of extremities: if arms and legs are
raised and let fall, there must be no other movement or hesitation in the fall. During haemodialysis, a patient's blood is pumped of the dialysis membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surface area of a membrane is into a device that contains a large surf
Figure 13.27 Single nucleotide polymorphisms. Both genes are found on the X chromosome and, as a result, it is possible to inherit both together. (3) (c) Suggest a trial, based on the results shown in the graph, that could be done to try to reduce osteoporosis in humans. The AV node relies on a signal from the SA node to send impulses to the
ventricles. The problem with cross-pollination is that the female stigma may not receive the male pollen because of the longer distance to travel. Often acts of altruism are actually a case of kin selection, in other words helping relatives, which actually helps the donor's own genes survive in a population. Some scientists might have ignored the white
eyed fly and excluded it from the experiments as an outlier, but Morgan and his team decided to see what would happen if it was allowed to breed. In an interview on the TED Radio Hour in 2013 she said, "The most profound experiments as an outlier, but being
absolutely a part of my biosphere in a very literal way. One of those instances is an allergic response. Record your results in the processed data table. This is why it is important to clean and cover cuts and abrasions of the skin when they do occur. Desert animals cannot break away entirely from their ancestors, so through the trial and error
mechanisms of evolutionary adaptations they have solved their physiological challenges with creative solutions. Pesticides are chemicals that kill animals that are regarded as pests. When you digest a meal that is high in carbohydrates, such as starch, your hepatic portal vein will contain blood with a very high
concentration of glucose. An example of this is the coastal mangrove, which lives in markedly hypertonic seawater. Most of these carriers are proteins with haem groups and are referred to as cytochromes. Instead, always use the sequence of steps shown on the previous page, of laying out the carbon backbone, adding the functional groups, and there
filling in with hydrogen(s) as needed. 529 12 NATURE OF SCIENCE Looking for patterns, trends, and discrepancies: laboratory experiments and field investigations helped in the understanding of different types of behaviour and learning. Accumulated lipids that are trapped in sediments at the bottom of an ocean form a waxy substance called
not believe that the person is dead. 17 Compare and contrast nitrogen and phosphate as minerals necessary for plant growth. Ways of knowing Ways of knowing Ways of knowing isted to the right, are there some that are better suited to the natural sciences than others? This research uses large amounts of data stored in databases
4 What would prevent stem cells from other species being successful in humans? We now know that endorphins are CNS neurotransmitters with painrelieving properties. 1 Agrobacterium tumefaciens is a bacterium that can be used to introduce genes into many different plants. Norton (Gould, James L. When the sequences are not available, the next
best way is to look at derived characteristics, such as whether or not an organism can produce milk. When further research reveals that a particular sequence controls a certain heritable factor, the locus of the gene is noted for further research reveals that a particular sequence controls a certain heritable factor, the locus of the gene is noted for further research reveals that a particular sequence controls a certain heritable factor, the locus of the gene is noted for further research reveals that a particular sequence controls a certain heritable factor, the locus of the gene is noted for further research reveals that a particular sequence controls a certain heritable factor, the locus of the gene is noted for further research reveals that a particular sequence controls a certain heritable factor.
looking to see whether they can demonstrate that the phenomenon is following a law of nature. The molecules pass through everyday examples are described here, as well as brief descriptions of related biological industries. Within seconds, she gets a
full printout and analysis of the genome she is interested in. What exactly does brain death mean? This may have little or no effect on the organism, or it may have a major influence on the organism or it may have little or no effect on the organism, or it may have a major influence on the organism or it may have little or no effect on the organism.
• yogurt • wine 'Auto' means self and 'troph' means feeder, so an autotroph is a self-feeder. Note 592 xii This is an approximation of what your eBook will look like and not an exact reproduction See the definitions of key terms in the glossary Create a bookmark Switch to whiteboard view The potato is called the Amflora potato, and it is a
breakthrough in production of amylopectin, a type of starch made by potatoes. It then took the methane gas millions of years to form and accumulate underground. Duke and Cerdeira 2007, Fig. For the Hardy-Weinberg equation, we need to look at the cross in a new way: as a model for the allele frequencies. A metaphase chromosome has sister
chromatids attached at the centromere. The sticky ends attach and the target gene is placed in the plasmid. A similar scenario occurs when a solution has become too basic: the relatively large number of hydroxide ions (-OH) can bond with the positive charges of the substrate or enzyme, and once again prevent proper charge matching between the
two. (a) The black ones will be eaten because they are easy to spot against a light background. However, there are muscles surrounding the lungs, including the diaphragm, muscles of the abdomen, and the external and internal intercostal muscles (which surround your ribs). Likewise, the two red-banded zones belong to two sister chromatids. A
yellow spot indicates that the gene is expressed or turned on in both normal and cancer cells, thus there is no difference here between the cancer cells and the muscle tissue to result in a unified event. If you have more reactant molecules
there are more to collide. All life that you see around you on Earth's surface relies either directly or indirectly on sunlight. This means that as much as 90% is lost at each level. The theory of evolution by natural selection is full of subtleties. Part of being a responsible citizen is making informed decisions relating to these difficult questions. Among the
species in this group are single-celled organisms that thrive in very salty conditions, some that live in the soil or in the ocean: some might be living in you or on you right now. Figure 12.38 Synaptic transmission. At the time of publication of this text, no effective treatment has been
found to cure someone with an HIV infection. Social factors can determine a child's vulnerability to substance abuse. Antibiotic resistance in bacteria. Here are the main reasons why not all of the energy present in an organism can be used by another
organism in the next trophic level. Exercises 12 What features would a seed possess that is capable of being successfully dispersed by wind? Hearing can also be affected by high-frequency noise. They carry the same genes but not necessarily the same alleles and, by now, they would have swapped some alleles during crossing over. Application:
Recognition features of Bryophyta, Filicinophyta, Coniferophyta, and Angiospermophyta, and Angiospermophyta, Entered to destabilize the chemical bonds in the reactant. Where the base pairs connect, there is a match; where they are repelled and do not connect, there is a difference in the DNA sequence and therefore there is no match (see Figure
5.15). Clearly, something is different with genes found on the sex chromosomes (X and Y), and this is how Morgan discovered sex-linked genes. (2) 568 (d) (i) Suggest an experiment to test the hypothesis that the male red-garter snake could discriminate between larger and smaller female snakes. 252 Reptiles Organisms such as snakes, lizards,
turtles, and alligators are classified as reptiles in part because they produce amniote eggs. Once you find that genus and make predictions about your new species in that genus and connect to one another to form a continuous column. It was first
sold in the USA in 1994, and had been genetically modified to delay the ripening and rotting process so that it would stay fresher longer. The rupture leads to millions of haemoglobin molecules circulating in the bloodstream. As the volume of biological data grows, so do the number and types of databases. The hypothalamus does not produce GnRH
when the oestrogen and progesterone levels are high, so FSH and LH remain at levels that are not conductive to the production of another Graafian follicle during this time. Genetic manipulation using plasmids is not possible in eukaryotes such as plants and animals, because they do not have plasmids. Chemical methods used to clean up habitats
include: • dispersing agents, which act like soap and break up the large oil molecules into small droplets • gelling agents, which are chemicals that react with oil to form solids. Often these peripheral proteins are anchored to an integral protein agents, which are chemicals that react with oil to form solids. Often these peripheral proteins are anchored to an integral protein agents, which are chemicals that react with oil to form solids.
research was close to non-existent. Most antibodies are quite similar to each other from a molecular perspective. Examples of some biomarkers are as follows. • Not all of the food swallowed can be absorbed and used in the faeces of
fruit-eating animals. Microorganisms are used in industry because they are small and have a fast growth rate. For years the highly repetitive sequences found in certain samples of DNA were called 'junk DNA'. It is unlikely that she will now go around to all her colleagues and say 'Sorry, I was wrong: it's a busy night and yet there is no full moon.' It is
more likely that she will forget this negative result and only remember the positive results, thereby showing a bias for confirmation. Phototaxis is the response to light. 1.3 Membrane structure Understandings: Phospholipids form bilayers in water due to the amphipathic properties of phospholipid molecules. Synapses that are rarely used are
eliminated, and those with strong connections are maintained. Any set of three bases that determines the identity of one amino acid is called a triplet. • language • sense • perception • memory. When you can do this without any mistakes, cover the right diagram and use the left diagram to trace the identity of one amino acid is called a triplet.
blood flow, noting at each location whether the blood is oxygenated or deoxygenated or deoxygenated or deoxygenated animation Despite regulatory approval by the EU, on 16 January 2012 BASF announced that it is pulling its genetic engineering division out of Europe and stopping production of its GM Amflora potato for the European market.
Table 11.3 Dehydration and overhydration Dehydration Overhydration Overhydration Overhydration Dehydration Dehydra
reabsorbed into the bloodstream within a single nephron. • Click human. The stain is a desert biofilm. Each erythrocyte is basically a plasma membrane surrounding cytoplasm filled with haemoglobin molecules. III Phloem (Total 1 mark) 5 (a) Outline the thermal, cohesive, and solvent properties of water. On the left, a white-eyed mutant fruit fly, and
on the right the kind of fruit fly typically found in nature, called the wild-type. How much depends on a whole set of factors, with genetics and eating habits being of prime importance. This suggests that birds are an offshoot of dinosaurs rather than a separate class of their own. Another effect of FSH and LH is the production of structures within the
ovaries known as Graafian follicles. • In the Query box type human beta haemoglobin. Huang goes on to state that one mechanism at work during these rapid connections is controlled by a type of neural adhesion molecule that is recruited to the site of the connection. 505 12 Figure 12.7 Parts of the human brain. The bloodstream supplies the
substances needed for an animal's metabolism, and also removes molecular waste products from the tissues. DNA replication A I only B I and III only C II and III only D I and II
variables: which things did Mendel make sure were the same from one experiment to the other so that the investigation was a fair test? 33 01 Cells CHALLENGE YOURSELF Use your knowledge of osmosis, diffusion, membrane transport, and kidney dialysis to answer the following questions. One of the options is called is performed. When blood
glucose levels are towards the upper end of the normal range, insulin is produced and this stimulates hepatocytes to take in and convert glucose to glycogen. Therefore, this type of ER is involved in protein development and transport. It contains Names and origin, Protein attributes, General annotation, and many more headings. People whose diets
are deficient in iodine can develop hypothyroidism. The result was that all three children then had high amounts of the necessary ARSA and their central nervous systems stabilized. This line should be dark in colour and as thin as possible. 

Monoclonal antibodies are produced by hybridoma cells. It contains four protein chains, two alpha and two
beta. 8 Explain why the flow of solution from A to B is a passive process. The increase in blood pressure is provided by the efferent arteriole, which drains blood from the glomerulus and has a smaller diameter than the afferent arteriole, which drains blood from the glomerulus and has a smaller diameter than the afferent arteriole, which drains blood from the glomerulus and has a smaller diameter than the afferent arteriole.
arranged with their tails facing inwards. The child will use his or her own primary immune response in order to produce both antibodies and memory cells for each of these three pathogens. They are sealed units in which any carbon dioxide produced is absorbed by an alkali such as soda lime or potassium hydroxide. 464 ATP myosin power stroke ADP
3 As myosin forms cross-bridges, ADP is released and the myosin bends due to loss of energy. The Spanish blackcaps have a shorter, stronger beak for eating the fruit that is their natural diet in Spain. The pH environment of the small intestine is neutral to slightly alkaline, which is the optimum pH for amylase. Recollecting fish with tags helps the
MDNR evaluate the behaviour and survival of these fish. Thanks to such a system, as little as possible is left to chance, making sure that the farmer maximizes production. Sathiya Moorthi et al. 2n DNA replicated and cell growth accomplished First meiotic division n Homologous chromosomes split n Second meiotic division The transition from diploid
(2n) to haploid (n) occurs after meiosis I because this is the cell division that separates the homologous pairs of chromosomes. Bloodletting was a procedure whereby small cuts were made in order to drain blood from certain areas of the body. Condensation reactions are key to that part of your metabolism, where larger molecules are
synthesized from smaller monomer units. Just as nuclear physics might be used to develop cheap sources of energy or to make bombs, could human brain research have both good and bad consequences? The postsynaptic neurone sums up the signals. They are mixed nerves, as some of the neurones within them are sensory and some are motor. The
challenge is that it is very difficult to get the DNA into the sick person's cells. Staphylococcus aureus is a bacterium that can be pathogenic, resulting in what many call a 'staph infection'. The contraction of circular and longitudinal muscle of the small intestine mixes the food with enzymes and moves it along the gut. The contraction of circular and longitudinal muscle of the small intestine mixes the food with enzymes and moves it along the gut. The contraction of circular and longitudinal muscle of the small intestine mixes the food with enzymes and moves it along the gut. The contraction of circular and longitudinal muscle of the small intestine mixes the food with enzymes and moves it along the gut. The contraction of circular and longitudinal muscle of the small intestine mixes the food with enzymes and moves it along the gut.
about by a special blue-green pigment in the plants called phytochrome. (Total 1 mark) 7 The cladogram below shows the classification of species A to D. X and Y should be considered as entire chromosomes rather than alleles of a gene. The endocrine system consists of numerous glands that produce a wide variety of hormones. This principle is
applied when the same species is accidentally named twice by two different experts with two different names; again the first one gets priority. Hummingbirds show impressive adaptation to their habitat. • The sperm moves from the tube to combine with the egg of the ovule to form a zygote. Would you want your parents to do such a test? The
digestive enzymes that accomplish this are hydrolysing 56 enzymes. Researchers add to this database when they discover, by experimentation, where a certain gene is located on a certain gene 
account only one genetic trait. This is no longer allowed. A DNA sample was obtained and centrifuged. The cell bodies of serotonin neurones are in the brains. By examining the alleles closely, it is possible to see that these offspring are different from either parent. 5! 3! DNA polymerase III leading
strand Okazaki fragment lagging strand 5! 3! RNA primer parental DNA helix 3! 5! All primase single-strand binding protein DNA ligase Draw Figure 7.8 from memory and annotate on the drawing what is happening at specific locations. What do you think the investigators of the cordgrass would like
when the map in Figure 5.6 was made, most of the moths were dark-coloured. As you will recall, blood within the pulmonary arteries is relatively low in oxygen and high in carbon dioxide. Thus we now know that the brain and nervous system are not static as previously thought. Lysosomes are usually absent from plant cells. This is called catabolism
Share your results and discuss your findings with your classmates. There are two problems that need to be addressed at this point in the procedure: • keeping the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for an extended period of time • identifying the B-cell types alive for ali
and labelling a reflex arc for the pain withdrawal reflex. An individual with little or no pigmentation is called an albino. • Application: External and intercostal muscles, as examples of antagonistic muscles, as examples of antagonistic muscles, and diaphragm and abdominal muscles, as examples of antagonistic muscles, and diaphragm and abdominal muscles, as examples of antagonistic muscles are flex. An individual with little or no pigmentation is called an albino.
cell respiration. Collectively, these actions decrease the volume of the thoracic cavity. As you can see from the formula, this chemical reaction involves oxygen gas from Earth's atmosphere. Biochemical compounds that are important to living organisms Living things are composed of an amazing array of molecules. Now answer the following questions.
as a double pump (with systemic and pulmonary circulations), and that the blood is continuously circulated to/from the body. • Carbon dioxide diffuses out of the biofilm into the flowing liquid. • Calcium ions and tropomyosin and tropomyo
Punnett grids for predicting the probable outcome for the next generation. It is also clear from Figure 8.16 that there is a fairly large number of electron carriers. Now that you know how to find the Sequence for a human, you can find the other sequences at the following website or the Word document on your eText:
www.pearsonhotlinks.co.uk/url.aspx?urlid=68727 • Click on the Hemoglobin File link. • Once fragment 1 is done, the lab technicians must process fragment 2, fragment 3, and so on, until all the fragments of the original sequence have been processed. Nicotine in tobacco products is a stimulant that mimics acetylcholine. If intercellular fluid and
dissolved molecules moved between adjoining cells, nutrients would have no selective barrier to pass through. In the process of electron transport, small amounts of energy are released. • Place a line of pigment from the leaf on a strip of chromatography paper using a 'ribbed' coin. proteins, and lipids, synthesized by other organisms in order to
survive. The villi and microvilli greatly increase the surface area for absorption within the small intestine, compared with a smooth-walled structure. Given that we ourselves know that our memories and observations can trick us, should we trust an eyewitness's account as irrefutable evidence during a trial? D Variations amongst individuals of a
population are selected by a changing environment. Application: Use of water as a coolant in sweat. P ADP The loss of the phosphate group restores the protein's original shape, thus causing the release of the potassium ions into the intracellular space. These three cells are called polar bodies, and their function is to be a cellular 'container' for the
divided chromosomes during both meiosis I and meiosis II. Each of the four cells has a different combination of half the genetic material of the original parent cell. Variation can be seen in this population of guinea pigs. The eggs of this species are generally speckled dark brown. As you read about the organelles of eukaryotic cells below, refer back to
the figures above and on page 16 and add more names of organelles. The two hormones that are most directly involved in lactation are two pituitary hormones, prolactin and oxytocin. The sliding filament theory of muscle contraction 1 Myosin heads are activated by splitting actin ATP. Note that thymine and cytosine are much smaller molecular
structures than adenine and guanine. Natural selection should be demonstrated by determining a minimum amount of food collected in the organism's stomach within the time limit. What do plants do with the sugars after that? The result of random orientation is that a male will only very rarely produce two sperm cells that are identical. Describe the
movement and final location of the largest population of paramecia. Nearly half the letters of the alphabet should in fact be avoided because they are too similar in their capital and lower case forms. Those sequences of mRNA remaining after splicing are called exons. This order or sequence is determined by the nucleotide base sequence in the DNA
of an organism. The dialysate contains key solutes at levels close to the patient's normal blood levels. Several groups in different parts of the world were trying to make sense of shared knowledge to produce an appropriate model. (c) Whatever cells are used, study them carefully, noting any internal structures, and their size in relation to the rest of
the cell and its visible parts. To test whether diet influences the rate of calcium loss, ovaries were removed from groups of female rats and the rats were then either fed a control diet or the same diet with 1 g of a supplementary food per day. The presence of HIV antibodies suggests evidence that the virus is present. Physical methods used to clean up to control diet or the same diet with 1 g of a supplementary food per day.
shore habitats include: • pressure washing • raking • bulldozing. Consumer demands push industries to produce more, which means burning more energy and releasing increasing amounts of greenhouse gases. 364 55 NADH 50 FADH2 45 free energy relative to O2 / k cal mol!1 40 Fe·S FMN Fe·S Q 35 Cyt b 30 Fe·S Cyt c1 25 Cyt c Cyt a 20 Carriers
FMN: 15 10 5 This protein carrier has a flavin-containing group. This triggers the active transport of potassium into the cell. 

Bacteriophages are used in the disinfection of water systems. Evidence for this template has been shown with experimental data: if birds are kept in a laboratory and denied any auditory stimulation, they produce a very
crude song. Large numbers of fungal filaments called hyphae form a cover over the surface of young roots. It is only in the early stages of the preparation for cell division that condensation happens and the chromosomes coil up into the shapes you are being shown in this chapter. Some examples of limitations to crop yield and how they have been
overcome are as follows. • Applications and skills: Application depends on pollination, fertilization, and seed dispersal. Values of 0.300 and 0.499 are indeterminate and need to be retested. Delving into human genetics confirms two
major themes: • we are all the same • we are all the same • we are all the same • we are all different. The newly formed 'army' of specific plasma cells begins antibody production. It might seem obvious that a young bird with a colour that makes it very conspicuous to predators has little chance of surviving to adulthood. Large elephants have a relatively small brain. 225 05 Evolution and
biodiversity On close examination, you should be able to see two moths on the tree trunk covered in lichen. There will be more about how this works later. This process has been used successfully to get E. For the first option, carry out the following. Don't use Cc, Ff, Kk, Oo, Pp, Ss, Uu, Vv, Ww, Xx, Yy, Zz. The three possibilities here are: • homozygous
dominant (AA) - in this case, the phenotype shows pigmentation • heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa) - in this case, the phenotype shows pigmentation but the heterozygous recessive (aa
seen with siblings from the same mother and father who are not identical twins, crossing over during prophase I allow variation in the offspring. Any one gene is a specific sequence of nitrogenous bases found in a specific location in the offspring. Any one gene is a specific sequence of nitrogenous bases found in a specific sequence of nitrogenous bases for nitrogeno
influenced by any one hormone: those cells that are influenced by a hormone are called the target 308 tissue(s) of the hormone are pulled to opposite ends of the cell during meiosis I, notably visible during anaphase I. The emphasis is on appreciating the
broader conceptual themes in context. Physical methods used to clean up oceanic habitats include: • booms, which sold the oil off the water • adsorbent materials, which sold the oil off the water • adsorbent materials, which sold the spindle,
which is made of microtubules. Models are based on the knowledge available at the time a theory is suggested. Whereas the original species had had a carnivorous diet, eating mostly insects, the new population had adapted to eating plants. • Skill: Determination of body mass index by calculation or use of a nomogram. A simplified drawing of these
two layers is shown in Figure 6.2. The contracting fibres of the inner, circular, muscles do indeed make a 'circle', as shown in this section, while the contracting fibres of the longitudinal muscles are positioned at right angles to the circular muscles. Organic chemistry is the study of compounds that contain carbon. Humans and many other organisms
have developed chemical strategies to store molecules in reserve to use for ATP production during the process of cell respiration. Leucocytes represent roughly 1% of all the cells in the bloodstream, so no one type of B lymphocyte is found in high numbers. This is called systole (pronounced sis-tol-ee). How are such differences in genes generated in
populations? The peripheral nervous system (PNS) is made up of the nerves and brainstem dendrites neurone cell body axon action potential axon terminal button nucleus myelin sheath made of Schwan cells nodes of Ranvier synaptic terminals of axon Figure 6.16 The structure of an individual
neurone. This shape is complex and at first glance appears to be random, but in enzymes (and other globular proteins) the complex shape is not random: it is very specific. Enzymes then remove the phosphate groups so that they can be added to adenosine diphosphate (ADP) to produce ATP. Synapses: chemical communication between neuronessate of the phosphate groups so that they can be added to adenosine diphosphate (ADP) to produce ATP. Synapses: chemical communication between neuronessate of the phosphate groups are the phosphate groups and at first glance appears to be random, but in enzymes (and other globular proteins) the complex shape is not random; it is very specific.
When one neurone communicates with another, the communication is chemical and occurs where two (or more) neurones adjoin each other in an area called a synapse. Psychoactive drugs affect the brain and personality, we must have an understanding of the two main neurotransmitters
acetylcholine and noradrenaline. You will recall from Section 3.4 that a Punnett grid shows the genotypes of the parents and offspring in a cross. Common names have been used for the plants to make the idea more accessible to students with samples of the flowers, or a selection of them
together with a hand lens. Model answers are available on these pages. Please remember they are just 'model answers' there are many ways to answer these questions which will follow from the student's own interpretation of the cladograms. Cladgram of figwort family - model answers (Activity 2) The essential
points to learn are that cladograms are useful in determining evolutionary relationships and in the past these have been created using visible features. Fertilizer is added as a source of nitrogen and phosphate for the microorganisms to increase their activity. • Chi-squared tests are useful in determining evolutionary relationships and in the past these have been created using visible features.
expected frequency distribution is statistically significant. In some cases, the term pistil is used to refer to a single carpel or a group of fused carpels. The medulla oblongata responds using the parasympathetic division of the autonomic nervous system. Many companies offer genome sequencing for private citizens willing to pay the price. Phosphate
reserves are limited, and it is estimated that the world phosphate reserves will only last another 50-100 years. • How can crops be genetically changed to improve their quality and quantity? • • Guidance • Ventilation can either be monitored by simple observation and simple apparatus, or by data logging with a spirometer or chest belt and pressure
meter. Neurones cannot store glucose, so the blood must deliver a constant supply. Olfactory receptors respond to smell. The end of spontaneous generation The idea of spontaneous generation has been shelved as unscientific. TT for the purebred tall parent. They extract toxins from the plasma and begin a two-step process to eliminate the toxins.
Instead, he promoted the idea that acquired characteristics could be passed on from one generation to the next. Large numbers of offspring meant a greater chance for diversity. 2215-2224 (Schmitt, Christopher J., Stricker, Craig A. A secondary immune response is both quicker and more intense, and thus symptoms are rarely experienced. 444 The
process of an evolving population changing significantly enough so that production of offspring with the original population becomes impossible is called speciation. The epithelial cells have tiny The hydrolytic enzyme lactase is being extracted commercially from certain yeasts, and is being used to hydrolytic enzyme lactase is being extracted commercially from certain yeasts, and is being used to hydrolytic enzyme lactase is being extracted commercially from certain yeasts.
milk products. Can you explain why? As the action potential reaches the axon bulb, calcium ions (Ca2+) rush into the end of the neurone. With just the one recessive allele b, a man will be colour blind. After dividing many times, some of the cells will specialize into muscle cells, others into nerves, others into skin, and so on, until a foetus forms. 

ATP
synthase in thylakoids generates ATP using the proton gradient. After training, it is possible to elicit the reflex response (eye blink) with a new and neutral stimulus (NS). 1.3 The structure of biological membranes makes them fluid and dynamic. (a) Measure the light conditions in which the experiment is taking place with a Vernier probe. Na!
repolarized After sodium ions and potassium ions diffuse, both are actively transported back to their resting potential locations. The allele for round is dominant (see Figure 10.9); • Seed colour: some seeds are green inside, while others are yellow. The function of microvilli, like that of villi, is to increase greatly the surface area for absorption
(compared with what it would be if the interior of the intestine was smooth). After passing through the epithelial cells of a villus, most monomers are absorbed into the adult Xenopus frog. 15 What name do we give to data that fall far above or far below the
line of best fit? It is the largest part of the mature brain. 21 Explain how MDMA acts on the receptor density of these rats 8 hours after the last dose of MDMA. Some metabolic pathways consist of cycles of reactions instead of chains of reactions. 4 Rinse off excess cDNA, put the microarray in a scanner to measure fluorescence of each spot. Outcomes
of genetic crosses should typically follow Mendelian ratios of 3:1 for an F2 monohybrid cross or 9:3:3:1 for an F2 dihybrid cross. The concept of biofilms is a new way of understanding how microorganisms exist in our environment. Before we discuss these phases, it is important to consider the codons. During the course of the study, alcohol
contributed to 27% of the deaths of 15-29 year olds in economically developed countries. Phenylketonuria (PKU) is a genetically inherited disease caused by a person's chemical inability to metabolize the amino acid phenylalanine. Chloroplasts occur mostly within the cells of the photosynthetic factory of the plant, the leaves
Only the portion of the alveolar membranes closest to the capillary is shown, as each alveolus is too large to show in full. When compounds, using a t-chart or a table is recommended. 549 12 Option A: Neurobiology and behaviour Synapses using a cetylcholine are called cholinergic synapses. But the two need to get together for the
vital process of protein synthesis to occur. air VENTILATION CO2 diffuses out of lung capillary CO2 diffuses into lung capillary CO2 diffuses out of lung capillary CO2 diffuses out of lung capillary CO2 diffuses into lung capillary
is a product of aerobic cell respiration Alveoli are composed of specialized cells called pneumocytes An alveolus is an evolution are the two alleles prove to be advantageous and tend to be more frequent. Genotype = the two alleles of a
gene received from the mother and father, e.g. AA, Aa, or aa. Which leaf would have the greater photosynthetic rate, assuming all affecting factors are equal? • The end product of this breakdown by the aerobic bacteria biofilm is carbon dioxide. Most organisms have sections of genes that may mutate or may be expressed at abnormally high levels.
Motta & T. (2) (c) Determine the percentage of worm-eating warbler nests parasitized by cowbirds at a level of 60% deforestation (1) (d) Suggest reasons for the relationship between deforestation and cowbird parasitism. The right hemisphere helps us understand what we see. cerebellum Figure 12.45 Areas of the brain with high
concentrations of cannaboid receptors. The valves located where the blood exits the ventricles are called semilunar valves and are also identified as left and right (see Figure 15.10). Human physiology Recent data supports a direct correlation between those countries and cultures that have shown a decrease in the number of people who smoke and a
corresponding decrease in the incidence of lung cancer. This means the double bonds (and hence the kinks) are eliminated) by adding hydrogen atoms. • Skill: Analysis of Meselson and Stahl's results to obtain support for the theory of semi-conservative replication of DNA. At the centre of each Petri dish is a tablet of penicillin. In
this chapter, you will learn about the physiology of some of the major organ systems of the body, and how those organ systems interact with each other. carbon available in aquatic ecosystems: dissolved carbon dioxide and hydrogen carbonate ions. The system works well as long as the level of urea is kept under control by the constant filtering of the
kidneys. Electrical signals from the vagus nerve result in the SA node once again adjusting the timing of the heart rate, so that the heart returns to its myogenic or resting heart rate. In each pair, could it be possible that both statements are valid? Multiple chromosomes As shown in Table 3.2, eukaryotes have more than one chromosome. These
regions are referred to as polymorphisms. These conducting tubes are actually living cells without a nucleus. Cells in multicellular organisms differentiate and thus do not produce the same proteins even though they contain the same genome. To increase the ventilation rate, the medulla's respiratory control centre sends action potentials to the
diaphragm, intercostal muscles (the muscles between the ribs), and muscles in the abdomen. What would happen at A if water was compressible? The following treatment was given to Ashanti and after 2 years she was showing near-normal T-cell counts. A liverwort is an example of a bryophyte. This reacquisition of the beginning molecule allows this
series of chemical reactions to be repeated over and over again (see Figure 2.46). Because the primitive characteristic requires the organisms to have a nucleus. The chromatid movement arises as a result of the shortening of the microtubules of the spindle. To find out, she would cross the tall plant (whose genotype is not known) with a plant whose
genotype is definitely known: a short plant that must be homozygous recessive, tt. The same can be said concerning the genes allowing them to hover and even fly backwards. Chemicals: • pharmaceuticals such as antibiotics and steroid hormones • biochemicals such as enzymes and proteins. Scientists are very interested in chromosome 21 because
of that syndrome. What scientific data are used to justify a diagnosis and give a child a drug that is possibly harmful? Tables such as this are valuable in summarizing detailed information about a particular concept. • Filicinophyta: this phylum includes ferns and horsetails, among others. It begins when the two sister chromatids of each chromosome.
are split. Smooth muscle is controlled by the autonomic nervous system (ANS), and you are not aware that your smooth muscle is contracting. D To combine with oxygen to produce water. Both mechanisms prevent pain signals from travelling to the CNS. • H. When you come across a term like 'germinal epithelium', ask yourself how that term makes
sense. CHALLENGE YOURSELF 1 Look at the list of characteristics below and think about which ones are determined by DNA and which are not. 8 Suggest a reason for these numbers. 32 Which genes could be the genes causing cancer? 1.5 There is an unbroken chain of life from the first cells on Earth to all cells in organisms alive today. However,
each cell will become a specific type of cell depending on which DNA segment becomes active. Orthokinesis is when an organism moves slowly or rapidly (changes speed) in response to a stimulus, but it does not move towards the stimulus. 180 6 7 Because 4.91 is greater than the critical value of 3.84, this means we can rej ect the null hypothesis.
Eventually the plant cells will acquire the DNA from the bacteria. (b) Explain how flowering is controlled in long-day and short-day plants. The means of each data set are very similar, but the variation is not the same. Falsification of theories, with one theory being superseded by another: evidence falsified the Davson-Danielli model. This enables the
continual production of a particular type of tissue. Such chemicals, in high concentrations and with long exposure times, can cause mutations and cancer just as radioactivity can: in a silent and invisible way. Therefore, no one should listen to you.' This is an example of cherry picking, something both sides of the debate are accused of doing. Could therefore, no one should listen to you.' This is an example of cherry picking, something both sides of the debate are accused of doing. Could therefore, no one should listen to you.' This is an example of cherry picking, something both sides of the debate are accused of doing.
graph ever go down: in other words could scientific knowledge ever be lost (maybe because of war, a laboratory burns down, a famous scientist dies)? Troponin has binding sites for calcium ions (Ca2+). Does this experiment have the expected characteristics of repeatability? bone 2 Olfactory receptor nasal epithelium cells are
activated and send electric signals. In order for crossing over to function correctly, identical breaks must occur at exactly the same position in adjacent non-sister chromatids. To make you even more familiar with BLAST, go back to the BLAST website. Almost all absorption of
nutrients occurs in the small intestine. The endosperm has the function of storing nutrients for the young plant. Finally students consider how the evidence from modern cladistics has shown that classifications of some groups based on structure did not correspond with the evolutionary origins of a group or species and try to decide what is the best
way to advance our biological knowledge. Can you give any examples of how classification of organisms has changed in the light of evidence from cladistics? Why are features of flowers thought to be homologous structures, but the wings of a pterodactyl and bat wings are considered analogous - similar structures which developed independently?
Activity 1 - Introduction to the Figwort FamilyLook at this gallery of photos and the diagram of figwort family flower structure below. Which of the plants looks the most different? This means that the enzymes cause chemical reaction. At the end of
this section, use the hotlinks to go to a website that includes a nomogram and online calculator for determining BMI. No. Sharks are not amniotes. Industrial production was started 2 years later. spindle microtubules pull chromosomes to opposite poles Telophase Examine the figure below. In this process, the eukaryote helped the bacteria by
providing protection and carbon compounds. However, it did become an almost universal behaviour within blue tit populations across Britain. The Italian scientist Francesco Redi also questioned the concept of spontaneous generation, nearly 200 years before Pasteur, and conducted an experiment using raw meat in jars. A sinusoid is visible (blue)
surrounded by abnormal hepatocytes. Unfortunately, many people have levels of cholesterol circulating in their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within their bloodstream that are excessive and can create problems within the excessive and can create problems 
cladogram showing the pattern of how they are related. • Computers: using computers on large fishing vessels with automatic data-logging software improves the counting accuracy and communication of total fish counts to a central location. In cases where two different animal species have been given the same name, there is a rule that the oldest
valid publication of the name should be used. A hypertonic (hypo-osmotic) solution has a higher concentration of total solutes than a hypotonic (hypo-osmotic) solution. (1) (ii) State the type of bond labelled II. Nothing in this world is to be feared ... only understood. When human beings are in the late stages of starvation they may be described as
being 'just skin and bones'. The enzymes may be on the interior or the exterior of the cell. QDs are nanoparticles. In potassium ions addition, there are negatively charged organic actively transported ions permanently located in the cytoplasm of the in axon. 73 and fig. How do we test them and decide if the scanner and computer are accurate? When
the Figure 11.21 Schematic showing how kidney dialysis kidneys do fail, there are two options available to a patient. 189 04 Ecology goes beyond the scope of this section, but, if you are interested, use the hotlinks at the end of this section to find more information. To learn more about gene transfer, go to the hotlinks site, search for the title or ISBN
and click on Chapter 3: Section 3.5. Exercises 15 Explain why PCR is necessary. 15 What is the heme group containing iron called in the conjugated protein haemoglobin? 1 Figure 10.27 Three different types of disruptive selection: (1) two types of spadefoot tadpoles (omnivore or carnivore); (2) the amount of nectar in lilies; and (3) the frequency of
the two forms of the pennered moth. Genetic modification: gene transfer between species Gene transfer The technique of taking a gene out of one organism, e.g. a tomato) is a genetic engineering procedure called gene transfer. Effect of temperature Imagine are
but it is always better to make a holotype available. Earth has shown many fluctuations in global temperatures over millions of years. Even though the early models of cell membranes were later proved wrong (because of new data), they helped in the development of the presently accepted model of cell membranes. Animals (and even some plant
organs such as leaves) exhibit determinate growth. Typical plants to try are impatiens, begonias, jade, or African violet. The corpus callosum is made up of myelinated neurones and is called white matter. This ingestion is by phagocytosis because haemoglobin molecules are very large proteins. The variable or R-groups are not shown in secondary
structures as they are not involved in creating the molecular shape. The posterior lobe of the pituitary contains the axons of cells (see Figure 15.19). A secondary tumour is a metastasis, a cancerous tumour that has spread from the original location to another part of the original shape. The posterior lobe of the pituitary contains the axons of cells (see Figure 15.19).
accession code (a unique identifier) • the name of the database • a literature review, providing information on articles that have been written about the data so that more information can be
gathered • the real data, so that the actual data are in the database and not held by a private company. (b) Which letter represents the double membrane that controls the entry and exit of materials for the chloroplast? 1 © The American Physiological Society (APS). For instance: • people who are overweight often have problems with high blood
pressure and cholesterol • a sedentary lifestyle may lead to smoking and overeating, and thus high blood pressure, cholesterol problems, etc. Think of a flexible metal wire that can be bent many times into what is called a globular shape. • What is a gene? The snail can learn from experience, and can keep its siphon
protected for a longer period of time after being given a chance to learn. A source is a plant organ that is a net producer of sugar, either by photosynthesis or by the hydrolysis of starch. This is a false-colour electron micrograph of plasmids. 343–344 (Muhlbauer, Roman C. Can human genes be patented? One further possibility is that the numerous
extra positive and negative charges of acidic and basic solutions can result in the enzyme losing its shape and thus becoming denatured. It also stipulates that if people wish to engage in an activity that may cause changes in the environment, they must first prove that it will not do harm. Plant water and mineral movement Transpired water has to be
replaced by the intake of water at the roots. Both atria contract at the same time, therefore you can say that both undergo systole at the same time, therefore this region is involved with cell control and reproduction. The pacemaker does what the name implies, which is to set the heart rate in the same way that a healthy SA node does naturally. In
January 2013 researchers in India found that biofilms of Pseudomonas bacteria were able to degrade crude oil in a marine environment. Using Table 2.6, which category would be used to describe him or her? Sugars include monosaccharides and disaccharides. Here is a summary of the more recent scientific information concerning stomach ulcers
and gastritis (inflammation of the stomach). Specific heat is the amount of heat per unit mass required to raise the temperature one degree Celsius. 5 Use the online calculator to confirm your own BMI calculation. Twenty quadrats sounds a bit small. This ionization does not alter the covalent bonding pattern but it does make the functional groups
look a little different as each carboxyl group has 'lost' a hydrogen ion and each amine group has gained a hydrogen ion. As erythrocytes approach the end of their approximately 120-day life, the cell membrane becomes weak and eventually ruptures. Type 1 alveolar cell BM Figure 15.28 A capillary with two adjoining alveoli. 3 Why is transpiration an
inevitable consequence of gas exchange in the leaf? When P. These new connections store memories, learning, and personality traits. Unlinked genes segregate independently as a result of meiosis. Is the knowledge offered by researchers using different methods to collect their data from different databases equally justified? However, many people
don't understand that there are different kinds of cholesterol and that they are used for different purposes in the body. Often, complex biological systems are best studied by using simpler 'models' that represent the more complex activity. It would be impossible to have a higher trophic level wider than a lower trophic level, for example, because
organisms cannot create energy, they can only transfer it inefficiently. We wish you success in your studies. The bending is towards the centre of the acrtin is moved inwards. The connection between the CNS and your body is made by two sets of nerves. Branches of the acrtin is moved inwards the centre of the sarcomere and the acrtin is moved inwards.
body. Reading such descriptions today is shocking because, by modern standards, they have a racist nature. These examples represent exceptions to the 'normal' cells that we see in most of the organisms on Earth today. By having an active site, the enzyme increases the likelihood of a reaction. Vessel elements (also called vessels) are the most
important xylem cells involved in water transport. The relevant sections from the IB biology guide for each sub-topic are then given as boxes showing Understandings and Applications and skills, with notes for Guidance shown in italics where they help interpret the syllabus. Capillaries have permeable walls that allow exchange of materials between
cells in the tissue and the blood in the capillary. Not surprisingly, she died of leukaemia, and her laboratories, which you can visit in Paris, still show radioactive contamination today. Methane from farms is a significant greenhouse gas. Place a cover slip gently on the slices without crushing them. 385 09 Plant biology Table 9.1 The cohesion-tension
theory of plant fluid movement Process Explanation Water moves down concentration of water wapour. What will happen when global warming causes large migrations of fish and other animals in the ocean? A given molecule may stimulate more than one receptor. 

Cyclins are involved in
the control of the cell cycle. hepatic artery The hepatic artery The hepatic portal vein receives blood from the capillaries within all the villi of the small intestine. Although a clade can sometimes have just one species, usually it is made up of multiple species. It also means damaged or dead cells can be replaced. This process is called condensation. A common freshwater
organism. C Formation of clones. Kupffer cells are a type of leucocyte that resides in the sinusoids of the liver. MSU Center for biofilm Engineering, P. Bioinformatics is the workhorse of biological information. When studying organisms, it is possible to take two
approaches. In this investigation, the spawning of echinoderms and its effect on phytoplankton was studied. We are delighted to share our enthusiasm for learning biology in the IB programme with you! Content The book covers the three parts of the IB syllabus: the core, the AHL (additional higher level) material, and the options, of which you will
study one. Hydrogenation straightens out the natural bent shape of unsaturated fatty acids. The numbered descriptions that follow refer to the numbered steps in Figure 8.21. The blood type are: • a person who has only the B protein is type B • a person who has both the
A and B protein is type AB • a person who has neither A or B protein is type O. • Skin colour • Sex (male/female) • Ability to speak Spanish Height
Personality Intelligence What about this: if a man had to have his left foot removed because of a war injury, would his future children be born with only one foot? To learn more about thas if a man had to have his left foot removed because of a war injury, would his future children be born with only one foot? To learn more about thas if a man had to have his left foot removed because of a war injury, would his future children be born with only one foot? To learn more about thas if a man had to have his left foot removed because of a war injury, would his future children be born with only one foot? To learn more about have his left foot removed because of a war injury, would his future children be born with only one foot? To learn more about have his left foot removed because of a war injury, would his future children be born with only one foot?
15.22 This oxygen dissociation curve shows the range of oxygen partial pressure found in the population; then there is a struggle between competing varieties that leads to survival for some and death for others. Following these two sounds is a silence
before the cycle is repeated. (Total 1 mark) 8 The diagram to the right shows part of the respiratory pathway. Animal physiology sarcomere (think of it as the Z lines coming closer to each other). We are grateful to the following for permission to reproduce copyright material: Figures Figure on page 49 from Lehninger principles of biochemistry, 3rd
ed., W. Actually, there are several histones, and each helps in DNA packaging. These entry points are lined with tissue cells that form a mucous membrane. The term Lamarckism is not required. Historians will tell you of the dangers of this, notably in Ireland in the middle of the 19th century, when 1 million people died of starvation. Alpha-Dglucose
and beta-D-glucose differ only in how a few of the atoms within the structure are oriented in space in relation to each other. What are the risks and benefits of this new technology? It is common to read that the pituitary gland is the 'master gland'. I Apical meristems II Lateral meristems A I only. If the calculated value for chi-squared is less than the
critical value, the null hypothesis can be accepted. Here are two guidelines to consider. But what if two or five or ten genes controlled a single trait? The damaged area. Studying diseases and discovering their genetic causes is more useful to medicine than
studying eye colour. In sex-linked alleles, the letter that indicates the allele is the superscript after the allele is the superscript after the allele is the superscript after the superscript after the allele is the superscript after the superscript after the allele is the superscript after the supers
resistant to disease. The viruses produced in this culture had DNA in their core with the detectable phosphorus. To decide how close a common ancestor is, researchers look at how many primitive and derived traits the organisms share. Lung cancer has a very high mortality rate. Looking at the means alone, it appears that there is little difference
between the two sets of bean plants. This species can be grown from seed or bought from a local florist. The sympathetic system is excitatory. • Guidance Details of DNA replication differ between prokaryotes and eukaryotes and eukaryotes.
the time for birth has come, the posterior pituitary will release a small amount of oxytocin into the bloodstream. About a third of coastal fisheries are now useless. Hepatocytes within the liver produce bile by converting surplus cholesterol into a similar molecule known as a bile salt. The reason for this is that the myelin sheath acts as an insulator,
preventing charge leakage through the membrane. Why is this? Recall that a karyotype is a property of a cell that is determined by the number and shapes of chromosomes that are present. Behavioural ecologists originally assumed that the large, muscular males (the hooknoses) were superior. • Labelled transferrin travels to the transferrin
receptors. Finally the air reaches the small air sacs surrounded by rich capillary beds. Sieve tubes are referred to by many as sieve elements. • • Guidance • Include branching and intercalated discs in structure of cardiac muscle. Eventually, what you are revising is stored back in your LTM, where it is now stronger. 487 11 To learn more about
polyspermy, go to the hotlinks site, search for the title or ISBN, and click on Chapter 11: Section 11.4. Animal physiology the cortical granules fuse with the ovum's internal plasma membrane and release their enzymes to the outside. This means that, before using a scientific name, it is best to check that the name respects any recent reclassifications.
Put simply, an increase in volume will lead to a decrease in pressure, and vice versa. In the UK it is projected that 17% of vehicle fuel has the potential to be replaced by compressed biogas. However, the trend seems to be that the larger an animal gets, the smaller its brain to body ratio. 365 08 Metabolism, cell respiration, and photosynthesis So
energy is now available as a result of the electron transport chain. The anticodon triplet is unique to each tRNA. As you can see in Figure 9.3, the thickened area of the guard cell wall is oriented towards the stoma. Human hearing range is between 20 and 20 000 Hz. auditory nerve brain The hair cells of the cochlea have stereocilia that stick out of
the hair cells and detect sounds of a specific wavelength. Take away the sunlight from this scenario, and the eggs could not have been produced because the hen would not have been produced because the 
are neither useful nor harmful. Use toothpicks to support it. The four mice that were injected with penicillin all lived for several days. These animals, as with the example of Rafflesia, facilitate the transfer of the male pollen to the female reproductive portions of flowers so that fertilization and seed development within the ovaries can occur. If no
oxygen is available, the pyruvate enters into anaerobic respiration. This giant panda has characteristics that set its species apart; it cannot breed with other species apart; it cannot breed with other species that are not giant pandas. Figure 13.18 The structure of benzene. The naturally high levels of oestrogen during pregnancy inhibit those cells from releasing milk. Criminal cases are
sometimes reopened many years after a judgement was originally made, in order to consider new DNA profiling results. Alleles: versions of genes Variations or 
a certain amount of isolation of gene pools over thousands of years, and we also know that different people grow up in very different environments. 4 When you have finished these tests, your teacher will explain what should be done with the organisms. • Explain the importance of accurate mass and volume measurements in this procedure, and in all
scientific experiments. 502 An example of a structural shift in the brain is has been shown in a study of London taxi drivers by McGill University scientists. omega end !1 Figure 2.17 This sketch shows how the name omega-3 is derived for some fatty acids. The story is very different for species that reproduce sexually. Science doesn't provide answers
to questions like these. This growth response does not appear to be the result of an increased production of auxin on one side of the shoot. Doctors put their faith in these prestigious peer-reviewed journals and, because they do not have the time or the budget to do all the clinical trials themselves, they trust that the researchers doing the work are
following sound practice. The alcohol-preferring rats consumed 5 g of ethanol per kilogram when given a choice between ethanol and water. Drugs act at the synapses of the brain using different mechanisms, resulting in an altered emotional state.
freshwater Courtship in the bird of paradise behavioral tactic fight * sneak Mate selection is important for survival and reproduction in a species. T cells 1 Remove ADA-deficient T cells from the SCID patient 2 Culture cells in laboratory Figure 13.36 Gene therapy for SCID. These lower amounts of energy are effectively harnessed by the cell to carry
out phosphorylation. After receiving a transplanted kidney, a patient will need to receive immune-suppressing drugs for the International Baccalaureate for permission to reproduce its intellectual copyright. It is in fact when Penicillium mould is
starving that it makes penicillin! Penicillin is a secondary metabolite produced in times of stress by the Penicillium mould: it is a defence mechanism against other organisms in its environment. Give the formula of the molecule. Some researchers have suggested that the function of leptin is related to increasing appetite when fat reserves are low, but
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not as an appetite suppressant when fat reserves are high. 6 Compare the number of primers needed on the leading and the lagging strands of DNA in replication. Blue whales have some neurones that are approximately 25 m in length. In the process of cellular respiration, the structure of the mitochondrion is very closely linked to its function. When
blood is pumped into an artery, the elastic fibres are stretched and allow the blood vessel to accommodate the increased pressure. What would you tell them? The joint where your humerus (upper arm bone) joins to the body at the shoulder is an example of a ball-and-socket joint, which is much freer and can move in various directions compared with
the elbow joint. Tracheid. The result is that the substrate will have fewer encounters with the active site and jump to conclusions. Hint: You will need to take the cell through the remaining pulmonary circuit, into a systemic circuit starting with the
aorta, and then eventually back through the first portion of another pulmonary circuit. 124 This is not science fiction: genetic engineering firms are finding such genes regularly, previous peptide bonds created methionine lysine Who should decide how fast and how far humans should go with our study of DNA and the technology that is rapidly
emerging? D A male with Down syndrome. For example, all living organisms are made up of molecules that can be classified into one of four types: • carbohydrates • lipids • proteins • nucleic acids. Industries that make the effort to invest in such measures may find themselves less economically viable than their polluting competitors. Then he
wondered whether the goslings imprint on any moving object. (c) Deduce what happens to the rate of respiration as the temperature increases between 40°C and 50°C. In taxonomy, there are two opposing philosophies concerning what to do when an organism does not fit well into existing categories: (1) broaden the definition of an existing categories.
to include the new organism; or (2) invent a new category or subcategory. (b) How did you determine the two locations where decarboxylation occurred? Natural selection increases the frequency of other characteristics, leading to changes within the species.
Bioinformatics has grown exponentially in the past decade. Such questions are second-order questions are second-order questions from Photosystem I flow
back to the cytochrome complex of the electron transport chain between Photosystem I (see Figure 8.21). Skill: Identification of an open reading frame (ORF). BLASTn allows nucleotide sequence alignment while BLASTn allows nucleotide sequence alignment.
M HCl for 10 min, then rinse them with water. This reduces the surface area for gas exchange, and so less oxygen reaches the bloodstream. They are energy transformers and breeders choose which animals will reproduce and which will not. Chrysanthemums are an example of short-day (long-night) plants. This means that there has to
be an intermediary molecule that carries the message of the DNA (the code) to the cytoplasm where the enzymes, ribosome, and amino acids are found. A related problem is the run-off of excess nitrate fertilizer from farms, golf courses, and lawns, which flows into rivers and streams. For example, predicting an outcome using graph A above would be
extremely unreliable. If the parents or doctors are concerned about the chromosomal integrity of an unborn child (for example, if an expectant mother is over the age of 35), a karyotype is recommended. In a multicellular organism, every cell of that organism has the same set of chromosomes and thus the same DNA. For example, the predictions of
how fast global temperatures will increase seem to have been confirmed for some years but not for others. Over the years, efforts such as the Rio Summits in 1992 and 2012, and the Kyoto Protocol in 1997, have tried to establish goals for carbon emissions. Cattle are responsible for producing large amounts of methane that escape into the
atmosphere. Next the liposome is fused with the lipid bilayer membrane of a cell and the DNA is transferred into the eason membrane (positive in relation to the inside) and a net negative charge inside the axon membrane (see Figure 6.17). Often people use
expressions like 'the numbers don't lie' when talking about statistics. Gross 1991 In order to appreciate the extreme mating behaviour. Here is a picture of the embryonic tissues of Xenopus (a species of frog). 46 Cancer As
mentioned earlier, cancer occurs when a cell's cycle becomes out of control. The fluidity of the plasma membrane is essential to allow fusion and subsequent secretion of the vesicle contents. Suggest one reason for the difference in heat losses between the autotrophs and animal heterotrophs. The sustainability of ecosystems Thanks to this recycling
of nutrients, ecosystems can continue to be productive and successful for long periods of time. • The cerebellum is often called 'the little brain' because it has two hemispheres and a highly folded surface. Figure 4.7 The unbalanced inorganic carbon dioxide goes in an organic carbohydrate (glucose) comes out CO2 C6H12O6 equation for
photosynthesis. As a result, the populations adapt to the conditions available to them, and some versions of genes will be selected for and others will be selected for and others will be selected against so that the populations are best adapted to their areas. This huge difference is the main reason why environmental groups and government policy makers are much more interested in
carbon dioxide concentrations than methane concentrations, although both need to be taken into account in discussions about global climate change. The change concentrations than methane concentrations, although both need to be taken into account in discussions about global climate change.
proteins on its surface. However, most of the changes have occurred over huge timescales (hundreds of thousands or millions of years); timescales that humans find difficult to grasp. When talking about the health of Planet Earth, we often use words like 'pollution' and 'waste'. The elongation of the cells is caused by an expansion of the cell walls on
the side away from the light source. X: Biology is a collection of facts about nature. Some regions of DNA do not code for proteins but have other important functions. The functions in the brain areas that were killed by the stroke are transferred to healthy regions.
prevents any change in pH. • Photoheterotroph organisms use sunlight for energy, and carbon from organic compounds as their carbon source. Many organisms, including ourselves, use this as a cooling mechanism. For this lab, you will need some dark, wet mud. To digest the food they catch in their tentacles, they have a gastric pouch with only one
opening. Remember that dopamine works in the reward pathway. Exercises To learn more about prokaryotic cells, and the features of bacterial cells, go to the hotlinks site, search for the title or ISBN, and click on Chapter 1: Section 1.2. 26 5 What is a disadvantage to prokaryotic cells of having their DNA free in the cytoplasm without
a nuclear membrane? Note that these events are all aligned on the same time scale. We actually see, smell, taste, and feel with our brain rather than our sense organs. For example, discovering the code behind something as wonderfully useful as insulin, the protein in your blood that helps regulate blood sugar, was the dream for many decades. Such
a mutation is very rare in the human population. Animals can be cloned at the embryo stage by breaking up the embryo into more than one group of cells. This delay allows time for atrial systole before the atrioventricular valves close. The German physician and chemist Friedrich Wöhler. 768-780 (Gilchrist, G. This raises the practical problem of
how many data points we need in an experiment in order to make a valid generalization. This is a time of very low metabolism and no growth or development. At that point the enzyme is called pepsin. • Place the quadrat down on the ground at the point determined by the number of steps, and decide which of the four sides will be the 'top' and 'right'
of the quadrat. chemical and enzymatic modification to make new antibiotics 581 13 Option B: Biotechnology and bioinformatics biomass (glv-2, carbohydrate, ammonia, penicillin (glv-2 × 10) 100 Figure 13.4 Penicillin fermentation using Penicillin 
NATURE OF SCIENCE Tim Hunt and Joan Ruderman were studying gene expression in early embryos. postsynaptic membrane. Quorum sensing Figure 13.22 Schematic picture of cells in a biofilm 'talking' to each other in order to make more ESP.
This process is called desensitization or tolerance. Vesicles move materials within cells. Your lungs are located within your thoraxic cavity (or thorax). 181 04 Ecology CHALLENGE YOURSELF 3 For each organism below, identify which type of nutrition is used: heterotroph; heterotroph; heterotroph that is a detritivore; autotroph
Birds of one species have a varied song, just as we have variations in the colour of our eyes. Toxic things in our environment standards. Where n = any number between 3 and 29 (11-23 are the most common) H R O N C C Figure 2.9 A generalized amino acid. At the end of meiosis, four cells are produced that are
genetically different from each other and only contain 50% of the parent cell's genome. The number of different cell types that can arise from the one original cell can be staggering. Scientists placed bees 200 cm away from an attractive odour source. • You will find five light-blue rectangles of information. The structure of water molecules and the
resulting polarity Water is the solvent of life. Students should be able to recognize from molecular diagrams that triglycerides, phospholipids, and steroids are lipids. One of the most famous, or infamous, members of this phylum is the parasitic tapeworm that can infest the intestines of mammals, including humans. Accumulation of plaque can cause
dental disease in the teeth and gums due to the high concentration of metabolites produced by the biofilm. wordpress.com/2012/08/01/ sanger-sequencing. Alternative lab 2 Begin with a vial of fruit fly media and ten flies in a
vial. 622 In another experiment, Dr Prasad at the State University in Buffalo, New York, has used quantum rods. (c) What is the letter of the thylakoid that contains the photosystems? Fawcett/ Photo Researchers, reproduced with permission; Figure 1.37 from World Health Organization, WHO report on the global tobacco epidemic, WHO, 2008, p.9,
mpower/graphs/en/index.html [accessed 16 June 2014], reproduced with permission of the publisher; Figure 3.20 from Methods and technology for genetic analysis: DNA sequencing and fragment analysis, 1 August 2012, reproduced with permission; Figure 11.9 from Cell
and molecular biology, 6th ed., John Wiley & Sons (Karp, Gerald 2009), fig. The kit should determine your pH in 0.5 increments from pH 4.5 to 7.5. The kit should also determine nitrate, phosphate, and potassium levels in 5-unit increments from pH 4.5 to 7.5. The kit should also determine your pH in 0.5 increments from pH 4.5 to 7.5. The kit should also determine nitrate, phosphate, and potassium levels in 5-unit increments from pH 4.5 to 7.5. The kit should also determine nitrate, phosphate, and potassium levels in 5-unit increments.
all three alga types with reduced and elevated nutrients. • Students should be familiar with methane because it is the same gas used in laboratories (the flame of Bunsen burners) and in homes for cooking and
heating. • A SERT (serotonin transporter) vesicle on neurone 1 will take up all the extra serotonin in the synapse and pump it back in when needed. 9 Denitrification. Diabetes Diabetes is a disease characterized by hyperglycaemia (high blood glucose). The primer and primase are only needed once for the leading strand because it is produced
continuously. 310 There is another important effect attributed to insulin. 373 08 Metabolism, cell respiration, and photosynthesis 6 CO2 from the air rubisco carbon dioxide fixation! 6 unstable intermediate 6 RuBP $ 12 glycerate3-phosphate 2 Figure 8.23 The Calvin cycle
Figure 1.27 Two cyclins are extremely important to the cell cycle: G1 cyclin and mitotic cyclin. The second meiosis II) is not completed until fertilization. The three foetal blood vessels shown are contained
within the umbilical cord. Explain how you arrived at this conclusion. Using prepared microscope slides or photomicrographs of stem or root cross-sections of various plant types, draw and label the primary xylem vessels. Fieldwork To understand random sampling, try this lab using quadrats. Visible light has a range of wavelengths, with violet the
shortest wavelength and red the longest. The fundamentals of this process were known in the early 1800s, and it was assumed, because of the widely held principle of vitalism, that this was the only way urea could be produced. If waterlogging becomes a large problem because of climate change causing floods, food crops could be seriously affected.
In which ways is energy lost between the trophic levels? The mouse is a common knockout (KO) species. A variety of factors are maintained as part of homeostasis, including blood pH, internal body temperature (birds and mammals), and water balance, to name just a few. SNPs If we compared your chromosomal DNA with your friend's, we would find
that 99.9% of your DNA sequence is exactly the same as your friend's. The length of the loop of Henle is positively correlated with the need for water conservation in animals. Thus it is clear that light is needed for the light-independent reaction to occur, but not directly. One of the challenges to renaming organisms is that books and scientific
journals, as well as gardening guides and museum herbarium collections, often still have the old scientific names. This causes higher humidity near the stomata. When an infant is 2 or 3 years old, he or she has 15 000 synapses per neurone. BLAST is to align a sequence of sequence of sequence alignment software.
nucleotides to a similar sequence of nucleotides in different organisms. 

Application: Assessment of the potential risks and benefits associated with genetic modification of crops. Amino acid Code Meaning A Alanine B Aspartic acid F Phenylalanine G Glycine H Histidine I Isoleucine K Lysine Landine B Aspartic acid F Phenylalanine B Aspartic acid F 
Leucine M Methionine N Asparagine O Pyrrolysine P Proline Q Glutamine X Any * Translation stop - Gap of indeterminate length • The best alignments are at the top. Mass consumption of meat, especially in the USA, where people eat
the most meat per person per year, has led to an increase in the number of cattle being raised. Populations that rely too much on maize as their primary source of protein can suffer from a variety of symptoms because of a low intake of these two amino acids. Is it considered by many to be false? Leg of insect To learn more about grasshoppers' legs,
go to the hotlinks site, search for the title or ISBN, and click on Chapter 11: Section 11.2. femur tibia tarsus tibia The immovable attachment point is called the insertion. Transgenic organisms produce proteins that were not previously part of their species' proteome. The decoding of a
strand of mRNA to produce a polypeptide occurs in the space between the two subunits. What is its source? • A motor neurone carries an action potential until it reaches the final synapse, called a neuromuscular junction. Applications and skills: Application: End-product inhibition of the pathway that converts threonine to isoleucine. The problem is
that organisms absorb valuable minerals and organic compounds and use them to build their cells. It is one of the most important of the neurotransmitters in the CNS. An isopod in a dry place may find a damp spot during its increased random movement. There 0 is a positive correlation. As species evolved to be able to do more complex behaviours,
they had to develop more working area for their brain. Some of the earliest detailed studies of human muscles were made by Renaissance artists such as Leonardo da Vinci. 762 In addition to smoking cigarettes, long-term exposure to the following is known to cause or exacerbate the symptoms of emphysema: • marijuana smoking • exposure to
second-hand smoke of cigarettes or marijuana • exposure to air pollution • exposure to manufacturing fumes • exposure to coal and silica dust. Although the shape and number of the bones may vary, the general format is the same, despite the fact that the specific functions of the limbs may be very different. There are enough warning signs to lead
experts to invoke the precautionary principle. For example, soybeans have certain genes that express proteins that give the soybean specific traits. The steps of B lymphocytes in mammalian immune response Among the leucocytes in mammalian blood are many different types of B lymphocytes. The following might be an interesting experiment to try with a class of
students. NATURE OF SCIENCE What are model organisms? Causality requires that the mechanism of exactly how X causes Y needs to be demonstrated. The motile spermatozoa absorb some of the fructose sugar in semen in order to have 'fuel' for what could be a very long journey. At a crime scene, forensics specialists can collect samples such as
blood or semen, which contain DNA. 5' HOCH2 C4' H 5' OH O H H3' C C2' OH H O OH C1' C4' H H3' C C2' OH H O OH C1' C4' H H3' C C2' OH H O OH C1' C4' H H3' C C2' OH H O OH C1' C4' H H3' C C2' OH H O OH C1' C4' H H3' C C2' OH OH Deoxyribose 86 HOCH2 H H Ribose C1' H DNA nitrogenous bases Adenine (G) Guanine 
containing surfactant that creates a moist surface inside the alveoli to prevent the sides of the alveoli to prevent the sides of the alveoli to prevent the two disks at the top furthest away from the hand (top centre and
top left) have allowed the bacterial colony to grow dangerously close. It would be an exceptionally difficult thing to do, and attempting to do this might mean you are considered to be a lunatic. This chapter will examine DNA replication as well as protein synthesis via transcription and translation. The antibiotic will kill them. Make sure the
temperature conditions for the entire experiment remain constant. CoA 4C 6C CO2 NAD! NADH 5C 3 The 5-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated to form a 4-carbon compound is oxidized and decarboxylated and decarboxy
dioxide and in the lithosphere as carbonates and fossil fuels in rocks. Similar disorientation symptoms can be felt by people who work temporary night shifts or have other irregular time patterns of sleep versus being awake. Much more information about the BRCA1 gene is available on this website for scientists or students to use. In one cross, he
examined the following two traits. Is such a statement provable? • Some organisms die without having been eaten by an organism from the next trophic level. Over time, acclimatization does occur. Translocation involves the movement of the tRNAs from one site of the mRNA to another. Mitosis Once all the preparatory processes have taken place,
and the DNA has replicated, the cell moves into mitosis or the M phase. The result is often lownutrition, high-calorie choices being made from the many ready-to-eat food products available today. Instead, there are cellular communication methods that lead to the cloning (many mitotic cell divisions) of the appropriate B-cell type to combat a specific
antigen when needed. (a) The single amino acid whose non-R-group shape is slightly different compared with all the others. Vitamin C is important in protection against infections, helping in wound healing, and in maintaining healthy gums, teeth, bones, and blood vessels. Blood cells make their way through capillaries one cell at a time.
Applications and skills: • • Application: Development of melanistic insects in polluted areas. Notice also that the number of chromosomes in the example is 4 in the parent cell at the start (so 2n = 4), because there are 2 in each pair. Rhizobium lives in the root nodules of legumes and fixes atmospheric nitrogen. Urea is produced in some living
organisms as a nitrogenous waste product. Micropropagation uses our understanding of plants, plant meristems, and hormones to stimulate existing plant material to produce large numbers of progeny (offspring). Each removed sample was immediately placed into a boiling methanol solution to denature the enzymes and stop the photosynthetic
process. The first thing you notice is the pain. However, there are many more species as yet unidentified, and it is impossible to know exactly how many there are in the biosphere: 5 million? Oxygen atoms, for example, are usually found in their most abundant isotope, which is oxygen-16, but can also be found in their 'heavier' form, oxygen-18, which
has a greater mass because it has two extra neutrons. At the time, 141 03 Genetics the term 'factors' instead) and the role that DNA played would not be discovered for nearly another century. Worked example Epidemiology is defined as the branch of medicine that deals with the incidence, distribution, and
possible control of diseases and other factors relating to health. More controversially, it was used by some to justify the superiority or inferiority of 'races' of humans. This is currently explained by the endosymbiotic theory. One year they say one thing, and then a year or two later they say 'Oh, we were wrong, here's the real story.' Archaeopteryx
Archaeopteryx is one of the most famous fossils in the world. Notice that in the area where replication has already taken place, the two strands are absolutely identical to each other. A typical example might be: Artwork showing an artery narrowed by plaque build-up over many years. When the living phloem is removed by girdling, the flow of food
from the leaves to the roots stops. C Glycerate 3-phosphate is reduced to triose phosphate. For example on the right-hand side of the page you will find several articles about the BRAC1 gene. T C A C A C G G C A T A T 3! A T C Figure 7.3 The antiparallel strands in 3! hydrogen bonds G T A 5! 325 07 DNA nucleotides are composed of a pentose sugar
a phosphate group, and a nitrogenous base. As mentioned earlier, water molecules have a slightly positive end and a slightly negative end. • Neural tube formation Have you ever wondered how all the organs in our body form from just one fertilized egg? There is now evidence that each sex requires the influence of specific hormones in order to
follow its pathway. (e) Giraffes used to have shorter necks. It occurs outside the grana but within the double membrane. Decomposers play a major role in the formation of soil, without which plant growth would be greatly impaired, if not impossible. For example, in males the hormone testosterone: • determines the development of male genitalia
during embryonic development • ensures the development of secondary sex characteristics during puberty • ensures sperm production as well as maintains sex drive following puberty. The portion of the protein that extends out of the membrane is predominately made up of hydrophilic amino acids that easily mix with the water environment either
inside or outside the cell or organelle. The sudden plummet of both hormones is simply the result of the birth because the source of the two hormones is no longer present. Type II pneumocytes are capable of mitosis for replacement of both types of alveolar cells if they are damaged. The Darwins worked with the coleoptiles, the initial section of the
stem during germination, of canary grass to find that they could bend the plant towards a unidirectional light source. Even more overwhelming is trying to imagine how many species there were in the past that have now gone extinct. • The diaphragm relaxes and the internal intercostal muscles and a second set of abdominal muscles help to lower the
rib cage. 27 What is the value of the mitotic index? Loss of elasticity and a build-up of plaque in arteries are prime contributors to hypertension. One benefit to the plant of this is the cooling effect that evaporation provides. For the second method, cells are obtained by chorionic villus sampling, which involves obtaining a tissue sample from the
placenta's finger-like projections into the uterus wall. The activation of dopamine in the nucleus accumbens is associated with the anticipation of a reward. The antibodies this man is receiving from the anticipation of a reward. The antibodies this man is receiving from the anticipation of a reward. The antibodies this man is receiving from the anticipation of a reward.
Estimating the size of commercial fishing stocks How do scientists really know what is in the ocean or a lake? One interesting invertebrate is a sea snail called Aplysia. Can you interpret the results of the experiment shown in the photo? To provide these functions, the RNA polymerase must first combine with a region of the DNA strand called applying the size of commercial fishing stocks.
promoter. Amniote eggs are characterized by having a membrane around the developing embryo to protect it, which is seen not only in reptiles with soft or hard-shelled eggs but also in birds and mammals. This fossil skull was discovered by Mary Leakey in 1959 at Olduvai Gorge, Tanzania. 90 80 lactose 70 penicillin 60 50 40 biomass 30 20 10
tRNA is transferred to the E site, where it is released. This reduces the relative water concentration in the sieve tube members, causing osmosis from the surrounding cells. We only use the separate stages to help us understand the overall process. Like any science, climatology is complex and we are learning new things all the time. It catalyses
hydrolysis of the bond linking the tRNA in the P site with the polypeptide chain. DNA can be put into the aqueous centre of the liposome. Modelling the growth curve of yeast The yeast Saccharomyces cerevisiae is a single-celled organism that reproduces by budding. and Jones, G. Molecular biology 2.8 Cell respiration Understandings: Cell respiration
is the controlled release of energy from organic compounds to produce ATP. • Cell respiration is used by all cells to produce ATP Organic moleculer structures. • Applications and skills: NATURE OF SCIENCE Developments in scientific research follow improvements in apparatus: experimental methods for
measuring phloem transport rates using aphid stylets and radioactively labelled carbon dioxide were only possible when radioisotopes became available. All living organisms are classified into one of these three. Leydig cells are found between the small tubules (seminiferous tubules) that produce spermatozoa (sperm cells). In order to do this, some of
organizational structure. 299 06 Light microscope photograph of a section of a nerve. Never use arrowheads when labelling. When they do, each is then called a chromosome and each has its own centromere. That may or may not be true for a polypeptide. This gives the baby's liver time to mature for full processing of bilirubin into bile. This means
that all the molecules in the mixture are more spread out than in a mixture at sea level. • Scroll down to Phylogram. Biodegradation is the preferred method for degrading oil, resulting in compounds that do not damage the ecosystems. plant stem holder plant stem tubing 391 09 Plant biology The following materials are necessary to assemble this
potometer: • clear plastic tubing • a ring stand with appropriate clamps • a 0.1-millilitre (ml) or 1.0-ml pipette, depending on the size of the plant stem you will be using and the plastic tubing • a syringe to pull water into the potometer • petroleum jelly or small clamps to seal between the cut end of the stem and the tubing. It appears that the first
angiosperms were pollinated by insects. The nuclear power industry has made an effort to isolate the abandoned nuclear power plant at Chernobyl by encasing it in a dome of cement. Mutations A mutation is a random, rare change in genetic material. Both ventricles also undergo systole simultaneously, just a little after the atrial systole. • A bacteria
such as Escherichia coli has a biochemical pathway that it uses to make a short-chain (2-carbon) alcohol. Prokaryotic cells DNA in a ring form without protein DNA enclosed within a nuclear envelope (nucleus) No mitochondria Mi
present 70S ribosomes 80S ribosomes 80S ribosomes No internal compartmentalization to form organelles Internal compartmentalization present to form many types of cells, make sure you include the following: • both types of cell have some sort of
outside boundary that always involves a plasma membrane • both types of cell carry out all the functions of life • DNA is present in both cell types. A Trisomy 21 B Sickle cell anaemia C AIDS D Type II diabetes 4 Outline some of the outcomes of the human genome. Another argument is that, just because a fossil of an extinct
crocodile looks very similar to a modern-day crocodile, there is no proof that the latter is a direct descendent of the former or that the two species would have been able to reproduce together had they been contemporaries. Be very careful with the solvent, it is highly flammable and should be worked with under some type of a fume or exhaust hood.
generation after generation. This chapter will introduce you to some of the more common biochemically important molecules and processes. The characteristics it possesses fit well into its environment. This dance attracts the female's attention. Research the organism and formulate a research question, which must be specific. Each container is tested
for the presence of a particular antibody. Critical thinking is characterized by reflective inquiry, analysis, and judgment. The spectrophotometer is set at an appropriate nanometre setting in order to give the best reading of the optical density of the colour change. Examples of this are given to help you to see the importance of biology in an
international context. Because we know what is in each probe, if the cDNA hybridizes with a probe we now know what DNA was present in the original sample. Folic acid is essential to bacteria as a coenzyme. viviparum. 193 04 In her description of living in Biosphere II, a hermetically sealed experimental facility developed in Arizona, USA,
researcher Jane Poynter said she had a new appreciation of the air she was breathing. • The rate of transit of materials through the large intestine is positively correlated with their fibre content. ATP and ADP are discussed in more detail in Chapter 2. Genes located on the single Y chromosome are responsible for early testes development and
relatively high testosterone production, resulting in male reproductive structures during subsequent foetal development. LH and FSH secretions increase during puberty, leading to ovulation and sperm production, among other functions the reabsorption of water from the
collecting ducts in the kidneys, it is therefore involved in the homeostatic mechanisms of osmoregulation Exercises 17 Differentiate between the actions of peptide hormones and steroid hormones and steroid hormones and steroid hormones and steroid hormones. The summation of the messages is the way that decisions are made by the central nervous system (CNS). The underside of a horseshoe crab (Limulus
polyphemus). It enables certain traits to be passed on to the next generation. Colony of Penicillium mould growing in a Petri dish of nutrient agar. How can we know? They do this under the control of DNA, each polypeptide being created under the control of a specific area of a specific DNA molecule called a gene. Each chromatid includes the long
arm as well as the short arm (the one that contains the coloured bands in this example). Rigor mortis decreases after about 36 hours. mRNA exits the nucleus through a nuclear pore. He was able to separate cells from a single sea urchin embryo and grow two identical embryos. Pili and flagella Some bacterial cells contain hair-like growths on the
outside of the cell wall. • Skill: Drawing diagrams to show the stages of meiosis resulting in the formation of four haploid cells. Because so much energy is lost at each level (90%), the only way to have more energy available for the top level is to increase the energy going into the bottom level, for the producers. They should be able to explain the
patterns or trends in these graphs. If there is no pattern in the frequency of a trait between females and males, it is probably an autosomal trait. Extracellular Figure 1.19 Stage 1: A protein in a phospholipid bilayer opens to the intracellular Figure 3.19 Stage 1: A protein in a phospholipid bilayer opens to the intracellular Figure 3.19 Stage 3.1
evolutionary distance between species? A photon of light is absorbed by a pigment in Photosystem I. This might be challenging for an irregularly shaped pasture or park, in which case online aerial views of the area might be useful. Many of these reactions occur in specific sequences and are called metabolic or biochemical pathways. Note how each
amino acid is identical except for the variable R-group. Answer: the difference in growth refutes the hypothesis. A protein will lose its normal three-dimensional shape, and thus lose its functionality, in these circumstances. This scaffold can connect severed axons. A stroke is caused by a blocked or ruptured blood vessel. This topic raises some
interesting Theory of Knowledge questions. If a mutation caused a shell to be bright white and/or the chicks to be bright yellow, the mutation would be unlikely to be an advantage to this species. This mechanism of auxin movement between adjacent cells continues until there is a greater concentration of auxin on the stem's dark side. Because of this
and many other reasons that will be discussed later, the prokaryotic cells are thought to have appeared on Earth first. To learn more about the electron transport chain, go to the hotlinks site, search for the title or ISBN, and click on Chapter 8: Section 8.2. The haem group of the carrier is the part that is easily reduced and oxidized. Eventually, it
would accidentally touch the lever that was in the box, which would deliver a pellet of food. (Total 3 marks) 2 Draw a diagram of the human digestive system. Casting nets in hundreds of selected locations Sampling with nets is called trawling. Again, only a small number of chromosomes is shown. But in nature there are frequently exceptions, and that
includes things that are called 'universal'. • Epinephrine increases the heart rate to prepare for vigorous physical activity. What does it reveal about the half-way point in this image of a DNA double helix being
unzipped) would have started on the left and be moving towards the right. The purebred short parent can only give t. Because it is impossible to go back in time and measure the temperature of fossils of temperature-sensitive
organisms, to estimate the climate back then. 1 Explain several factors that may play a role in the movement observed animal behaviour. Plasmids have very important roles to play in some techniques involving genetic engineering/modification. If
you wave your hand suddenly in front of someone's face, he or she will automatically blink. Once a steroid hormone has entered the cytoplasm of a cell, it binds with a receptor protein and forms what is called a receptor-hormone complex. 

Transfer of excited electrons occurs between carriers in thylakoid membranes. Many, but not all, bottom
feeders in rivers, lakes, and oceans are detritivores. The first commercial example of a GM food was the Flavr Savr tomato. Because of this dipolarity, water molecules in very interesting ways. If your doctor orders a lipid blood test, chylomicrons are some of the low-density lipoproteins (LDL) that are
measured. The name trypsin and the method used to activate it are not required. In the experiment published in the article, using both glycerol and rhamnolipid, 58% of the crude oil was degraded. C If an adaptation to the environment is useful, an individual will develop it and pass it on to its offspring. W. This allows methylation patterns to be
maintained. 7.3 Information transferred from DNA to mRNA is translated into an amino acid sequence. The new plasmid makes the cells resistant to the antibiotic. A notochord is a line of cartilage going down the back that provides support to the animal. Smaller vessels like capillaries cannot be seen without magnification. The erythrocytes have no
nuclei and few organelles or other components other than haemoglobin. In contrast, carbonaria moths are no longer effectively camouflaged and get spotted and benefits. This bond is no longer needed, as the second tRNA is currently
bonded to its own amino acid, and that amino acid is covalently bonded to the first amino acid. When a muscle is not contracting the binding sites on actin are covered by a thin protein filament called tropomyosin. There are two main categories of glands. Genetic modification of crops has many risks to be considered: t the potential for herbicide
resistance genes to escape into the wild population t unintended harm to other organisms, such as insect pollinators and amphibians t reduced effectiveness of herbicides t possible human health risks, for example some studies have found glyphosate in human urine. • Arteries, capillaries, and veins Arteries are blood vessels taking blood away from
the heart that has not yet reached a capillary. However, a typical person would only survive 1 week or less without any water intake. This requires these two nucleotides to become covalently bonded together, because they are the beginning of a new strand. Nectar is considered by some to be an example of a plant exudate. Too often people think that
climate change is someone else's doing, that their personal day-to-day decisions do not have an impact. The thickened leaves often include a more developed cuticle to minimize water loss. Let's explore what happens to ingested foods. Myofibrils run the length of the cell. Remember that, even though the changes can be observed in individuals from
generation to generation, what is of importance is what happens at the level of populations rather than at the individual level. It begins with layers of mesh topped with soil and plants called rafts. (2) (d) (i) Outline the effect of sea water temperature on echinoderm larvae numbers. Once pollination occurs, the next step is fertilization. As European
human populations spread out and established populations outside Europe, notably in North America, they brought their lactose tolerance (and their livestock) with them. H2O guard cells is largely because of the transport of potassium ions. 6 Figure 13.12 Glyphosate- resistant weed species in the
USA. If it is a second (or third, etc.) encounter, the response is known as a secondary immune response. The most widely accepted explanation for the movement of water and minerals upwards in plants has several names. For example, an organism may have to control fluctuating temperature and acid-base levels to create a constant internal
environment. Although polyploidy is rare in animals, certain species of the whiptail lizard in the genus Aspidoscelis show polyploidy and can reproduce without a male. It refers to a type of prejudice whereby a person gives an unfair preference to one opinion over another, rather than giving a balanced argument. 

Deletions, insertions, and frame
shift mutations do not need to be included. If the protein is an enzyme, it is ready to catalyse 78 a reaction. On the other hand, it might be more attractive to mates. Cells have enzymes attached to membranes that catalyse many chemical reactions. The fluid stroma is similar to the cytosol of the cell. 4 During voyage cargo hold full ballast tanks empty
Figure 13.25 Cross-section of ships showing ballast tanks and the ballast water cycle. Exercises 9 Why do plants need both mitochondria and chloroplasts? • Go to your downloaded haemoglobin file and select all the text and paste it into the text box in the rectangle just below STEP 1 (enter your input sequences). Recall that a species must be able to
freely interbreed with members of the same species to produce fertile offspring. Some languages in and around that country just by looking at the names for 'pig' in the various languages in and around that country. There is also a need to get rid of the increased levels of carbon dioxide that accumulate in
the bloodstream. The answer is that there must be some kind of mechanism that could explain how one could cause the other. Individuals that reach maturity have the possibility of reproducing and passing on their genetic material. CHALLENGE YOURSELF 10 In order to better understand the basic structures of RNA and DNA, it is useful to compare
and contrast their characteristics. Air at higher altitudes is at a lower pressure. 8 Why is BMI a better reflection of a person's health compared with body mass alone? This virus is made of RNA (green) and a protein coat (pink). Treatment of the melanoma should lower the protein biomarker levels. 10 Describe the resistance seen in weed species in
suspends her own natural hormones associated with her menstrual cycle. You and the elephant seal are both mammals. All organisms alive today have evolved for the same number of years: we are all survivors. (3) (d) Suggest why patrolling is a social behaviour. It is a five-step process. With a better understanding of cell structure and metabolism, as
well as the new techniques of gene sequencing developed over the past few decades, we now know that some organisms that were put into the same categories in the 1700s should not be together in the same genus or even the same organisms that were put into the same organisms.
and his team worked out the details of carbon fixation. • A gene on the Y chromosome causes embryonic gonads to develop as testes and secrete testosterone. • Carbon dioxide diffuses from the atmosphere or water into autotrophs. 48–56, Fig. nucleus accumbens Broca's area is one of two parts of the cerebral cortex linked to speech and language
(the other is Wernicke's area). Empiricism = the belief that our senses allow us to acquire knowledge. A gene is not a fixed sequence of bases like the letters of a word. Another grabs the end of its tail and says 'It's covered in long hairs'. The surviving resistant bacteria would then be a new strain of bacteria. It receives products from the ER. To learn
more about vitamin C, go to the hotlinks site, search for the title or ISBN, and click on Chapter 15: Section D.1. Linus Pauling was an American chemist and biochemist who, in his book, How to Live Longer and Feel Better (1986), suggested that large doses of vitamin C would protect people against colds. The carbon on the far left of each structure is
called the omega carbon. Hepatocytes: these are the most numerous cells in the liver, and are the most active in removing and processing chemical toxins from the blood. Parents who find out that their future child will have a chromosomal disorder that would lead to learning disabilities have a choice to make: some may choose to terminate the
pregnancy and try for another child without any anomalies whereas other parents may decide that they will keep the child no matter what. Bile is added to the duodenum when fatty foods are being digested in order to emulsify fats. No two brains are identical, and your brain continues to change throughout your life. Explain your answer. The sensoryent
and motor neurones connect in the brain rather than the spinal cord. A Figure 8.25 B Scientists in laboratories located around the world are presently working on the development of an artificial leaf. If p = 0.50, it means the difference could be the result of chance alone 50% of the time. Later, they pick an image at random and show it to the
participant while he or she is still in the scanner. International Baccalaureate ® is a registered trademark of the International Baccalaureate organization. Application: Evolution of antibiotic resistance in bacteria. The plant material is fed to microorganisms that ferment it and in the process release ethanol. With a patent, the company could charge a registered trademark of the International Baccalaureate ® is a registered trademark of the International Baccalaureate organization.
pharmaceutical manufacturers that wanted to use the gene to make new medicines. A Two different species of the same genus. Cardiac muscle cells joined together by interconnections called intercalated discs. Interpreting the 2 value calculated Once we know the value, we need to know what it
means. Young male sparrows sing a crude species-specific song that is inherited. • Application: Comparison of diploid chromosome numbers of Homo sapiens, Pan troglodytes, Canis familiaris, Oryza sativa, and Parascaris equorum. If you want to calculate the actual size of a specimen seen with a microscope, you need to know the diameter of the
microscope's field of vision. 11 What is the function of an auxin efflux pump in plant cells? 2 (a) Stinging cells present, can show radial symmetry...
                                                                                                                                                                                                 ... The hypothalamus produces a hormone known as gonadotropin-releasing hormone (GnRH). nobel prizes/medicine/ laureates/2000/press.html If the siphon of the snail is stimulated once, the
gill is retracted. These are bone-to-bone joints where there is a self-contained capsule area that contains a lubricant called synovial fluid. Fifteen shells were measured from each group. The cap and poly-A tail seem to protect the mature mRNA from degradation in the cytoplasm and to enhance the translation process that occurs at the ribosome.
NATURE OF SCIENCE Assessing risks associated with scientific research: patient advocates will often press for the speeding up of drug approval processes, encouraging more tolerance of risk. These two reactions occur together during chemical research: patient advocates will often press for the speeding up of drug approval processes, encouraging more tolerance of risk. These two reactions occur together during chemical research: patient advocates will often press for the speeding up of drug approval processes, encouraging more tolerance of risk.
the gene that codes for flower colour, plus a superscript, which refers to the specific colour, R (red) or W (white). Many scientists disagree and have published research showing that climate change is not due to human activity. Individual phospholipid molecules should be shown using the symbol of a circle with two parallel lines attached. The hepatics
portal vein is the other blood vessel supplying blood to the liver. Identification of lung tissues with light and electron microscope. (3) (Total 6 marks) 573 13 Option B: Biotechnology and bioinformatics Essential ideas B.1 Microorganisms can be
microscope, multiply the power of the ocular lens by the power of the objective lens. Two examples of genetic traits that have this particularity are colour blindness and haemophilia. It has since been shown that all parts of the tongue can taste sweet, sour, bitter, and salty. Platyhelminthes Flatworms have only one body cavity: a gut with one opening
for food to enter and waste to exit. Over many generations, this process reduced the number of light-coloured genes from the population and favoured the allele for dark coloration. So what prevents blood from flowing back up into the vena cava and pulmonary veins when the atria undergo systole? If ADH is present, the collecting duct becomes
ones that have a higher chance of being eaten. Another way that antibodies help is by recruiting other cells and proteins to fight the pathogen. vii Introduction The nature of scientific process as it applies to biology. • There is considerable
heat loss as a result of cellular respiration at all trophic levels (shown by the wavy arrows in Figure 4.2), although the loss of heat varies from one type of organism to the mean size of the group living closer to the water indicated that barnacles living closer to the water had larger shells. This is an artist's impression of human nerve cells.
Test three different areas with different types of soil, e.g. farmland, parkland, and a garden. 503 12 Option A: Neurobiology and behaviour Exercises 1 Describe spina bifida. In chemiosmosis protons diffuse through ATP synthase to generate ATP. Both are drugs that affect transmission at the synapse. The example in Figure 3.9 shows one of the 23 three different types of soil, e.g. farmland, parkland, and a garden. 503 12 Option A: Neurobiology and behaviour Exercises 1 Describe spina bifida.
pairs of homologous chromosomes found in humans. Pat Tosto I dedicate this book to the most important people in my life, my family. And yet, it is impossible to carry out investigations such as breeding experiments with organisms that have gone extinct. Remember, nature has been doing this for a long time by forming identical twins. The bacteria
that received the first message then make even more inducer. Because of this reaction, there is a large drop in the potential energy of the compounds on the produced in the reaction. In our arteries, pressure receptors can
detect a change in blood pressure. • Atrial systole does not build up very much pressure. Animals feed on plants, digest, and rearrange plant proteins to make their own proteins. • The GenBank® database can be used to search for DNA base sequences. This passive flow of water and the minerals dissolved in it is referred to as bulk flow or mass flow
Batches A batch is the volume of nutrients and other materials (substrate) added to a fermenter. The ornithologists noticed that the UK blackcaps left to go back to Germany 10 days earlier than the Spanish blackcaps. urmc.rochester.edu/Media/life-sciences-learning-center/ documents/DNA Microarrays and Cancer.pdf, p.
Other countries do not have such policies (or the policies are ignored by smugglers), and fossil hunters can sell fossils for profit to people wanting to add them to their personal collections. Figure 6.17 A neurone axon at resting potential. Which organisms depend on them? Metabolism: reactions controlled by enzymes If you were to visualize zooming
into the inside of a cell down to the molecular level, you would see thousands of molecules produced in the step-bystep pathway to achieve the end product. vascular cambium cork cambium lateral meristems Apical
meristems add primary growth, or growth in length. An example is Escherichia coli, which is commonly found in animal waste products. t t T tt tt tt trigure 3.28 Test cross between a heterozygous recessive short plant. coli? 7 State the specific function of each of the following: Broca's area; nucleus accumbens; visual plant and a homozygous recessive short plant.
cortex. State Mendel's law of independent assortment. coli grown in optimal conditions. The pain reflex arc is part of this system. All they need are signals to synchronize their contraction activity. NATURE OF SCIENCE Now is an ideal time to have a classroom discussion about cell characteristics, the functions of life, and exceptions to the current
cell theory. This results in an autonomic nervous system signal being sent by the vagus nerve to the medulla oblongata. This time, no result: she is still sick and asks her doctor what is wrong. • Guidance • Students should know that visible light has wavelengths between 400 and 700 nm, but they are not expected to recall the wavelengths of specific
colours of light. The protein enzymes involved in DNA polymerases I and III. They can develop in a short time, even in hours. Here is an example. These proteins will have the hydrophobic region in the mid-section of the phospholipid backbone.
When sunlight strikes the red pigments in the shirt, the blue and the green wavelengths of light are absorbed, but the red wavelengths are reflected. Jane Goodall, who is famous for observing the behaviours of chimpanzees in their natural environment, is an ethologist. This technique is called gene therapy. Just as one screwdriver does not work for
all DIY jobs, molecular biologists have several tools to choose from as they try to transfer genes into a plant. Exercises 1 List four essential nutrients. (a) If each spike on this graph shows an impulse somewhere in the middle of an axon, what event must have just occurred in the area of the axon just preceding this one? Can you see that there are large
differences between the two sets of data? 2 Explain how nucleosomes contribute to transcription control. A cavity in the graph for small female snakes, calculate the ratio of unsaturated lipids indicated by the arrows. • Hair-like cells on the leaf
surface trap a layer of water vapour, thus maintaining a higher humidity near the stomata. Old classification Aster cordifolium Blue wood aster. The rate at which the rats excreted calcium was measured. Here male crabs fight furiously over access to
females. Pinocytosis is another active transport mechanism often used to absorb molecules from the interior of the villi cells, and also requires ATP from the mitochondria. The researchers at Myriad were the first to patent these fragments of DNA and recognize their usefulness. coli is in the bacterium's single
chromosome. (a) Is there a strong or a weak correlation between carbon dioxide levels and atmospheric temperatures over the last 400 000 years? Sharing of information is a common occurrence amongst these laboratories and their researchers. When a scientist comes up with new evidence, old theories can be challenged or even overturned. The
chances remain the same no matter how many boys or girls the family already has. Look closely at the incompletely digested food from the stomach artwork opposite and you will see the pancreatic duct. In plants, unlike in animals, there is often a great deal of interaction between the different hormones to bring about the most appropriate response.
This is very important for the efficient neural processing characteristic of organisms with a high functioning nervous system. Conversely, if one organism benefits from, the process is passive immunity. THC mimics the neurotransmitter anandamide. Application: Discovery of genes by EST data mining.
Xylem is actually a complex tissue composed of many cell types. Table 10.5 shows the results for an experiment using purple flowers/red flower as one trait and long are the dominant traits). Bloodletting was believed to restore the healthy
balance. Autotrophs obtain inorganic nutrients from the abiotic environment. Plasmid transfer involves one bacterium donating genetic information to another in a ring of nucleotides called a plasmid. The nucleus was removed from a cultured cell. repopulation of biofilm Biofilms and trickle filter beds A trickle filter is a biofilm of aerobic bacteria
attached to the surface of filter media. sister chromatids centromere anaphase chromosome Prophase Examine the figure below. This absence of a neurotransmitter that is excitatory. How useful are these metaphors? Also, some of the minerals
dissolved in the water will move into the roots as water moves into the outer root cells via osmosis. Pairing of homologous chromosomes III. It inhibits an enzyme, EPSPS, that is necessary for making essential amino acids.
red blood cell through the complete circulation pattern as shown in the right part of the figure. Because interphase involves growth, it is essential that protein synthesis occurs at a rapid rate during this phase. Consider this: all events in nature are caused by physical phenomena. 10 Draw and label the stages of meiosis II. 122 • Once a DNA sample
has been taken, it is chopped up into fragments and copies are made of the fragments. The bile salts are the emulsifying portion of bile. Caused by the combination of groups of polypeptide chains, such as occurs in haemoglobin. It is the holotype for the extinct hominid species Paranthropus boisei and the skull is now at the Natural History Museum in
London. Many foods contain bacteria and fungi, and the vast majority of these are not harmful within the alimentary canal. (e) What do you think would happen if discrete sensory information from a receptor was being received repeatedly at a rate faster than about 5 milliseconds apart? In effect, the contents of this table can be summarized in the
generalized formula for calculating 2, which is: (O - E)2 2 = E where = Greek letter chi, O = observed values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the results of the experiment), E = expected values (the experiment), E = ex
unsaturated lipids were determined. This is why practice makes perfect. • Applications and skills: Application and overhydration and overhydration. This species of moth can have a peppered (grey) form or a melanic (black) form; the melanic form is a rare mutation that usually affects less than 1% of a population. These two types of cells
are neurones and glial cells. How important are such discoveries in ensuring funding for future missions? (a) Modify a pair of Petri dishes to make a choice chamber, in which the isopods are given an opportunity to be in humid or dry conditions. Root hairs increase the surface area over which water and mineral ions can be absorbed by a factor of
nearly three. The bacteria, after a series of changes, became specialized in providing the eukaryote with ATP. 3 anticodon bases Once an mRNA molecule has been transcribed, the mRNA detaches from the singlestrand DNA template and floats free in the nucleoplasm. If you had to make a list of what you would need, there would be some obvious
things, such as liquid water, food, and oxygen gas to breathe. • Applications and skills: Application: Morgan's discovery of non-Mendelian ratios in Drosophila. Each myoglobin molecule consists of a single polypeptide, a haem group, and an iron atom. The chances of a characteristic showing up in one sex of fly is different from the chances of it
showing up in the other because the eye-colour gene is found on Drosophila's X chromosome. Brain lesions One method of studying the brain is to look at people who have had injuries to particular areas of their brain. vessicles containing neurotransmitters (serotonin) shape of synapse modified adenyl cyclase Figure 12.42 The effect of slow-acting
neurotransmitters on the postsynaptic neurone. The focus is on solving the problem decimated the fishing stock. Mating begins with a male doing a zigzag dance when he sees a female. The centrosome is located at one end of the cell close to the nucleus. The Human Genome Project
was completed in 2003 and has identified the chromosomal location and sequencing of all of the genes in the human genome. Unlike nutrients, energy cannot be recycled. There are also two divisions to the ANS: the sympathetic system and the parasympathetic system. Sensory input from the right hand is sent to the left primary somatosensory.
cortex, and vice versa. This interrupts oxygen flow to the brain cells. The reaction between the phosphate group on the 5 carbon and the hydroxyl group on the 3 carbon is a condensation reaction, with a molecule of water released. When the liver is not functioning properly, there are also likely to be many other symptoms. Each muscle is composed of
thousands of cells, called muscle fibres because of their elongated shape. Reprinted by permission from Macmillan Publishers Ltd (a) (i) Identify which supplementary food was most effective in reducing calcium loss. It is the largest common factor in a series of related species showing polyploidy - any chromosome number from any of the related
species should be divisible by x. N = sample size of the population If you plug in the values from the above example s = standard deviation with bean plants, you should get t = 0.06. Soon these spermatozoa will detach and move through the lumen to a storage area called the epididymis. Testosterone causes prenatal development of male genitalia
and both sperm production and development of male secondary sexual characteristics during puberty. A polypeptide is a single amino acid chain with its own primary structure. Levels of dissolved oxygen, which are so important to fish, are sixty times greater than they were at the beginning of this effort. dialysis solution balance of water and ions
urea Some people develop crystalline structures known as stones within their kidneys that can cause blockages and severe pain, especially if the kidney stones pass into the ureter. However, methane concentrations are about 400 p.p.m. (parts per
million), meaning that the concentration of carbon dioxide is more than 200 times greater than that of methane. There is another way the light-dependent reaction of photosynthesis may produce ATP. There is another way the light-dependent reaction of photosynthesis may produce ATP. There is another way the light-dependent reaction of photosynthesis may produce ATP. There is another way the light-dependent reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction of photosynthesis may produce at least a second reaction reaction of photosynthesis may produce at least a second reaction rea
of that particular tissue. Carbon number 1 is the carbon of the carbon o
single structure, that structure is called a nerve. One of the benefits of embryogenesis is that it enabled scientists to learn the key principles of neural development. For many years, debates have addressed the importance of innate attributes and abilities versus those learned through experience. Excretion is essential to life because it
enables those chemical compounds that an organism cannot use or that may be toxic or harmful to it to be released from the organism's system. One of the clover leaf contains an exposed anticodon. B They prevent short-wave radiation from reaching Earth's surface. Psychedelic plants have been used in the past to induce a religious or
mystical experience. Application: Causes and consequences of emphysema. • Guidance • Osmosis experiments are a useful opportunty to stress the need for accurate mass and volume measurements in scientific experiments. Mitochondria are bounded by a single membrane.
CHD is higher in men, but is the leading cause of death in women as well. 1 C 200 000 South Florida fishing fleet registered vessels 150 000 recreational 100 000 50 000 commercial 0 1965 1970 1975 1980 1985 1990 1995 2000 2005 year The aim of the study was to give the fishery management in Key Biscayne strategies for promoting
sustainable fishing practices. When the first spermatozoon and ovum fuse their plasma membranes, ! Haploid nucleus of sperm enters ovum - this restores the diploid number. The vast majority of molecules typically found inside and outside most cells are also polar molecules. (c) In what phase of the cell cycle is the alveolar cell showing a nucleus?
However, when space and food begin to be limiting factors, then natality is lower and mortality higher. For example, a rat can learn that pressing a pedal releases food. 3 It has been found that some trees and shrubs are able to live in seawater. Annelida Annelida
Today, areas that have modern sewage processing and drinking water treatment rarely have problems with cholera, optic nerve optic chiasm lateral geniculate nucleus primary visual cortex. When a coronary artery
or one of its main branches becomes blocked, it is known as a coronary thrombosis or an acute myocardial infarction, i.e. a heart attack. The interior of the resulting tube is called a peptide bond. In reality, before the
chromosomes start preparing for the cell to divide, they are all uncoiled and are not visible in the nucleus. Many people who live in areas of the world where the availability of any type of food is severely limited will have neither glycogen nor body fat to make use of. For example, a person either has cystic fibrosis or not. chromosome DNA wrapped
around histone core and held in place with another histone (not shown) central cores of nucleosomes (48) humans (46) 4 Figure
5.22 Solutions 1 2 (a) (b) (c) (d) (a) (b) (c) (d) (e) (f) Digitalis and Veronica. This entire structure is known as a follicle, and typically enters the Fallopian tube soon after ovulation. Fortunately, we have Novocain. Graph A's regression line suggests that there is very 793 Mathematics, and information and communication technology skills • Trend lines
are useful for seeing whether there is an overall pattern or tendency in the data points. Techniques of food production have changed dramatically since Malthus' time, and we have not yet reached the tipping point he predicted. However, if it remained in the synapse, the postsynaptic membrane would go on firing indefinitely. When methane
undergoes a phase change, because of its lack of polarity, there are no hydrogen bonds that influence the change of phase. The stronger the colour, the higher the original quantity of antibody that was present in the serum. Glass lenses were used in the first century by the Romans to magnify objects. Besides providing ATP, these companion cells are
responsible for keeping the sieve tube members alive. Hence, sperms and eggs only contain 23 chromosomes, one from each pair, rather than complete pairs. All molecules composed of just carbons and hydrogens (hydrocarbons) are non-polar. But how far do we go? Liposomes are artificially prepared sacs of lipid molecules that have an aqueous
interior. When genes are expressed, the result is a protein or series of proteins. Any chemical that could inhibit this would also be damaging to our own body cells. Finally, the strength of the remaining synapse is increased. The release factor does not carry an amino acid. There are challenges to this definition, however. • A negative control is a check
for false positives. 705 14 Option C: Ecology and conservation CHALLENGE YOURSELF 60 50 length 40 weight 30 20 10 0 14000 biomass (lbs) 250000 biomass (lbs)
printout and analysis of the genome of the man she wants to know more about. Values greater than 0 indicate the ballast water was warmer than the pier-side water. The signal molecule from the target cell can be secreted into the extracellular environment or carried on the target cell's surface. The signal molecule from the target cell can be secreted into the extracellular environment or carried on the target cell's surface.
haemoglobin, allowing the transfer of oxygen in the placenta onto the foetal haemoglobin. Solutions top predators 10 kJ m-2 yr-1 reproducers 10 000 kJ m-2
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religion take note of scientific developments? Bacteriophages are organisms that are rapidly grown and easily detected. Your teacher will provide the information you need to produce a wet mount. 442 When one phenotype is favoured over two extreme phenotypes, it is called stabilizing selection. This glucose is absorbed into the bloodstream in the

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capillary beds of the villi of the small intestine, and thus increases the blood glucose level. The stem cells delivered the neural growth factors needed for the spinal cord injury to be repaired. Figure 4.11 shows some of the places where crude oil has been found in the world. Within the ovaries are
cells known as follicle cells, and the true reproductive cells that are at a stage of development called oocytes. • Their DNA is free; it is not attached to proteins. • the light-dependent reaction. Cochlear implants convert sound into electrical signals that are sent directly to the brain. Haemophiliacs lack the ability to
produce one of the chemicals needed for normal clotting. In a healthy animal the blood leaving in the renal amount of salt ions (Na+, K+, Cl-, etc.) • a lowered amount of water • a nearly identical amount of glucose • a nearly identical amount of protein •
absolutely no change in blood cells. 8.1 Metabolic pathways consist of chains and cycles of enzyme-catalysed reactions. Identify the difference between the two and complete the phrase below. Because the cane toxic, no predators can eat them. • The structure of the mitochondrion is adapted to the function it
performs. Randy McGonegal I dedicate this book to my husband, who has been my editor and constant support. Ovulation occur near the middle of the cycle. Notice that the visible light portion of this spectrum has colours with wavelengths of between 400 nm and 740 nm. Example: Aa carries the gene for albinism (like the
penguin in the photo on the next page) but has pigmented skin, which means an ancestor must have been albino; if both parents are unaffected by a recessive condition yet both are carriers, some of their progeny could be affected (because they would be aa). Each spermatogonium is capable of undergoing either
mitosis or meiosis at any given time. • Spinach, Spinacia oleracea, or kale, Brassica oleracea, leaves are recommended for this procedure. pith heartwood sapwood As early as the 1600s, it was observed that trees slowly die when a ring of bark around the trunk is removed. These internal bones comprise what is called an endoskeleton. • Repeat this
as many times as possible in, say, an hour: the more quadrats, the better. alpha chain alpha chain beta chain Dimers are proteins with two polypeptide subunits. At this point, the structure is referred to as an activated amino acid, and the tRNA may now deliver the amino acid to a ribosome to produce the polypeptide chain. 105
02 Molecular biology The visible light spectrum • the purpose of considering how chlorophyll absorbs light energy, we are going to consider three regions of the spectrum. • the purpose of considering how chlorophyll absorbs light energy, we are going to consider three regions of the spectrum.
the top of the hierarchy are the three largest groupings for organisms, called domains. Now that you are familiar with BLASTp, insert your name (first, middle, and surname) into the FASTA query rectangle. The pH scale is a logarithmic scale. Seen from space along the edge of Earth's curve, the atmosphere is a surprisingly thin, almost insignificant
looking, layer of gases. They may also serve to reflect light thus allowing a lower leaf temperature and less water loss. Other organisms, such as certain protists, fungi, and worms, can also be pathogens. DNA differs from RNA in the number of strands present, the base composition, and the type of pentose. After reading through this information
create a list of bullet points that offer advice to people to help them make good lifestyle choices in order to reduce their chances of developing CHD. According to Karl Popper, science is based on a series of theories. The thoracic cavity is closed to the outside air. For both processes, the double helix must be opened to expose the base sequence of the
nucleotides. Again, although they are similar, homologous chromosomes are not identical to each other. This is especially helpful for people who are lactose intolerant. A chromatography solvent that consists of an organic solvent, such as a type of alcohol, acetone, or petroleum ether, will be used. Both have regular repeating patterns. This is very
similar to the unzipping process involved in DNA replication, but in this case only the area of the DNA where the particular gene is found is unzipped. With very rare exceptions, the vast majority of researchers and medical professionals are against the idea of reproductive cloning in humans. Here is a partial list of the substances absorbed through
villi into the bloodstream or lymph fluid: • water • glucose (plus other monosaccharides) • amino acids • nucleotides • glycerol • fatty acids • mineral ions • vitamins. The nucleus accumbens (see Figure 12.17) is associated with the reward circuit in the brain. Most people lose the ability to produce lactase as they get older, and by adulthood no
longer produce any significant amount of lactase. The cytoplasm is green because of the presence of a large number of photosynthetic chloroplasts that make food for the organism using sunlight. This process doubles the quantity of DNA and also ensures that there is an exact copy of each DNA molecule. When a chemical is a competitive inhibitor, it
competes for the active site of an enzyme, and its concentration must be kept high to keep the chemical reaction occurring at a slower rate. As the first technique in this area involved using embryos, the cells are referred to as embryonic stem cells, and the branch of laboratory work that investigates therapeutic cloning is called stem cell research.
pylori employs the enzyme urease to create ammonia, and this helps to neutralize stomach acid. State one example of an exception to this law. This made it easier to grow in areas with high salinity. If you get it near a pond, be sure to take some pond water separately as well. Look at Figure 5. Since the Sanger technique was invented, many
negative pole. How much money do you think people would be willing to pay for a molecule that could reverse the effects of ageing and prolong life by several decades? Each of the polypeptides would require a different gene within the bacteria's genome to code for its synthesis. Figure 1.30 This animal cell is in prophase. Nitrosomonas converts
ammonia (NH3) into nitrite (NO2-). Sodium ions diffuse in then potassium ions diffuse out. • Peyote is a cactus that is ingested during some Native American religious ceremonies. This organism has been used by many researchers to determine the details of, and the factors that affect, a process known as photosynthesis. Fortunately, certain gases in
the atmosphere filter out some of the more harmful radiation from the Sun, such as UV radiation. Think of your skin as having two primary layers. The toxin results in a severe diarrhoea that leads to dehydration and is frequently fatal. If a split-brain person is sitting down looking at the dot and a picture of the spoon is flashed up, the visual
information about the spoon crosses the optic chiasma and ends up on the left hemisphere. This removal of the apical bud allows the production of much more flowers and fruit. Where a gene is located determines whether or not the trait it controls is more common in males or females. A second option when a
person's kidneys fail is to have a kidney transplant. • Visual encoding: converting information into mental pictures are available online that you can use to practise labelling the parts of the eye. Of the many sperm cells that may be present, only one will penetrate the egg. Anaphase II 1 2 3 metaphase II 1 2 3 metaphase II 4 Centromeres of each
chromosome split, releasing each sister chromatid as an individual chromosome. Substrate-level phosphorylation, mentioned in the earlier phases of cellular respiration, does not involve an electron transport chain. The cDNA will also be made of molecules (nucleotides) that have fluorescent dyes attached to them as labels. The addition of minerals
allows the producers to synthesize complex molecules such as cellulose, proteins, and lipids. • Several species, for example the mangrove, secrete salt through salt glands. In addition to animal models, new technologies have increased our knowledge of how the brain recovers from a stroke. Ribosomes are small (20 nm) structures that manufacture
proteins. Also note that all of the expected values should be equal to or greater than 5. Sensory information from the hip or leg. Many animals use their pineal gland to help regulate their daily 24-hour cycle of activity, called the circadian rhythm.
This represents an adaptation feature to overcome harsh environmental conditions. Table 1.1 A comparison of light and electron microscope Electron microscope Electron microscope Electron microscope Inexpensive to purchase and operate Expensive 
to 2000× Magnifies over 500 000× Specimens may be living or dead Specimens are dead, and must be fixed in a plastic material Cells and their subunits are so small they are hard to visualize, so it is important to appreciate their relative sizes. Photoperiodism is the plant's response to light involving the relative lengths of day and night: a very
important factor in the control of flowering. They are always composed of a type of RNA and protein. However, when Marinobacter breaks down benzene the product is simply carbon dioxide. Both oogonia and primary oocytes are diploid cells. The result was devastation of both the ecology and the economics of that area for months. One chromosom
from each pair goes into each new cell. Could it have been a mutation that caused a change in the travel direction? Compare and contrast the data regarding the two plant species. Fundamental research ('I would like to find out how this
disease is caused so that we can find better medical treatments for it'). Second, we can draw conclusions based on the statistical analysis of the data. The changes that we are seeing now are happening on a scale of decades, and the speed and magnitude at which CO2 levels and temperature are increasing are unprecedented. Species are groups of
organisms that can potentially interbreed to produce fertile offspring. Separation of photosynthetic pigments by chromatograph *Safety alerts: Fumes from the chemicals used in this procedure are dangerous. The more you weigh, the more blood you need to supply oxygen and nutrients to your cells. 96 A specific tRNA molecule now floats in: its
tRNA anticodon must be complementary to the first codon triplet of the mRNA molecule. 3 Open ocean fisheries records show widespread decline of fisheries. To spread the cells out on the slide, use a mounted needle. What can we learn about the individual's karyotype from this figure? Leg of man femur Figure 11.4 The bones of the endoskeleton of
a human and the segments of the exoskeleton of an insect are similar enough to be given many of the same anatomical names. • Auxin is produced by all cells in the stem on the side towards the light source. Justice Clarence Thomas wrote 'A naturally occurring DNA segment is a product of nature and not patent eligible merely because it has been
isolated.' To learn more about genes, go to the hotlinks site, search for the title or ISBN, and click on Chapter 3: Section 3.1. 126 Exercises 1 What is the difference between an allele and a gene? Here is a quick summary of each RNA type: • mRNA, messenger RNA, as described above, each mRNA is a complementary copy of a DNA gene and has
enough genetic information to code for a single polypeptide • rRNA, ribosomal RNA, each ribosome for polypeptide formation. Genes for making vaccines have been put into plants, which can solve the problems of
cost and global shortages of vaccines. • Application: Swallowing, breathing, and heart rate as examples of activities coordinated by the medulla. After practising selective breeding for dozens and sometimes hundreds of generations, farmers and breeders realized that certain varieties of animals now had unique combinations of characteristics that did
not exist before. • The pollen tube grows down the style of the carpel. (b) In the south-west of France, a study of 127 French Basques found an allele frequency for d to be 0.51. Some water needs to be eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water needs to be eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water needs to be eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the total volume of water eliminated in the urine each day, but the urine each day, but the urine each day is a supplication of the urine each
nucleotides to code for a polypeptide chain or a series of amino acids making up a protein. Example: Aa is a heterozygous genotype. This is where cladistics is clearer than the Linnaean system. The palisade the 14N. 382 • The palisade the 14N. 382 • The palisade the 15N, the band that was higher contained the 14N. 382 • The palisade the 14N. 382 • The palisade the 15N, the band that was higher contained the 14N. 382 • The palisade the 14N. 382 • The palisade the 15N, the band that was higher contained the 15N, the band that was higher contained
mesophyll is located in the upper portion of the leaf, where light is most available. The position of the alleles of some genes is indicated. Figure 3.8 This drawing shows how DNA is packaged into chromosomes. He was not able to see the capillaries that connected arteries to veins, but he postulated their existence. Empty spaces separate the
rectangles along the x-axis. The other area is not water soluble and is non-polar. They allow you to apply your knowledge and test your understanding of what you have just been reading. In some countries, there is a very intense debate about whether the concept of evolution should be taught in schools. Layers found in thick sheets of ice that have
been formed by annual snowfall can also be used in a similar way as tree rings and ocean sediments. 100 soybean cotton Amflora: a genetically optimized potato that produces only one starch component and is used for technical applications. If the animal's body is directed towards the stimulus, we say it has a positive response. (Total 8 marks) 5 What
are Allium sativa and Allium cepa? Artwork showing fertilization. 99% × 500 = 495. What are the benefits of this 'conservatism'? Consider this quote, about the struggle to get a theory accepted, "A theory is a species of thinking, and its right to exist is coextensive with its power of resisting extinction by its rivals".— Thomas Henry Huxley, Science and
Culture, and Other Essays (1890), How closely does this fit with the development of theories of classification?..
quite easy to follow but this is a complex topic which has had to be simplified to make it an introduction to cladistics and the use of DNA sequences. product Mechanism of enzyme action. It is cause by a defective gene called ARSA. In some cases, environmental factors during an organism's
lifetime can have an influence in turning on or turning off certain genes. Currently, very little pollen of either type is found in desert and polar regions of the world. Testing for antibiotic resistance. Often when DNA evidence is used in a courtroom trial, it has a certain credibility as scientific fact, and yet we know from our own experience in lab work
that there is a degree of error in any procedure. Two Graafian follicles are visible, with an oocyte at the centre of each (two inner circles). • Reduced NADP and ATP are produced in the light-dependent reactions. The sense strand has the same sequence as the newly transcribed RNA, except with thymine in place of uracil. The peristaltic movement is
relatively fast within the oesophagus and slows dramatically in the intestines. To learn more about protein functions and structures We have spent a lot of time discussing protein production in the cell, because proteins are very important.
Option D: Human physiology Table 15.4 The American Heart Association has released the following blood pressure ranges for guidance when interpreting blood pressure ranges for guidance when in
blood pressure (hypertension) stage 1 140-159 or 90-99 High blood pressure (hypertension) stage 2 160 or higher than 110 Risk factors affecting coronary heart disease A digital sphygmomanometer designed for home monitoring of blood pressure. These blood
vessels are called the coronary arteries. 596 Vectors as an indirect means of inserting genes into plants Vectors are carriers of genes. Notice that the b6-f complex, which is a cytochrome complex, pumps the hydrogen ions into the thylakoid space. The correlation between body size and brain size The weight of the brain compared with the weight of
the body is called the E:S ratio, where E stands for brain weight and S stands for body weight. We discussed the structure of the mitochondrion in Chapter 1. Quantum rods can fluoresce under a wider range of colours than QDs, and can be used for imaging cancer cells. Data from log books should be crosschecked against sales receipts. Notice in
Figure 12.24 that both the rods and cones synapse with their own bipolar neurones. Is scientific knowledge progressive? The sexual reproductive organs of angiosperms are their flowers. Table 6.1 shows different types of molecules found in food and their molecular form before and after digestion. How much difference in structure and function is
there between animals? Huntington's disease is caused by an autosomal dominant gene on the seventh chromosome, and cystic fibrosis is caused by an autosomal recessive gene on the seventh chromosome. Not only is this rate consistent throughout the day and night, it is also at a relatively low level. It seems that robins are solitary birds, while blue
tits are flock birds. When the rings are counted under a microscope, it indicates the age of the fish. Fish have a twochambered heart and amphibians have a threechambered heart are flock birds. When the rings are counted under a microscope, it indicates the age of the fish. Fish have a twochambered heart and amphibians have a threechambered heart. Primary organization Figure 7.17 This figure represents a primary structure. The great benefit they have, besides being small, is that they glow a particular colour when
illuminated with low-intensity light. Variety in the population allows some individuals to be better adapted to whatever change in the environment is harmful to others. Emphysema is one of the diseases collectively known by the acronym COPD (chronic obstructive pulmonary disease). Globular proteins are more three-dimensional in their shape and
are mostly water soluble. This cellular union ensures that half of the genetic makeup of the resulting zygote is derived from each parent. The dormancy period is quite variable for different types of seeds. In addition, the haemoglobin tends to crystallize within the red blood cells, causing them to be less flexible. The 3-carbon molecules of GP are acted
upon by ATP and NADPH from the lightdependent reaction to form two other 3-carbon molecules called triose phosphate (TP). NATURE OF SCIENCE In 2001 three-dimensional X-ray crystallography was used to take the first pictures of proteins involved in quorum sensing. Porifera (b) Presence of differentiated tissues and organs
As you will recall, cardiac muscle never stops contracting, with alternating periods of systole and diastole occurring repeatedly throughout your life. What can be concluded from this? Climate change is not a debate or a controversy: it is well-supported by an increasing volume of data. One such anomaly is called Down syndrome, and it happens when
there is an extra chromosome in the 21st pair. (1) A non-polar (lipid soluble) steroid hormone enters directly through biphospholipid layer of plasma membrane. In this situation, the passive means of transport mentioned so far are not useful. • The target gene is linked to other sequences that control its expression. F f f Helen children's alleles F f
Mark f Chloe F F Lee 149 03 Genetics Genetic diseases are rare You have probably heard of some of the conditions listed above, but not all, and it is unlikely that you will encounter any more than a handful of people with these diseases in your lifetime, because they are so rare in the general population. Pseudomonas comes to the rescue again.
During the earliest part of the 20th century, chicks were added to the study of embryogenesis. Examples of heterotrophs include: • zooplankton • fish • sheep • insects. Any living organism or virus that is capable of causing a disease is called a pathogen. The food product known as liquid smoke can cause seeds of this type to germinate. This allows
replication to occur at a much faster rate. Cellular respiration and heat In the example of the grass and the grasshopper chemical energy is used for cellular respiration. In other words, the distribution of this fern species is not related to shade. Jesse Gelsinger, who was 18 years old, died during a gene therapy clinical trial. This
second type of cloning is called therapeutic cloning, and its aim is to develop cells that have not yet gone through the process of differentiation. Fomepizole is a competitive inhibitor of alcohol dehydrogenase, which catalyses the breakdown of ethylene glycol and methanol into toxic metabolites. The US health service recommends that women take
supplemental folic acid during pregnancy to prevent neural tube defects. eu 768bl, robert Kneschke 768cr, seralex 623tl, SNEHIT 170, tinadefortunata 263; genome.gov: 124t; Getty Images: 696br, Alan John Lander Phillips 574, altrendo travel 696bl, Brian Lawrence 442, BSIP / UIG 723, Cornstock 704, drbimages 767t, E.A. Janes 768c,
Gamma-Rapho 768, George Grall 699t, Janis Christie 645 tl, Jeremy Woodhouse 186, Jim McKinley 710t, Jon Gibbs 662, London Scientific Films 701t, Mark Raycroft 176t, Mint Images / Frans Lanting 223b, Paul Nicklen 699b, Photothek 585b, Ralph Lee Hopkins 643, Spike Walker 583t, Steve Gschmeissner 605b, Tetra Images 768bc, Travel Ink 768tl
UIG 204t; Imagemore Co., Ltd: 746, 772; NASA: 201br, 210c, 210b; Paul Billiet: 176b, 234; Pearson Education Ltd: Jules Selmes 770t; Randy McGonegal: 450; © Rough Guides: Paul Whitfield 126; Science Photo Library Ltd: 771, A.B. Dowsett 14, 292t, 427cr, 538, 539, 606, 744, 779t, 800bl, 590, 612 tl, 779 b, Adam Jones 404, Adrian T Sumner 417b,
Alfred Pasieka 54, 66, 88, 93l, 95, 277r, 287r, 453b, 707b, Alice J. In short, Goldacre says that the studies being published are not showing all the data and that, in order for doctors to decide whether a drug is safe to prescribe, they need to see both the positive and the negative results. • Over a beaker full of water, suspend a plant that will produce
roots in the water, for example garlic, onion, or potato. • Applications and skills: Application of acetylcholine by neurones at synapses. The development of herbicide-resistant soybeans has been development of herbicide-resistant soybeans have been development of herbicide-resistant
and so on, until you reached a family or genus that it fit into. Neurotransmitter diffuses across synaptic gap. Ventilation rate and tidal volume should be measured, but the terms vital capacity and residual volume are not expected. (2) (Total 6 marks) 413 10 Genetics and evolution Essential ideas 10.1 Meiosis leads to independent assortment of
chromosomes and unique composition of alleles in daughter cells. N, nucleus; RBC, red blood cell (erythrocyte). You will be amazed! Female birds of paradise are much less coloured and feathered than the males. ELISAs are also used to test for the presence of drugs in blood and urine. • In a tube with the cancer mRNA add nucleotides tagged with a
red fluorescent colour. As catalysts, the function of enzymes is to lower the activation energy of the reactions that they catalyse. The example in Figure 8 shows a newborn baby's body mass between the time of its birth and the age of 18 months. Bright fluorescence means the gene in the probe has matched with the gene in the blood or tissue sample
The human digestive system shown in Figure 6.1 has been simplified so that you can use it as a basis for practising drawing and labelling the digestive system. It is possible to put one species' genes into another's genetic makeup because DNA is universal: as you will recall (Section 2.6), all known living organisms use the bases A, T, C, and G to code
for proteins. The digestive enzymes of decomposers convert the organic matter into a more usable form for themselves and for other organisms. It is a very serious condition. Plants make use of the same part of the electromagnetic spectrum that our eyes are able to see. Applications and skills: Application: Cairns' technique for measuring the length
of DNA molecules by autoradiography. The lower curve shows the activation energy required when an enzyme is present to catalyse the reaction. 542 A.5 Neuropharmacology Understandings: Some neurotransmitters excite nerve impulses in postsynaptic neurones, and others inhibit them. Find out more about this by going to the hotlinks site and
clicking on Chapter 5: Section 5.3. 241 05 International cooperation and communication are key concepts in science. A cross between a homozygous for both of the traits (GgLl). 318 Some couples are unable to
bear children. Cell membranes are 10 nm thick, while molecules are about 1 nm in size. Arrow number 3 shows the point when primates lost their tails. Most eukaryotes have multiple pairs of chromosomes, and each chromosome will carry a different set of instructions for the cell, inner cell mass inner cell mass blastocyst in uterine cavity fluid filled
cavity trophoblast 488 When the blastocyst enters the inner cavity of the uterus, it is in direct contact with the inner lining called the endometrium. Once the cells of an organism have been collected and grown in culture, a karyogram is made following the steps below. 2, p. ! round yellow peas "9 ! round green peas "3 ! wrinkled yellow peas "3 !
wrinkled green peas "1 NATURE OF SCIENCE Mendel crossed two true-breeding plants with each other. Which species has the most similar number of genes to humans? When successful, the heart will continue beating on its own once the electrical shock has been delivered. The term germ line refers to cells involved in passing genes on to the next
Without a universal classification system, each language, culture, or region may have a different name for an organism. A a AA Aa a gametes from the other parent Figure 3.23 A Punnett grid. Let's consider what happens when a small blood vessel is damaged (see Figure 6.11). The enzyme DNA polymerase III then allows the addition of
nucleotides in a 5 to 3 direction to produce the growing DNA strand. Discuss what can be done to increase the sharing of personal knowledge in scientific research. The flourishing fast-food industry is a testament to how many people choose acquired tastes over good nutrition. Any diagram identified as a dorsal view (from the back) shows the right of the contraction of the
side on the right, and the left on the left. Although long-term tobacco smoking is the leading cause of emphysema, there are other causes, including long-term exposure to the following: The diagnosis of emphysema is often delayed because the symptoms develop slowly. 216, Photographee. These changes in the peppered moth population over time,
from light-coloured to dark-coloured to dark-coloured and then back again, is an example of transient polymorphism, temporary changes in the form of a species. Newer methods of DNA sequencing are faster and cheaper. DNA provides a code made up of 64 different 'words'. 1 2 3 4 5 An animal is trained to press a lever to get a reward. 722 People who have medical
calculations. Using the formula E = CSr, we can establish the relative capacity of brains of different species with different body weights. We have learned to link certain tastes, sights, and sounds with emotions. When the time is right, several eggs (oocytes) are then harvested surgically. 485 11 Animal physiology A second reproductive strategy
employed by animals is internal fertilization, biceps triceps joint capsule human elbow joint fortilage Reduces friction and absorbs compression
cause extension (straightening) of the arm Humerus Acts as a lever for the biceps muscle fibre is a mu
variety among offspring from the same two parents, and so increases the chances of survival of some offspring if one combination of alleles is more favourable for survival than others. Several scientists at different locations around the world produced research indicating this discontinuous strand formation. Sinusoids are where exchanges occur
undergoing cell growth in preparation for a cell division. Why does it make this prey choice? However, Fleming became frustrated by his inability to isolate the chemical from the fungus that produced the antibiotic, and moved on to other work. NATURE OF SCIENCE Why are scientists interested in comparing the genetic codes of various species?
During more strenuous exercise, the heart rate increases by direct stimulation of the cardioacclerator centre. This is called diastole (di-astol-ee). A represents a normal pathway with several enzymes producing intermediate compounds along the way. The H0 in an experiment of this type is what we would expect: in Mendel's example, we expect a 3:1
medulla's breathing centre. • The shoots must be cut under water. One method of calculating age is to measure the rings in the otoliths (ear bones) of a fish. As a general rule, high blood pressure is positively correlated with the consumption of fruits and vegetables. A paradigm is a
way thinking about a topic: it is a framework upon which to build ideas. This was called spontaneous generation. • Learned behaviour develops as a result of experience. It is these polymorphisms that are analysed with DNA profiling. If you go to the NOAA Earth System Research Laboratory Global Monitoring Division's website (see the hotlinks at
the end of this section), you will find maps, graphs, and databases of measurements of carbon dioxide and other atmospheric gases over many decades. Nucleic acids The nitrogenous bases form links by means of hydrogen bonds. That is the hope of many researchers. Let us use the BLAST website to find information about the human gene for lepting the hope of many researchers.
and see how closely it is aligned with the same gene in a mouse. Another effect of oestrogen is to stimulate the pituitary gland to release more FSH and LH. 1 2 3 4 5 6 The leading strand is assembled continuously towards the progressing replication fork in the 5 to 3 direction. Alternative lab 1 Grow duckweed or Lemna in pond water over several
months under grow lights. Committees of scientists? In 2003, 29% of fisheries were collapsed. This is challenging for students and adults alike. Species that are the most similar are most likely to be closely related, whereas those that show a higher degree of differences are considered less likely to be closely related. Fertilization is internal and the
eggs are laid in a nest area that the female creates. • Pick a well-defined area, such as a fenced-in pasture, public park, or a sports field with natural grass (be sure you have permission to work there first). As we have seen with cystic fibrosis, the difference between one version of a gene and another (the mutated and non-mutated alleles of the CFTR
gene) can mean the difference between healthy organs and organs hampered by an overproduction of mucus. • Triose phosphate is used to regenerate RuBP and produce carbohydrates. On the other hand, they have the highest resistance to malaria. Polar amino acids have hydrophilic properties, and they are found in regions of proteins that are
exposed to water. (c) If a gene that is on the DNA wrapped around the histones needs to be transcribed, what will have to happen to it? When active transport occurs, the substance is moved against a concentration gradient, so energy expenditure must occur. In contrast, a typical human only gets 12% of his or her daily water intake from metabolism
Interpret this value. Warmer oceans can affect reproductive cycles. In order to evaluate such data, a basic understanding of the action of MDMA on serotonin and dopamine metabolism in the brain is immediately available as
a source of energy in the cell. Notice in Table 10.3 that, in addition to the degrees of freedom, there are probability values for p. To learn more about the action of drugs, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: Section A.5. Exercises 19 Outline summation as a function of postsynaptic neurones. 

Application:
Production of cloned embryos produced by somatic-cell nuclear transfer. Consequently, the changes can be used as a kind of clock to estimate how far back in time two related species split from a common ancestor. It is present in all eukaryotic cells, but centrioles are absent from higher plant cells. SCID therefore results in loss of T cells. The date of
the article is 1994. Sometimes it is an advantage to have two opposing varieties of a phenotype rather than only one. A second group lived between 10 and 20 m above the water level. Always include examples in answers to compare and contrast questions. Although there are others, we will examine three phenomena that provide evidence for
evolution by natural selection: the fossil record, animal breeding and homologous structures. • 717 15 Option D: Human physiology Essential nutrients: what are they? Application: Degradation of oil by Pseudomonas. If energy is needed for a process to occur, that process is called active and the form of energy most often used is a type of nucleic acid
called adenosine triphosphate or ATP. The males display extreme colour, plumage, and fancy behaviour to show off in front of the females. 748 anterior and posterior pituitary glands thyroid gland parathyroid gland parathyroid gland parathyroid gland parathyroid glands pancreas Figure 15.15 Some endocrine glands are shown in this body outline. The crude template is a good example of
innate learning, while the adult song is an example of how learned behaviour can help an animal acquire new skills. Could there still be colonies of bacteria living on Mars today, or is life extinct on the red planet? Both processes result in two separate daughter cells that have genetically identical nuclei. Notice that some of the information given
cannot be acted upon by an individual (e.g. age/gender/ethnic background/family history) and so this information cannot be used to help someone follow a healthy lifestyle, although it can make them aware of the importance of those factors that can be controlled. The end with the methyl group is also called the omega end. This reduces the time and
the cost of sequencing a genome. 1 What is the effect of altering the pH environment on the activity of the enzyme lactase? The seven characteristics he studied were controlled by genes on separate chromosomes and therefore demonstrated independent assortment. We might carry out an experiment to see whether watering the bean plants prevented independent assortment.
wilting. It is not difficult to recognize most of the molecules that are hydrophilic, as these molecules typically contain functional groups that result in the molecules that are hydrophilic, as these molecules that are hydrophilic, as the hydrop
breeding behavior and life history evolution in changing environments, Ecology, 72 (4), p. If it is not achieved and is significantly less, noncompetitive inhibition is being represented. • Amylose is the only one of the three glucose polysaccharides that is a linear molecule with no side branching. Solenoids group together in looped domains, and then a
final coiling occurs to produce the chromosome. Veins are blood vessels that collect blood from capillaries and return it to the heart. They are used to transport fats to the liver and other tissues in the body. 794 Table 4 Charting observed and expected results Possible outcome 1 Possible outcome 2 Sum Observed numbers in each category of possible
outcomes (O) Expected numbers in each category of possible outcomes (E) Difference squared (O - E)2 (O - E)2 (O - E)2 (E 2 = The third and fourth lines of this table are intermediate steps to see the difference between the observed and the expected values as well as their squared values. 18 What did the surfactant do to facilitate oil
degradation? The eggs can develop into baby lizards without being fertilized. False-colour transmission electron micrograph (TEM) showing the microvilli of an epithelial cell extending into the intestinal lumen. The traits are passed down to male offspring and become even more prominent in the species over generations. The presence of multiple
replication origins greatly accelerates the copying of large eukaryotic chromosomes. On the other hand, it is perfectly acceptable to name a well-described organism that no longer exists, such as an extinct dinosaur. An example of such a model is provided in the Impatiens wallerana lab. NATURE OF SCIENCE Cholesterol in our diet has a bad
reputation. Stargardt's disease is an example of a human condition that is in the early stages of being treated with stem cells. Cytosine and thymine are single-ring structures known as pyrimidines.
Project, DNA structure and GenBank, go to the hotlinks site, search for the title or ISBN, and click on Chapter 7: Section 7.1. 333 07 NATURE OF SCIENCE Looking for patterns, trends, and discrepancies: there is mounting evidence that the environment can trigger heritable changes in epigenetic factors. (Notice the bacterium has its own circular
chromosome and the plasmid DNA. Skill: Use of a light microscope to investigate the structure of cells and tissues, with drawing of cells. A dolphin has an EQ of only 2.49. Fill in as many major events as possible under each heading. Taxol is a powerful inhibitor
of cell division that is used to treat ovarian, lung, and breast cancer. Lipids (fats and oils) have a tendency to coalesce (clump) together because they are hydrophobic and thus not water soluble. Repeat the same procedure for the next two objectives to determine the diameter of their field of view. A small amount of blood or other source of DNA is
collected and attached to the microarray. When we compare human brains with those of other animals, the biggest difference appears to be in the surface area of the cerebral hemispheres. A liger is a hybrid between a lion and a tiger, and is considerably larger than either parent animal. 17 What do these additives provide the bacteria with? Why area of the cerebral hemispheres.
oxides of nitrogen classed as greenhouse gases? The ribosome then separates from the mRNA and splits into its two subunits. Tropisms may be positive (towards the stimulus) or negative (away from the stimulus). For example, the fact that every known living organism on Earth uses DNA as its main source of genetic information is compelling
evidence that all life on Earth has a common ancestor. It is interesting to note that the male and female reproductive structures have common origins in the pre-8-week-old embryo. Do scientific researchers have a responsibility to communicate and collaborate freely with each other? Figure 1.5 What is different and what is similar between this typical
plant cell and Figure 1.4? A TEM of a pancreatic exocrine cell. Some of the colliding molecules when they collide. An example of such a chain is shown in Figure 2.31. Although it can be argued that using biofuels
allows countries to reduce their dependence on imported fossil fuels, the burning of any biomass still releases carbon dioxide into the atmosphere. All the cubs are raised in a community; if one lioness dies, another female can raise the cub. One of the factors that can be controlled is weight. The event that will terminate the positive feedback loop is
birth because the uterine muscle will no longer have anything to contract upon. The chloroplast contains a double membrane and is about the statistics
were reliable, doctors did not accept them at first and continued to use X-rays on pregnant women for more than two decades. Urine collects within each kidney in an area called the renal pelvis. • The surface area of the leaves is reduced. W 0 w Ww w0 Two out of every four
offspring show the recessive white-eyed trait Figure 10.13 Crossing a whiteeyed female and a red-eyed male fruit fly. 2 What determines whether an enzyme is competitively or non-competitively inhibited? Figure 8.7 The first stage of 6-carbon glucose glycolysis; the circles represent carbon atoms. Inside the seminiferous tubules you can see
developing spermatozoa with flagella surrounded by cells in various stages of meiosis.. The environment and gene expression Another area of gene expression involves the effect of the environment. His research involved the creation of the now famous 'lollipop' apparatus. 100% Tt and will be tall, so 0% will be short. The origin of eukaryote cilia and
acidic environment. Synapses using noradrenaline are called adrenergic synapses, percentage of bees/% 100 80 Key Control group Experimental group 60 40 20 0 orientated flight circlings Adapted from Chaffiol et al. You will recall that prokaryotic cells also contain ribosomes. The pain reflex involves a series of nerves that run from your arm to your
spinal cord, and back to your arm muscle. 0.3 atmosphere over oceans 0.003 1.4 dissolved 80 000 1 000 organisms 85 0.3 Phosphorous can move from oceans to atmosphere pool. 28 What does yellow indicate? of the elbow to do that. The selection factor is that those who share blood with close associates are those that survive to reproduce. In
1878, Francis Blake and David Edward Hughes discovered that carbon transmitters could amplify sound, which was a big advance over the horn! In 1920, the vacuum tube was invented. These X-ray diffraction images also allowed an understanding of the width of the DNA molecule and the spacing of the nitrogenous bases within it. Option B:
Biotechnology and bioinformatics • Take a sample of cells from a cancerous area of the skin and another sample from normal skin (these are the tissue samples). In other words, 'what is the benefit is to allow the atria time to send the blood down to the ventricles before the AV node 'fires'. • Use of software to construct
simple cladograms and phylograms of related organisms using DNA sequences. Before the flower opens. For example, humans are heterotrophs: we cannot simply lie out in sunlight to get our food
the way phytoplankton and plants can. Nephrons are the filtering units of kidneys Each kidney is made up of about 1.25 million filtering units known as nephrons. The cell wall gives the cell shape. The text covers the course content using plain language, with all key scientific terms explained in the eBook glossary. Generally it is agreed that
evolution does not happen overnight, but there are two main views (see Figure 10.30): • the changes are relatively quick and followed by long periods of little or no change (punctuated equilibrium). The early embryo continuous and slow (gradualism) • the changes are relatively quick and followed by long periods of little or no change (punctuated equilibrium).
as it divides. This means that the impulse is being carried along the nerve. (d) For each cell type you observe, complete the following steps. Further, Galen taught his students that blood flowed from one ventricle of the heart to the other through tiny pores. Specialized cells called guard cells control the opening and closing of the stomata. Each step of
the assembly line is catalysed by a specific enzyme. • High blood pressure may double the risk of mortality from CHD. The large primary oocytes begin the early stages of meiosis, but the process stops (is arrested) during prophase I. The blue line shows fluctuations between warmer temperatures that are close to zero (representing no change from
modern climatic conditions) and colder temperatures several degrees below what they are today. An example is the use of sulfanilamide (a sulfa drug) to kill bacteria during an infection. enzyme 1 enzyme 2 enzyme 3 Figure 13.1 The pathway to artemisinic acid. Table 8.1 summarizes anabolic and catabolic reactions. This seems to increase spawning
time and causes the females to lay more eggs. Release of raw sewage and nitrate fertilizer into rivers As societies become urbanized (living in towns), the common problem of waste disposal grows, particularly in relation to sewage. Theories are developed after the accumulation of a great deal of data via observation and/ or experimentation. No
second messenger is needed, thus the speed is very fast. This bacterium occurs naturally in hot springs, and its enzymes are not denatured at high temperatures, including the specific DNA polymerase that it possesses. Mollusca Spiders are arthropods.. The matrix is the area where the Krebs cycle occurs. Markers can detect a genetic disease A
marker is a genetic variation in a DNA sequence that can be observed. Closure of the neural tube in the tail area occurs more slowly and may not even completely close during embryonic development. There must be no barriers for freedom of inquiry. This transfer of energy occurs many times in photosynthesis. A B C D (Total 2 marks) 8 Using
examples, distinguish between analogous characteristics and homologous characteristics we make inferences about a whole population based on just a sample of the population. These proteins serve many purposes, including 285 06 Human
physiology some that are involved in clotting. The easiest genotype to determine by simply looking at a person or animal is aa. Some bacteria have an additional layer of a type of polysaccharide outside the cell wall. 4 (Kim Lewis 2007), Copyright 2007. He had been working with Louis Pasteur and it took a great amount of persuasion and force of
personality for Pasteur to save his reputation. If every enzyme molecule is working as fast as possible, adding more substrate to the solution will not increase the reaction rate further (see Figure 2.28). Many species of animal are territorial and possessive of their food supplies: they spend a great deal of time and energy defending their resources.
BLAST is the acronym for Basic Local Alignment Search Tool. When emphysema destroys an area of a lung, there are no remaining healthy cells to regenerate the dead tissue. Nerve and muscle cells are good examples of this type of cell. 85 02 For many years most scientists all over the world believed it was protein, not DNA, that contained our
genetic information. Most have four legs when they are adults, but there is a legless group called caecilians that resemble large worms or small snakes. A vaccination does not prevent an infection but, on subsequent exposure to the real pathogen, the secondary immune response is quicker and results in higher antibody production compared with the
primary immune response (see Figure 11.1). Eukaryotic DNA molecules are quite long and replication begins at a large number of sites along the molecule. Overdoses can cause brain seizures or cardiac arrest. Each of these ATPs has been produced by substrate-level phosphorylation. This mould gets its energy to reproduce and grow from glucose.
to occur in degradative reactions or those reactions or those reactions in which a complex molecule is broken down into simpler materials. An increase over time in the average height of children of a certain age indicates improvement in the health of a population, whereas stunted growth is an indicator of poor health in a population. Noradrenaline depolarizes the
postsynaptic neurone; it is involved in the sympathetic system. Cardiac muscle has some similarities with skeletal muscle, especially in the arrangement of the actin and myosin proteins in contracting units called sarcomeres. Further studies have shown this may not be the case: the behaviour strategy of the jacks may be more successful. And yet the
search continues. DNA profiling is used in other circumstances too, for example in studies of ecosystems, when scientists use DNA samples taken from integral, polar proteins that allow the passage of small, charged particles through the
hydrophobic region of the membrane. It was once assumed that embryos that produced testosterone changed from the 'default' sex of female to male. This is a protein found in the ribosomes of some bacteria. DNA microarrays can be used to test for genetic predisposition to a disease. The primary difference between the blood in these two vessels is
the levels of water, salt ions, and urea. This is a performance, which indicates learning, atmosphere over land 0.025 3.2 soil 125 000 mineable rock 19 000 Cycling of P between organisms and soil. On the one hand, we can argue that we are all the same species and therefore we are comparable. The importance of phototropism to a plant is clear. The
neurone that releases the neurotransmitter is called the presynaptic neurone, and the receiving neurone is called the postsynaptic neurone. How new alleles are produced Worked example Look at the two sequences of DNA below, which are from the coding strand of a section of genetic information that helps in the formation of haemoglobin, found in
red blood cells. Some time will also be spent on understanding how the most complex cells may have come into existence on our planet. As the energy collected by producers is limited by the amount of sunlight reaching Earth's surface, it is difficult to increase it. Eventually, this work will proceed to human trials. Experiments were devised to
determine how splitting the brain affected these patients. For this reason, it is unlikely to get one and much less likely to get two such alleles. The damaged tissue and platelets release chemicals called clotting factors that convert prothrombin into thrombin. She had a genetic disorder called severe combined immunodeficiency (SCID). (A) Adolescent
rats (27 days old) self-administered nicotine combined with acetaldehyde alone or saline. In practice, this means that, just because one trait (such as a certain flower colour) is inherited from a parent, it does not follow that any other specific trait of that parent (such
as a specific seed colour) is passed on as well. As an example, we use molecular tools to read the basic instructions of life one letter at a time as we decode the human genome. Methods can be devised to measure the response to gravity if organisms are put into a container that is then placed upside down. • The SA node also has to repolarize, but the
electrical activity is hidden 'behind' the QRS complex. Box (innovator in statistical analysis) Box and Draper, 1987. A beneficial mutation for a bird or insect might result in a different hydrogen atoms. 17 Justify whether the benefits
outweigh the risks in genetically modifying plants and animals. One of the fundamental principles of immunity is that an organism cannot be immune to a pathogen before being exposed to it at least once. A typical female fish often lays hundreds of eggs at a time. 

Measurement of the length of sarcomeres will require calibration of the eyepiece
scale of the microscope. Therefore, all cellular processes within prokaryotic cells occur within the cytoplasm. Tracking with luminescent probes Quantum dots. This reaction looks the same for any two amino acids, as the only change would be to the R (variable) groups. 206 Climate refers to the patterns of temperature and precipitation, such as
rainfall, that occur over long periods of time. exoskeleton Muscles work in antagonistic pairs When a muscle contracts, one end of that muscle is connected to a bone (or exoskeleton) that is not designed to move. 2 hydrogen bonds 1' Figure 2.31
Five nucleotides bonded to form a very small section of a strand of DNA or RNA. Although this might be more obvious in mammals, which can give off considerable amounts of heat, even grasshoppers will lose heat to the environment. The two effects of insulin both have the same ultimate result, which is to lower the glucose concentration in the
blood or, to put it more simply, to reduce blood glucose. After 4 weeks all of the products of benzene degradation had been converted to carbon dioxide. If fair-skinned people are informed that they have this marker, they can take precautions to limit their exposure to direct sunlight. The USA may run out of this accessible, domestic source in a few
decades. (2) (Total 6 marks) 2 (a) Outline the use of Simpson's diversity index. At this stage, the two blue-banded zones are part of two connected sister chromatids forming a single chromosome attached at the centromere. Strokes can cause the hemisphere in which they are located to lose function. • Applications and skills: Applications connected sister chromatids forming a single chromosome attached at the centromere.
of the thermal properties of water with those of methane. The white area in the upper right corner is the lumen (cavity) of the intestine, where unabsorbed food would be located. As thermometers have only been around for a few hundred years, temperatures on Earth from thousands or millions of years ago must be inferred from proxies. • Recall
involves remembering a fact, object, or event that is not currently present. We cannot actually see the hydrogen bonds. Novel products from GM plants include vitamins, pharmaceuticals, enzymes, and vaccines. Directly this means that carbon has six protons, but indirectly it also means that carbon has six electrons.
nucleus Chromosomes are made of very long DNA molecules. The cell wall is removed to expose the protoplast, a plant cell that has been argued that once evolution by natural selection is understood, many of the mysteries of nature are revealed.
(e) Which two letters represent the areas of the chloroplasts? Human nerve cells (neurones) are essential to our lives. Electron transport chain and chemiosmosis The electron transport chain and chemiosmosis The electron transport chain are produced. Could you do the exact same experiments today,
over a century and a half later, and get similar results? We do not have storage mechanisms for protein: we need to have a regular intake of protein that can be digested to provide the amino acids needed for our own protein synthesis. In one study, scientists compared genetically manipulated alcohol-preferring rats to normal rats. For example,
humans can consciously decide to adapt to a situation: think of a student learning the language of a country where driving is done on the left-hand side and so adapts very quickly to left-hand driving. This is
also a form of negative feedback. (2) A receptor protein signals the beginning of a cascade of reactions. direction of selfpropagating wave 301 06 Human physiology Repolarization: return to the resting potential Neurones do not send just one action potential; one neurone may send dozens of action potentials in a very short period of time.
Biopharming Biopharming uses genetically modified plants and animals to produce proteins for the renal artery is different from that in the renal artery is different from the renal arte
as puffing up their bodies, turning feathers into skirts, and dancing in dizzying circles. As the width of an object such as a cell increases, but at a much slower rate than the volume. Companion cells are actually connected to their sieve tube members by plasmodesmata. You will recall that the orientation of bivalents
during metaphase I is a random process. Illustration showing an occlusion (a clot caused by plaque build-up) in a coronary artery. Figure 3.11 Human chromosomes, purple = sex chromosomes, purple = sex
would be wise at this point. One well known example is the optic nerve pair, which carries visual information from the retina of the eyes to the brain. It moves directly into the vesicles of the presynaptic neurone and causes their release into the synaptic cleft. n-terminal end [Valine - Glycine - Serine - Threonine - Alanine] c-terminal end Computer
graphic representation of the structure of bradykinin, a polypeptide that is active in human metabolism. This method takes a few genes and compares the base sequences to build cladograms. Activity 3 - What shall we do? Behavioural isolation Behavioural
isolation can happen when one population's lifestyle and habits are not compatible with those of another population. In plants a hormone may be produced throughout the plant. A person suffering from rickets with characteristic bowed legs as a result of improper bone plate growth. • Chlorophyll absorbs red and blue light most effectively, and
reflects green light more than other colours. 6.5 Neurones transmit the message, synapses modulate the message, expanses modulate the message, synapses modulate the message, synapses modulate the message, synapses modulate the message.
Homologous chromosomes carry the same alleles of those genes but not necessarily the same alleles of those genes. If something is forgotten, it is usually because the synaptic connection has become weakened. Learned behaviour can be defined as the process of gaining new knowledge or skills. Two or more mice can mate and have litters of mice that
then form a new population on the island. The researchers who hypothesized that it was not acid but bacteria to grow. To prevent this, an enzyme called acetylcholinesterase breaks down acetylcholine in the synapse. One technique that has been successful in measuring such differences is DNA
hybridization. These are often called blood thinners, but they do not actually 'thin' the blood. Particles of a certain type move from a region of higher concentration to a region of higher concentration. In addition, biochemical processes in living organisms follow certain common pathways for which we can study the common pattern. So mushrooms
cannot be classified as plants, because they are not autotrophs, but they are certainly not animal-like either, one reason being that they have cell walls made of chitin. Activation energy In 1958, Daniel Koshland used a larger body of knowledge than had been available to Fischer, to present the induced-fit model. 3.4 NATURE OF SCIENCE Inheritance
Understandings: Mendel discovered the principles of inheritance with experiments in which large numbers of pea plants were crossed. 630 Table 13.6 Amino acid codes (use for BLASTp) The following codes are for 24 amino acids and three special codes. How is knowing this useful? The use of pluripotent stem cells is particularly controversial. For
example, does mythology count as scientific knowledge? Once nuclear division has occurred, the cell undergoes cytokinesis. At that time, a particular plant may be giving off carbon dioxide and taking in oxygen to maintain its relatively low and consistent rate of cell respiration (see Figure 2.51). (c) Can a person who is blood type O Rh+ receive blood
from someone who is O Rh-? This continual pattern of growth is referred to as indeterminate. So p + q = 1.9 Name two organisms and inorganic processes that allow the carbon to be available. Think of a nerve as being like a 298
telephone cable: a protective sheath surrounding many individual wires. Make sure you write a title for each data table. Are such practices sustainable? This is a routine procedure and can provide a doctor with a wealth of information concerning your physiology. Injury to the Broca's area interferes with the ability to vocalize words; injury to the
Wernicke's area affects the ability to put words into sentences. Try to evaluate the information given by researching the following. It is a rapid learning process by which a young animal develops an attraction and recognition of another moving object, usually the mother. Wear
goggles and a lab apron throughout the procedure. Over time, as a condition called atherosclerosis develops, cholesterol can help form deposits called plague on the inside of arteries. The sources of the electrons that move down the electron transport chain are the coenzymes NADH and FADH2 from the previous stages of cellular respiration. Look at
the top of the table of t-values (Table 2) and you will see the probability (p) that chance alone could make a difference. Many metabolic reactions occur in an assembly-line type of process so that a specific end product can be achieved. After fertilization, cells of the frog embryo develop into three distinct tissue layers: the outermost layer (ectoderm),
which will become the brain and nervous system of the adult frog; the inner layer (mesoderm), which forms the lining of other organs; and the middle layer (mesoderm), which develops into the skeletal, reproductive, circulatory, excretory, and muscular system of the adult frog. However, even though blood glucose is expected
to fluctuate slightly above and below the homeostatic normal level, it must be maintained reasonably close to the body's set point for blood glucose level, and negative feedback mechanisms ensure this. It's not by pure happenstance that flowers have adaptations perfectly suited to their insect pollinators, or that certain bacteria become resistant to
the antibiotics we try to fight them with. Your immediate response to the sting is a pain withdrawal reflex. Lots of partners are tried, and eventually one is found that is compatible. From 15 plants, Mendel obtained 556 pea seeds in the following proportions: • 315 round and yellow (56.6%) • 108 round and green (19.4%) • 101 wrinkled and yellow
(18.2%) • 32 wrinkled and green (5.8%). CHALLENGE YOURSELF Fungi are saprotrophs. In addition, the placenta begins production of high levels of oestrogen that also continually increase during the entire gestation. He proposed the domain Archaea. Knowledge claims Compare the validity of knowledge claims of two categories of scientific
disciplines. Excitatory neurotransmitters: • increase the permeability of the postsynaptic neurone to Na+ • causing Na+ ions to diffuse in • so the impulse is carried forward. They are said to be iso-osmotic to the water of their surroundings. Some examples of animal hybrids are: • female horse + male donkey = mule •
female horse + male zebra = zorse • female tiger + male lion = liger. The numbered steps are described in the text. Include the following labels: chromatid, centromere. Certain bacteria form a symbiotic relationship with a host plant and fix nitrogen for it, e.g. Rhizobium lives in symbiosis with legumes (beans, peas, and clover). At the beginning of
the 20th century, milk was commonly delivered to the doorsteps of British residents in bottles, and the milk had a layer of cream that settled on the top. These bacteria are symbiotic and receive carbohydrates and a favourable environment from their host plant. increasing substrate concentration (assumes enzyme concentration unchanged) Use of
immobilized enzymes in industry Cells are not the only 'factories' that make good use of enzymes. Haemoglobin Haemoglobin is the protein molecule found within erythrocytes that is responsible for carrying most of the oxygen within the bloodstream. Table 5.2 shows two examples of the full identification of two species according to the seven taxa we
have just named. If the female is near the middle of her menstrual cycle, there may be a secondary oocyte within one of the two Fallopian tubes. Using this type of receptor, we can taste and smell. Look at the table of critical value (2critical) to
compare the calculated value of 2 (2 calculated) to. There are some exceptions to the generalization that all chordates have a backbone: sea squirts do not, for example, but are still classified in this phylum because they do develop a notochord.
to introduce glyphosate resistance into soybean crops. Waterlogged soils create anaerobic soil conditions with no oxygen. 740 When a chamber of the heart contracts, it is because the cardiac muscle fibres of the chamber to contract. When studying, ask yourself how well you
know something. The B cells are kept alive by fusing them with cancerous (myeloma) cells. This molecule contains deoxyribose, a nitrogenous base (A, T, C, or G), and three phosphate groups. In order to be able to declare that our two populations showed a level of 95% significance in their differences, we would need a t value of 2.10 or more (see d.f.
= 18 and p = 0.05 (5%) in Table 2). (5) Messenger (m)RNA molecules are synthesized as a result. 353 08 A coenzyme is not usually a protein. Particles move across membranes by simple diffusion, osmosis, and active transport. Imagining how this progresses from year to year makes it easy to guess how this plant got its name.
Illustration showing neurones with myelinated axons and nodes of Ranvier. Notice the lack of space between the categories, and the fact that the categories on the x-axis represent continuous incremental numerical values. Each of the methods used to determine the BMI must be correlated with information concerning the BMI that shows whether a
value reflects someone being underweight, or obese. As the cells progress through meiosis and differentiation, they move closer to the centre. Roughly two-thirds of their mass is rRNA. Many scientists have contributed to developing the three main principles of this theory. niger with molasses as the substrate, i.e. as the
carbon and sugar source. One way to determine this is to place a plastic ruler under the low-power objective lens so that it crosses the diameter of the field of view. Other nucleic acids function as coenzymes. Researchers use highly specialized laboratory equipment including sequences of bases. • Cacti exist on water
that the plant stores in fleshy, watery stems. This process is referred to as translation because it changes the language of DNA to the language of DNA to the language of protein. Helper T cells chemically communicate with (activate) the specific B-cell type that is able to produce the antibody needed. • The round window releases pressure so fluid in the cochlea can vibrate.
It is important to monitor the level during treatment for some patients. Each villus contains a capillary bed and lacteal for the absorption of nutrients. Many types of seeds may be used, and you will encounter several suggestions in your research. A phylogram is a type of phylogenic tree in which the lengths of the edges do represent evolutionary time
On these micrographs, annotate names of structures and their functions. Researchers have developed a clever and unique procedure for forming many antibodies all of the same type. Plants use nitrates to make their own proteins. Ault et al. • Clones are groups of genetically identical organisms derived from a single original parent cell. The sugar
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splitting proceeds efficiently in aerobic and anaerobic environments. Functions of the cerebral cortex are evidence of the importance of this brain part. A common origin for all cells on Earth requires an explanation of how a cell could progress from a

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simple, non-compartmentalized prokaryote to a complex, highly compartmentalized eukaryote. Examples include purple bacteria. This one is from October 2013, but you might be able to find a more recent one if you do a web search for the title. 326 Types of DNA sequences The genomes, complete DNA sequences, of many eukaryotes are now known
because of rapid advancements in the field of genomics. (b) Fungi on a dead log. E. These oogonia grow into larger cells called primary oocytes. However, the children marked C1, C3, and C4 do not show many similarities. coli cell expresses the gene and synthesizes whatever protein the gene codes for. Flagella allow a cell to move. Geographical
isolation Geographical isolation happens when physical barriers, such as land or water formations, prevent males and females from finding each other, thus making interbreeding impossible. The antibodies (green) that are specific to the attached antigen will bind to it. 1 2 Using the pedigree chart below, state the genotypes for all the plants A to K.
Determine the month of the year during which this low point most often occurs. Some living organisms have evolved proteins and other molecules that remain stable and functional at very high temperatures. Each tube contains a special nucleotide called dideoxynucleic acid (ddNTP). Then again, perhaps
international agreements will curb fossil fuel use and prevent climate change from getting worse. Any alcohol not removed the first time is brought back through the liver sinusoids by the hepatic artery. A good example of how this works can be seen in the study of Fish Fry Lake near Billings, Montana. Such critics are sometimes referred to as
'climate change deniers', and they have a number of criticisms about the IPCC's findings. This is how the circuitry of the nervous system is formed. (4) (Total 10 marks) 4 During the first 24 days, worker bees (Apis millifera) go through a series of occupational specializations. In that year, the World Health Organization began a campaign to 'vaccinate
the world' against smallpox. Cells others. Remember that when Cl- enters the neurone becomes hyperpolarized and resists firing. In plants, when an adequate amount of water is inside the cell, there is pressure against the cell wall. Is it beneficial for all the cubs in a pride to be at almost the same age as a result of the synchronization of
the female oestrus? The small subunit moves down the mRNA until it contacts the start codon (AUG). • Acid conditions in the stomach favour some hydrolysis reactions and help to control pathogens in ingested food. Carbon atoms can form four covalent bonds, allowing a diversity of stable compounds to exist. Table 12.14 compares cholinergic and
adrenergic synapses. Four major database are: NATURE OF SCIENCE • Swiss-Prot, a well-curated database and browser of genomic information about humans and other vertebrates • GenBank, a National Institutes of Health genetic sequence database that is an annotated collection of all publicly
available DNA sequences • OMIM (On-Line Mendelian Inheritance in Man), a description of phenotypes for a series of disease-causing SNPs (mutations in the human genome). Use class data to build up a larger database. A solid understanding of these processes will help you with the following information. Greek philosophers used mnemonic devices
a lot and are repeatedly referred to by Plato and Aristotle., Stricker, Craig A. Wouldn't it be nice to be able to read the copy to make insulin in a laboratory? In his laboratory? In his laboratory, Wöhler had mixed two inorganic substances, cyanic acid and ammonium, in a beaker. Great white sharks are well known for their jaws and teeth, and
the vast majority of fish have these features, although they are not always visible. Each molecule has a specific function and collectively they all work together in order to ensure that body cells have access to glucose for their energy needs. Post-transcription modification of mRNA Eukaryotic cell DNA is different from prokaryote DNA in that within
the proteincoding regions there are stretches of non-coding DNA. The importance of fibre in the diet Materials that are not absorbed are egested (become part of faecal matter). Hence, the egg the woman produces has two 21st chromosomes instead of one. The products of anaerobic respiration are lactate or ethanol and carbon dioxide. These two
pancreatic hormones are antagonistic: they have opposite effects on blood glucose concentration. Plasmids are small circles of extra copies of DNA floating around inside the cell's cytoplasm. From this table several points should be noted. More recently, ideas of a 'carbon tax' or 'cap and trade' policies have been put forward, so that countries
compensate for their excessive carbon emissions. Darwin was surprised to discover in 1858 that Alfred Russel Wallace had independently developing follicles When making sense of Figure 6.28, use the line indicating the time of ovulation as an important marker. And
Boycott, B. • Eukaryotic cells modify mRNA after transcription. Biologists often use invertebrates that have a simpler nervous system compared with humans and other vertebrates. 13 Using 10 different objects found in your school bag, design a dichotomous key. Permission conveyed through Copyright Clearance Center, Inc.; Figure on page 636
adapted from Sunlight inactivation of fecal bacteria in sewage-polluted seawater, Applied and Environmental Microbiology, 65 (8), pp. The continuing development of the binomial nomenclature system is an example of scientists recognizing and overcoming the confusion that would occur if each biologist used the local names of
species in his or her own language. At a press conference, the world's bestknown molecular biologists announced the draft of the Human Genome Project. Bias is a good term to know in TOK. How life has changed over time and how we make sense of the living world around us is the focus of this chapter. The generations are: • the gametophyte
generation, which is haploid • the sporophyte generation, which is diploid. If the exposure to smoke or other agents leading to lung damage is stopped soon enough, the lung tissue can fully or partially repair itself. This is the cause of death of the tree. An international team is trying to determine the range of each bird species on a global scale. Are
such testimonies reliable enough to put defendants in jail or to sentence them to death? There are two main factors that determine how much of an influence a gas will have on the greenhouse effect: • the ability of the gas to absorb long-wave radiation (heat) • the concentration of that gas in the atmosphere. This ATP is provided by the companion
cells, which occur adjacent to the sieve tubes. • Gently wash the roots and place them in a solution of Congo red (red ink could also be used). 218 Evolution is defined as the process of cumulative change in the heritable characteristics of a population. • Guidance Only the ring forms of D-ribose, alpha-D-glucose, and beta-D-glucose are expected in
drawings. In active transport, proteins shuttle a substance from one side of the membrane to another by changing shape. (Total 2 marks) 10 Analyse the relationship between the organisms in the following cladogram. 2 3 1. Application: Control of milk secretion by oxytocin and prolactin. Grow the cells with the plasmid in a culture vessel. 9 State the
name of a type of cell in your body that is haploid. Such factors include family, family parenting skills, and mental health problems of the family or child. The incidence of cigarette smoking is decreasing in many countries, especially in those countries where public opinion has been informed by scientific research showing the harm that smoking does.
At the beginning of this chapter you were introduced to hydrolysis reactions and an opposite set called condensation reactions. Receptors detect changes in the environment Mechanoreceptors are stimulated by a mechanical force or some type of pressure. Receptors detect changes in the environment Mechanoreceptors are stimulated by a mechanical force or some type of pressure.
answer questions that previously required an animal model. The input of energy is typically in the form of heat. Both of these fibres are proteins, which explains why, as a source of food, muscle tissue is so rich in protein. Can one genetic group be considered genetically superior to another? Depolarization: sending an impulse An action potential is
often described as a self-propagating wave of ion movements in and out of the neurone membrane. In addition, the widths of the rectangles that make up the histogram represent specific incremental quantitative values. Each angle change after that represents a carbon atom. 100 percentage haemoglobin saturation Option D: Human physiology 90 80
70 100 120 140 In Figure 15.24, notice that the curve for foetal haemoglobin is consistently to the left of adult haemoglobin. These substances continue into the large intestine and become a part of the solid waste (faeces). Scientists and statistics experts often say that 'correlation does not mean causality', meaning that just because two things occur
in the same place at the same time does not necessarily mean that one causes the other. The diagram below is a record of the first 24 days in the life of one worker bee. positive correlation between light intensity and photosynthesis rate of photosynthesis rate of photosynthesis rate of photosynthesis enzymes, etc. The bones within our bodies
require constant repair, requiring small amounts of calcium for that repair. fully hydrogenated Condensation reactions result in the formation of triglyceride lipids (fats in animal cells and oils in plant cells) are glycerol and three fatty acids. • To carry out a positive control test (one that is designed to
purposely give positive results), in a test tube add 2 ml of liquid milk and 1 ml of enzyme solution. The cultures were maintained in 1-l capacity bottles at room temperature. 2008, p. It would be expected that all the cells in C. Is that an experiment? • Less energy in the form of ATP is expended for the transmission of impulses, as the only locations
where the Na/K pump needs to re-establish resting potentials is at the nodes of Ranvier. With an acoustical spectroscope, it is possible to measure the difference accurately. At first, shortness of breath only occurs when the afflicted person does strenuous activity, but over time the inability to get sufficient gas exchange becomes constant. True
immunity Antigen presentation, T- and B-cell activation and B-cell cloning are the events that occur during a primary infection. The mouse, Mus musculus, was the organism we used when looking at the leptin gene that is conserved in humans and many other organisms (an identical DNA sequence that occurs across species). Cells 1.1 Cell theory, cell
specialization, and cell replacement Understandings: According to the cell theory, living organisms are composed of cells. One technique used to determine the frequency and distribution of a species is random sampling. The cell plate occurs midway between the two poles of the cell and moves outwards towards the sides of the cell from a central
region. In addition to carbon, the following elements are common: hydrogen, oxygen, nitrogen, and phosphorus. One of the most famous experiments in biology was Gregor Mendel's pea-breeding investigation, which revealed important insights into the secrets of genetics. People with sickle cell trait have a better resistance to malaria because of
chemical imbalances that make the survival of Plasmodium in their blood more difficult. 6 Using a microscope, check the numbers of Chlorella on each slide for 3 days. Study the diagram and answer the accompanying questions. Parrot fish. Exercises To learn more about parts of plants, go to the hotlinks site, search for the title or ISBN and click on
Chapter 9. In flowering plants, which bees will land on which flower of a population, with what pollen from another flower in that population, is also a matter of chance. For example, pain receptors receive the stimulus of heat, pressure, or chemicals produced by injured tissues. (6) (b) Compare the roles of the parasympathetic and sympathetic
nervous systems. Uses of citric acid Before the production of citric acid by fermentation, it was obtained from the juice of citrus fruit. Thus the results need to be interpreted with caution. Usually, reflexes are protective. The Rh blood type is based on the presence or absence of a protein called the Rh protein. • Pupil reflex: this must be absent (pupils
do not constrict in response to a very bright light shone into both eyes). This glucose then enters the bloodstream. Students should be clear that biomass in terrestrial ecosystems diminishes with energy along food chains, due to loss of carbon dioxide, water, and other waste products, such as urea. By replicating DNA segments, scientists can produce
huge numbers of these segments to study and analyse. Are such models just inventions? The matrix (blue) is permeated by the membranous cristae (pink). Lastly, people who inherit a sickle cell gene from both their mother and their father can produce only sickle-shaped cells and suffer from severe anaemia that can sometimes be fatal. Some of the
effects of cocaine are euphoria, talkativeness, and an increase in mental alertness. The problem is that human production of greenhouse gases shows little sign of slowing. Scraping off the stain is how petroglyphs (carvings or inscriptions on rocks) were left on cave walls. Diagram of ear should include pinna, eardrum, bones of the middle ear, oval
window, round window, semicircular canals, auditory nerve, and cochlea. Application: Correlations between global temperatures and carbon dioxide concentrations on Earth. Often the secondary messenger then chemically activates one or more other messenger molecules in the cytoplasm in a cascade of reactions. Since the mother always gives an h
the two middle children must have at least one h, but, because they are affected, they are Hh. Example 2: co-dominance in flower colours, so a pedigree chart can help keep track of how the offspring got their phenotypes. Neurones are usually very efficient but sometimes things go
wrong. The evolutionary solution was uric acid. Here is the formula: number marked in the second sample (n2) = number marked in the second sample (n3) total number caught in second sample (n3) total number marked in the second sample (n3) are the marked in the second sample (n3) total number marked in the second sample (n3) are the marked in the second sample (n3) are the marked in the second sample (n3) total number marked in the second sample (n3) are the marked in the second sampl
ecosystem. Any point selected on the x-axis shows that adult haemoglobin. A CGGUAUGCUAGC C CGGTATGCTAGC B GCCAUACGAUCG (Total 1 mark) 4 The diagram below shows two nucleotides linked together to form a dinucleotide. The word 'stoma
comes from the Greek word meaning mouth or opening. Some amino acids have areas that are charged either positively or negatively. These proteins may become parts of membranes, enzymes, or even messengers between cells. A negative correlation means that as one variable increases the other decreases. It is important to note that: • FADH2
enters the electron transport chain at a lower free energy level than NADH, thus FADH2 allows the production of two ATPs while NADH allows the production of two ATPs while NADH allows the production of the chain, the de-energized electrons combine with available oxygen. Each time a nucleotide is added, it is attached to the 3 carbon end. Vitamin D is an
important nutrient for the proper formation of bones. If a patient is positive, he or she will be retested using a different test to obtain more evidence of a positive result. The reason is essentially due to chance. But, unlike annelids, their bodies are not segmented. Lesions in identifiable areas of the brain tell us indirectly about the function of those
parts of the brain. Click on the accession code at the end of that first line. In some instances we have been unable us to do so. They are made of semiconductor materials, such as silicon. • NATURE OF SCIENCE Making careful observations:
careful observation and record keeping turned up anomalous data that Mendel's law of independent assortment could not account for. If you go to an eye doctor, he or she may dilate your pupils by using a drug called atropine. B Notice that the muscles are attached to the inside of the exoskeleton. Haemoglobin has two alpha chains and two beta
chains, and four haems. This strengthens the plasma membrane and allows attachments between adjacent cells. For example, Thomas Edison had more than 1000 patents for the many things he invented, such as his improved electric light bulb and his phonograph. (d) The photo insert shows the station where the measurements were taken, at the top
of a volcanic island in the Pacific that is part of a USA state. To learn more about reflexes, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: A.2. As you can see, the diagnosis of brain death is a very thorough process. Crossing over is the exchange of DNA material between non-sister homologous chromatids. A cell contains a
wide variety of fluids, all of which are primarily water. Caution: mould may cause allergic reactions in some people. This indicated to Pasteur that the concept of spontaneous generation was wrong. Inside a lily flower, the anthers produce pollen cells by meiosis. It is one of the characteristics of genetics that allows a population to be successful. 294
Data-processing possibilities • For each test subject, calculate a ventilation rate, expressed in breaths min-1, for both the baseline and after-exercise raw data (the 20-second ventilation counts). The role of enzymes in these energy processes will be examined first. The process by which this occurs is called chemiosmosis. You can use Figures 12.23
and 12.24 so that you can really understand what is happening. If some birds in a population develop a mating call that is different from the others, this could also potentially separate one population into two groups: one that likes the new call. A coloured SEM of the body cavity of a honeybee, Apis mellifera. An
alternative for lactose powder is milk; use powdered milk if you want to compare the ratio of lactose mass, as in question 3. Look at Figure 2.29. The human brain is larger in proportion to its body size than brains of other animals. This begins at the first receptor neurone that began the chain of events. Summation A postsynaptic
neurone is on the receiving end of many excitatory and inhibitory stimuli. The two pyruvate molecules then enter a mitochondrion and are metabolized further. These hormones are produced in very small amounts and have effects in many parts of the plant. No. Only four people are homozygous recessive and have the phenotype, which is 25% of the
population. By moving away from the parent plant, the potential new plant faces a reduction in competition for limited resources. This also explains why a woman who does not breastfeed her child soon does not produce breast milk. Figure 10.21 The worldwide average height of men. Both sides of the debate have been accused of following blind faith
rather than objectively assessing the evidence. The blood that returns to the foetus has been oxygenated, and nutrients have been added while it passes through the placenta. The applications include a range of types of behaviour and types of behaviour and types of animal. The bands produced in each lane may then be used to determine the exact sequence of that
particular fragment of DNA. Transforming lists into stories is a good example of a mnemonic. In the example with the pigeon or rat, the change in the environment is food being released, and the pattern is repeatedly pressing the lever. • Chiasmata formation between non-sister chromatids in a bivalent can result in an exchange of alleles. Each of the
cell stages of meiosis has moved the resulting cell closer to the interior of the seminiferous tubule. He releases his sperm, which fertilize the eggs. So you can record and label with A or a all the possible gametes. There are almost 40 species of bird of paradise, and all have different displays and colourings. How can we 'prove' that something is safety.
for the environment? locus gene whose locus is at an extremity of the X chromosome would have no counterpart on the Y chromosome because the Y chromosome because the Y chromosome does not extend that far from its centromere. It involves comparing present information with memory. Almost all the energy of the green wavelengths is reflected, not absorbed. Using
BLASTn, we found the alignment with nucleotide sequences of other organisms in the database, such as the mouse. drug stops release of neurotransmitter Researchers from Australia and Canada have found that alcohol and other drug abuse ranks among the top 10 contributors to the global burden of disease among adolescents. When they crossed
the white-eyed male with a red-eyed female, the results were as Mendel predicted (see Figure 10.12). You and everyone you know possess many mutations. To re-establish homeostasis, a process called haemodialysis may be carried out. This mechanism promotes or inhibits flowering in certain plants. 

DNA polymerase links nucleotides together to
form a new strand, using the pre-existing strand as a template. If experiments show that the results do not support the hypothesis or even refute it, the 775 idea is falsified. Figure 13.15 Recombinant DNA plasmids are injected into the chloroplast of the plant cell. (1) (b) State precisely where in a cell this stage of respiration is occurring. Thus,
immediately following an action potential (depolarization), membrane proteins open to potassium ions and allow them to diffuse out of the axon. index.php?action=gallery;sa= view;id=1361 1.5 Option A: Neurobiology and behaviour individuals who are on an equal basis share resources with each other, it becomes an advantage for both. Although
some of these molecules, such as certain amino acids and lipids, can be synthesized by the human body, many cannot. Your brain allows you to think and dream. Scientists studying animal behaviour. • Appetite is controlled by a centre in the
hypothalamus. Stoma is the term for a single opening. An fMRI is used by doctors to determine: 508 • a plan for surgery • treatment for a stroke • placement of radiation therapy for a brain tumour • the effects of degenerative brain diseases such as Alzheimer's • the diagnosis of how a diseased or injured brain is working. Organelles can be up to 10
µm in size. Bear in mind what it means to be an 'essential' substance. 273 06 A light microscope photograph showing a transverse section through several villi. As you can see, the activation of genes caused by extra serotonin in the synapse changes the form and function of the synapse, resulting in memory. This value is found under the column 0.05,
which corresponds to a 95% certainty, and it is found in the row that has the degree of freedom of 1. The other strand (or the template strand). coli bacteria that change the genes and modify the way the pathway works. Example: some macromolecules that have not yet been fully digested. These molecules are added to
the 3! end of the growing mRNA strand. As a result of recent advances in the treatment of patients, it is possible to artificially maintain the body without the impulses that normally come from the brain. Table 1.2 Surface area 0.79 3.14 19.63 Volume 0.07 0.52 8.18
Surface area = (four)(pi) (radius squared) Surface area : volume ratio 11.29: 1 6.04: 1 2.40: 1 Volume = (four-thirds) (pi)(radius cubed) Sphere formulas: This means that a large cell, compared with a small cell, has relatively less surface area to bring in materials that are needed and to get rid of waste. Leydig cells in each testis produce
testosterone. Anticoagulants simply help prevent blood clotting from occurring as quickly. 24 Why do we inhale oxygen and exhale carbon dioxide? 4 Predict how the graph would look for non-germinating seeds at 12°C. The proteins change the form and function of the synapse, and this results in memory. Are there any that can be completely
 eliminated from the list when dealing with the natural sciences? Control of milk secretion by prolactin and oxytocin During a mammal's pregnancy there are many hormone changes that help control the various processes necessary for foetal development, birth, and postpartum (postbirth). This mathematical representation for the allele frequencies is
known as the Hardy-Weinberg equilibrium and it is reached after only one generation of random interbreeding. The bubbles enlarge in both directions, showing that the replication process is bidirectional. If you can take the complex terms of biology and relate them to something else, you will find it easier to remember them. Human males have one X
chromosome and one Y chromosome. This is the phosphorylated alcohol side. Cilia are hair-like extensions capable of a wave-like movement. 1 2 3 4 5 6 DNA within the nucleus of a hepatocyte synthesizes messenger (m)RNA for a particular protein (transcription). We now know that comparisons of the sequence differences in either proteins or
nucleic acids can be more exact for indicating relatedness. A secondary oocyte is only healthy enough to be fertilized for about a day after ovulation. 26 Explain why black surfaces (like tarmacadam and asphalt) get much hotter in sunlight than lighter surfaces (like stone and concrete). It is still not clear what the full ramifications of the spill are to the
fishing, shrimping, and crabbing industries in the area, all of which are very important to the Gulf states. The cut-off value indicating a positive result is 0.500. This precise elimination of synapses that are unused and the strengthening of the more active synapses is a key part of normal brain development. Water is split by an enzyme to produce
electrons, hydrogen ions, and an oxygen atom. Two mitochondria (ellipses) can be seen on the left. Of the offspring produced, not all will be equally valuable in the turgor pressure of the guard cells that surround them. (2) (Total 8 marks) 715 15 Option D: Human physiology
Essential ideas D.1 A balanced diet is essential to human health. Pyramids of energy should be drawn to scale and should be stepped, not triangular. In photosynthesis, the limiting factor is the one that affects the rate of the photosynthetic process regardless of
the effects of other factors. Hormones, such as oxytocin and ADH, are produced at the cell body end of these cells (in the hypothalamus) and then move down the axons into the posterior pituitary gland. The calcium and phosphate ions bind with the DNA. Because water is an excellent solvent for biochemically important molecules, it is also the
when anaerobic respiration is used to maximize the power of muscle contractions. When a chamber undergoes systole, it is imperative that the blood moves consistently in a single, useful direction (see Figure 15.10). • Step 5 - Interpret grid. For example, an action potential (or impulse) has a voltage, although the typical unit for this voltage is
millivolts. TP is the pivotal compound in the Calvin cycle. In science, is it possible to have all the evidence of any particular phenomenon? Innate behaviours are controlled by genes and inherited from parents. Events occurring with the menstrual cycle An SEM of a future hamster ovum and one of the polar bodies during oogenesis. Be cautious of cork
borers and any other sharp instruments used. Water also has a high heat of vaporization. They then performed specially designed experiments to gather data to support one of these models. However, in this chapter we are only going to focus on the influence of changes in the composition of the atmosphere, notably the presence of greenhouse gases
Because of this, auxin moves down the concentration gradient from the intercellular space into the adjacent cell. 783 Mathematics, and information above the mean is shown extending above the top of each bar of the chart, and the same standard deviation below the mean is
heating homes by burning fossil fuels, maintaining a diet high in meat (the meat industry is highly dependent on fossil fuels), purchasing goods that have to be transported long distances from where they are produced to where they will be used, travelling long distances between work and home, purchasing foods that are grown out of season in
greenhouses heated by fossil fuels. Taxonomists sometimes reclassify groups of species when new evidence shows that a previous taxon contains species that have evolved from different ancestral species. Try doing a web search on the topic of 'memory of water'. They also use diverse sources of energy. 1 Ratio = loss with supplementary food loss
in control rats 2 The results are shown in the graph below. 18 Which group has the highest number of activated serotonin receptors? This ensures that she will produce many Graafian follicles in each ovary and provide many potential ova (oocytes) for harvesting. You should remember that the double helix is held together by the hydrogen bonds
between complementary base pairs (adenine and thymine, cytosine and guanine). As the protein moves through the Golgi apparatus, it is modified and exits on the trans face inside a vesicle. • Ganglion cells synapse with the bipolar neurones and send the impulses to the brain via the optic nerve. • Applications and skills: Application: Structure and
function of sodium-potassium pumps for active transport and potassium channels for facilitated diffusion in axons. This supports the hypothesis that blackcaps are genetically programmed to fly in a certain direction. • The muscle and elastic fibres assist in maintaining blood pressure between pump cycles. Based on data from 'Facts About
Glyphosate-Resistant Weeds', Purdue Extension, www.ces.purdue.edu/extmedia/GWC/GWC-1.pdf. With inbreeding, the genetic variety is reduced and the risk for disease increases, with a lack of vigour. When Mendel planted these peas, and let them grow into adult plants and self-pollinate, he expected some of the recessive traits to show up again in
the F2 generation. This is thought to be because some hydrogen ions move back to the matrix without going through the ATP synthase channel. Our society will need to make some difficult decisions in the coming years concerning our genomes and who has access to the information contained within them. When an axon contacts an unfavourable
surface it contracts, but with a favourable surface it persists. 2 You will need baseline ventilation data for each individual test subject. chromosome Figure 1.28 This diagram shows you how DNA is packaged by supercoiling from a single double helix to nucleosomes, to solenoids, to looped domains and finally to a chromosome. In selective breeding
view of a microscope is to use an eyepiece graticule. R r Figure 10.22 Mendel's pea R RR Rr RR or Rr = round 3 out of every 4 offspring r Rr rr rr = wrinkled 1 out of every 4 offspring experiment. You are plates,
labelled C, occur in xylem vessels? We can be 95% sure that there is a relationship between the fern distribution and amount of sunlight. Option B: Biotechnology and bioinformatics As the colonies of bacteria become more dense, they can coordinate the expression of their genes in response to the density of their population. Used by permission of W
Some of the free-floating species are carried by the current, but others are agile swimmers. ESTs have recently become an important tool that is helping us understand the function of human genes. Yeast then converts both of the 3-carbon pyruvate molecules to molecules of ethanol. The endonucleases cut the DNA at specified points. Conversely, if
we end up with a calculated value that is less than 3.841, it means we can accept the null hypothesis. There are lots of YouTube tutorials for BLAST online. • Heat is less than 3.841, it means we can accept the null hypothesis. There are lots of YouTube tutorials for BLAST online.
study of 23 832 people revealed that 3% of the population was Rh-. Psychologists adopt an experimental, laboratory, approach in which the external world of the animal is controlled carefully. It is crucial that you remember Darwin's steps of how natural selection leads to evolution. Another trick is to not report in the published study any participants
who dropped out of the trial because they felt ill from sideeffects. 35 Describe a benefit to the coral reef that occurred over the 24 months at site D. 5.3 Classification of biodiversity Understandings: The binomial system of names for species is universal among biologists and has been agreed and developed at a series of congresses. Hence the
probability that a woman could produce the same egg twice is 1 in 223 or 1 in 8 388 608. So one factor that causes our blood does not receive constant levels of glucose. Free ribosomes synthesize proteins for use primarily within the cell. CHALLENGE YOURSELF 2 Figure 11.11 shows you a
simplified diagram of a sarcomere in a relaxed position and when contracted. Patients typically receive an entire new pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that their current pacemaker when the need arises to ensure that the need arise that th
Obtain the DNA of the gene of interest from another organism. It is obvious that plants are an extremely important part of life on Earth. If the organism benefiting from the antibodies is the same organism that produces the antibodies, then the process is active immunity. According to the chi-squared table (see Table 5 on page 796), the critical value
in order to obtain a 95% certainty is 3.84. • Receptor cells, known as chemosensors (or chemoreceptors), located in the annual of the aorta and carotid arteries, detect when there is an increase in carbon dioxide level and the associated decrease in blood pH. They differ in the amount of peptidoglycan present. Notice the colours of the original
strand of DNA and how one 'parent strand' becomes one of each of the new strands produced by replication. (1) (c) Other than resting and patrolling, describe the changes in the bee's activities over the 24 days. The axons of the ganglion cells make up the optic nerve, which carries the message of vision to the brain. 

Limit vectors to Agrobacterium
tumefaciens and tobacco mosaic virus. However, the sunlight that strikes Earth must be converted into a form of chemical energy in order to be useful to all non-photosynthetic organisms. The bright colours around the edge of the hot water are caused by microbial colonies that include archaeans. A Punnett grid can give us the results. Two rings of
follicle cells are formed, with a fluid-filled cavity separating them. Cladistics is the study of clades, and cladograms are the diagrams that show the phylogeny of the clades being studied. 21 If the microorganisms grow at the optimum temperature, what percentage of microorganisms encountered optimal temperatures? There are several general
conditions that must be present for a seed to germinate: • water is needed, to rehydrate the dried seed tissues • oxygen is needed, to allow aerobic respiration to produce ATP • an appropriate temperature for the seed is necessary (temperature for the 
the short plants' parents were known to be all short. (1) (b) (i) Compare the changes in total CO2 content in the venous plasma due to exercise. There are only slight variations, which can be explained by changes since the common origin of life on our planet. Excitatory drugs like nicotine, cocaine, and amphetamine increase nerve transmission, while
inhibitory drugs such as benzodiazepines, alcohol, and tetrahydrocannabinol (THC) decrease the likelihood of 550 nerve transmission. There is a higher concentration of auxin on side B, creating increased elongation of these cells and thus growth towards the light. If you substitute 0.25 for p and 0.75 for q in the equation, you should get 1.
Earthworms, woodlice, and dung beetles are detritivores found in the soil community. Ever since then, these drugs have been available for people who suffer from conditions where the oesophagus becomes irritated by hydrochloric acid. Analysis of various karyotypes has revealed that the Egyptian walking onion, A. 

Databases can be searched to
compare newly identified sequences of known function in other organisms. Blood from an arteriole enters the capillary bed. Thus yeast cells take in glucose from their environment and generate a net gain of two ATP by glycolysis. 29 Breeding strategies can affect chances of survival and reproduction. The promoter region is a short
sequence of bases that is not transcribed. 4 List two examples of adaptive radiation. A and H produce red flowers and must be homozygous for red, CRCR, because any other combination would give pink or white. (2) 45 production of oxygen / µmol m-2 s-1 6 The effect of temperature on photosynthesis was studied in sweet orange, Citrus sinensis,
using leaf discs. For those who support the idea of the biochemical evolution of life, the most logical explanation for such chemical similarities is that they imply a common ancestry for all life forms that use left-handed amino acids to build their proteins. One strand is complementary to the other, so there is a difference in the code of the strands. They
are 'Y'-shaped proteins that share many of the same amino acid sequences. • Pathway engineering is used industrially to produce metabolites of interest. Glycolysis The word glycolysis means 'sugar splitting' and this pathway is thought to be one of the first biochemical pathways to evolve. I II III IV Light dependent Light independent A I IV B II III C
III II D IV I (Total Total 1 mark) 10 What is the link reaction in aerobic respiration? The strain of bacteria on the right is a strain that has developed a resistance to penicillin and its growth is not nearly as inhibited. 

Global temperatures and climate patterns are influenced by concentrations of greenhouse gases. Therefore, there is a greater oxygen
consumption at the higher temperature. Each haemoglobin molecule is capable of reversibly binding to as many as four oxygen molecules and one carbon dioxide molecule. The World Health Organization defines overweight and obesity as abnormal or excessive fat accumulation that may impair health. Guidance • Alleles carried on X chromosomes
should be shown as superscript letters on an upper case X, such as Xh. The expected notation for ABO blood group alleles is: Phenotypes O ii A IAIA or IAi B Genotypes AB IBIB or IBi IAIB Mendel's experiments with pea plants Who was Gregor Mendel? Many flowering plants rely on birds, insects, and sometimes mammals to transport their pollen
from one flower to the next. Whether it be in the laboratory or in a courtroom, it is difficult to imagine evidence that can be considered 100% certain. The cyclins bind to cyclin-dependent protein kinases (CDKs), enabling them to act as enzymes. They supply chemical energy for the light-independent reaction to occur. You may recall from your
introductory chemistry course that each carbon atom has an atomic number of six. Mutations can happen at varying rates. • Auxin efflux pumps can set up concentration gradients of auxin in plant tissue. Normally, these neurotransmitters would be broken down by enzymes in the synapse, but amphetamines interfere with the breakdown. Like
reptiles, however, amphibians cannot control their body temperature; they are called ectothermic (or, more informally, cold-blooded) and need to bask in the sunshine to warm up, and seek shade or water to cool off. If there is no pattern to the frequency of a trait between females and males, it is most likely to be an autosomal trait. An example of an
interaction between genes and the environment is seen in the higher susceptibility of fair-skinned people to skin cancer. There is no cure for people who get sick from such super-resistant germs, and they must rely on their immune system to save them. A bird of paradise. In female body cells, usually one of the X chromosomes becomes inactive. (c)
Look at the first four lowest values on the light blue line. Table 11.2 The three types of nitrogenous waste Example organism Ammonia Fish H Advantages Requires very little energy to produce Very toxic in blood and tissues; must be diluted and removed from the body quickly by using a great deal of water Requires
less energy to produce compared with uric acid; toxic in blood and tissues but only at physiologically abnormal levels Requires more energy to produce compared with uric acid; toxic in blood and cytoplasm; can be stored within specialized structures
within some animal's eggs; requires little to no water for dilution and removal from the body Its complex structure requires a great deal of energy to produce N H H Urea Mammals O C H2N NH2 Uric acid Birds O H N NH O N H N H O Disadvantages Let's look at each type of animal mentioned in Table 11.2 and see why each type of nitrogenous
waste makes sense for that animal based on its probable habitat and evolutionary history. Gibbons. Since his experiments (some of which did not give conclusions are widely criticized and are not taken seriously by the scientific community today.
Karyotype is a property of a cell: the number and type of chromosomes present in the nucleus, not a photograph or diagram of them. The cell cycle integrates a growth phase with a divisional phase. When a plant leaf is hit by sunlight, the red and blue wavelengths of light are absorbed by chlorophyll and used for photosynthesis. The problem is, a
large percentage of the studies are being funded by the companies who make the drugs and, according to epidemiologist Dr Ben Goldacre's 2012 book Bad Pharma, it is common practice in the pharmaceutical industry to use a wide variety of tricks and manipulations to make a new drug look good in clinical trials. The result of the active uptake of
mineral ions is a high solute (hypertonic) concentration within the root. Prolonged cocaine use leads to psychological dependence. Sieve tubes have sieve plates with pores at their ends, to allow phloem sap transport to take place from one element to the next. She asks you if you know what this phenomenon is
what do you tell her? Computer artwork showing a blastocyst (right) preparing to implant itself into the endometrium of the uterus (left). Table 12.3 shows the E:S ratio for various species. The following bullet points would be suitable for annotating a diagram of the retina. Role Helicase Unwinds the double helix at replication forks Primase
Synthesizes RNA primer DNA polymerase II Synthesizes the new strand by adding nucleotides onto the primer (in a 5 to 3 direction) DNA polymerase I Removes the primer and replaces it with DNA DNA ligase Joins the ends of DNA segments and Okazaki fragments Research involving eukaryotes has shown that replication in prokaryotic and
eukaryotic cells is almost identical. • Skill: Identification of recombinants in crosses involving two linked genes. 1 A 2 Muscle 2 contracts, insect leg segment B moves up. The root cap is very important in protecting the apical meristem during primary growth of the root through the soil. Imbalance In areas of the world where there is a single staple
crop providing most of the nutritional needs for a population, there can be an imbalance of nutrients in the population's diet. The researchers can see how the dots travel from the injection site to the cell nucleus of the tumour cells. There is no cure for emphysema, but the progression of the disease can be slowed drastically with the cessation of
smoking or exposure to other risk factors. Extracellular fluid collagen fibre extracellular matrix glycoprotein in plasma membrane microfilaments Cytoplasm 24 The use of a light microscope to investigate cells and cell structure sizes *Safety alerts: Be very cautious with sharp instruments. At some point, the mRNA will float through for extracellular matrix glycoprotein in plasma membrane microfilaments Cytoplasm 24 The use of a light microscope to investigate cells and cell structure sizes and cell structure sizes are fined by the control of the control 
one of the many holes in the nuclear membrane (nuclear pores) and will then be in the cytoplasm. How can the most ethical decision be made? Industrial microbiology attempts to modify the existing pathways of microorganisms so that they can be efficient factories for particular compounds (the metabolites of interest). These develop into gametes.
The right side of the heart sends blood along a route that is called your pulmonary circulation. • The original behaviour is performed spontaneously during exploration from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we looked at in Section 3.1, which always had chromosomes is a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from all the cells we have a very different situation from a very different situation from a very different
in pairs. frequency of homozygous dominant frequency of homozygote recessive Figure 10.26 Annotated Hardy-Weinberg equation. The same is true for the line graph. C Nucleotides added by DNA polymerase I in the same direction as the replication fork. 578 Development of new drugs to fight diseases such as malaria is one of the benefits of
pathway engineering. Therefore, photosynthesis can be described as a series of reactions in which carbon dioxide and water are fixed into glucose, and oxygen is produced as a by-product. Notice the shiny yellow bacterial colonies in the lower right corner. Inhibitory neurotransmitters: • make the inside of the neurone more negative • causing Cl- to
 move in or K+ to move out • so the neurone is hyperpolarized • so the impulse is inhibited. 15, fig. To make sure a house plant maintains a more rounded appearance, it has to be turned regularly. Thus four haploid cells, each containing 23 chromosomes, are created from one that originally contained 23 homologous pairs. In this way, steroid
hormones control the production of proteins within the target cell. The same is true for emigrations, when one group with a particular allele leaves the population. Some animals are osmoregulators and some animals are osmoconformers In order to achieve consistent water balance, different animals employ different strategies. This explains why
these hormones are said to have been produced within the hypothalamus, but they are in fact secreted from the posterior pituitary. Just as with low oxygen levels, if the acidity is not conducive to the decomposers, they will not be able to do their work. • One blue rectangle is named Annotation progress. • We introduce new genes into the E. (1) (d) (i)
Describe the general pattern of change in photosynthesis in sweet orange as the temperature increases. Clones of selected ESTs were tested and the results analysed using a computer program. The cells of decomposers also carry out cellular respiration and, as a result, any heat produced this way will also be lost to the environment. We used a
database for comparison, but another method to determine exactly what a gene does is to 'knock it out' and see what happens. Do you feel modern technology is decreasing the chances of these visual illusions occurring in modern-day science research? Tagged fish also have their adipose fin clipped. (d) Where along the x-axis of the graph would the
sodium-potassium pump be beginning to work to re-establish a resting potential? • cAMP activates another molecule, protein kinase (PKA). How can we know if the official numbers released by the Democratic People's Republic of Korea are reliable? 18 Golgi apparatus to be flattened sacs called
cisternae, which are stacked one on top of another. Some bean plants were grown in sunlight, and some were grown in shade. Platelets do not have a relatively short cellular life span, of about 8-10 days. Brain scans using fMRI have revealed the effects of addictive drugs on the brain. Most flowering plants use mutualistic
relationships with pollinators in sexual reproduction. (The definition above is clearly aimed at sexually reproducing organisms, and cannot be applied to bacteria or archaeans.) • What about infertile individuals? A spider spins a web correctly the very first time. Figure 2.4 The alcohol H (c) HO C H C C groups added. Proteins are also too
large to make their way through the fenestrations of the glomerulus, and so should not be found in urine. Is it ethically acceptable to generate a new human embryo for the sole purpose of medical research? So p must be 0.90, which means that, in the gene pool, 90% of the alleles are T. No organelles are required. Just as with 14C, 40K radiometric
dating can unstable radioactive be a useful tool in determining the age stable parent daughter of a sample studied in a laboratory. • QRS complex: this is where the impulse from the AV node spreads down the conducting fibres and out to the Purkinje fibres within the ventricles, thus this shows the ventricular systole. The mother is in the first track on
the far left. This is an excellent example of the genetic basis of behaviour and its change by natural selection. Various species of bean seeds are ideal for this study. Our planet shows complex interactions between the atmosphere, water, and living organisms. The female and male engage in some form of intercourse in which spermatozoa are deposited
into the female in order to fertilize one or more ovum. (2) (d) Discuss two other factors that could influence the outcome of this experiment. The mouse gene sequence for obesity (ob) produces the hormone leptin, which is involved in fat metabolism. This is a distinct advantage for colonizing new territories, as only one female is needed to produce a
produced by the grass is converted by the grass is converted by the grasshopper's cells into carbon dioxide and water. • • NATURE OF SCIENCE Use models as representations of the real world: mechanisms involved in water transport in the xylem can be investigated using apparatus and materials that show similarities in structure to plant tissues. These steps are reversed using apparatus and materials that show similarities in structure to plant tissues.
for an expiration (breathing out). The general anaesthetic changes the nerve cells so that normal communication among many of them is closed off for a period of time. That effort was successful after only 10 years, and smallpox became the first disease to be eliminated by humans. More often than not this occurs in the spleen or bone marrow, but it
can happen anywhere in the bloodstream. A diagnosis of brain death includes the following. peptide bond created arginine phenylalanine two tRNAs fit within ribosome Figure 2.42 Events of translation (synthesis of a polypeptide). Drug companies anticipate that using E. Explore the different ways scientific method is used in each of these disciplines
Many of the cell-to-cell communication proteins have carbohydrate molecules attached. From top left to bottom right: the chromosomes condense and appear as long thread-like structures (prophase). The first method uses transfection. The area where ovulation occurs grows into the corpus luteum, which temporarily produces the hormone
progesterone Fallopian tubes (oviducts) Ducts that carry the ovum (or early embryo) to the uterus A muscular structure where the early embryo implants and develops if a pregnancy occurs Endometrium The highly vascular inner lining of the uterus.
sperm to enter for fertilization and provides a pathway for childbirth Vagina A muscular tube that leads from the external genitals to the cervix; semen is ejaculated here during sexual intercourse How does a person become male or female? A very simple, generalized, metabolic pathway is represented in Figure 8.1. Figure 8.1 An example of a
metabolic pathway. • The result gives the scientist information about what organism(s) has the same gene, the name of the gene, and the function of the gene, and the function of the gene are number of the gene. People with this condition have an immune response to the proteins that project from the outer surface of the pollen. 1 Obtain two depression microscope slides, and place the same number of
Chlorella organisms in a proper culture medium in each well. If a fertilization does not occur, the released gamete remains a secondary oocyte until the cell dies. To find out to what extent a particular abiotic factor influences a species' distribution, many measurements must be taken, of both the abiotic and biotic (living) aspects of the environment.
295 06 Human physiology The blood entering these capillary beds comes from the right ventricle via the pulmonary arteries. For example, the use of the pesticide DDT was prohibited in North America when it was proven to accumulate in ecosystems and reduce populations of birds of prey such as the bald eagle. Locus - The particular position on
homologous chromosomes of a gene (as seen in Figure 3.2 and labelled in Figure 3.21). When stem cells divide to form a specific type of tissue, they also produce some daughter cells that stay as stem cells Higure 3.21.
       gene Constructing a Punnett grid Figure 3.23 shows a Punnett grid. lacktriangle Applications and skills: Application: Electron tomography used to produce images of active mitochondria. cepa, known as the Egyptian walking onion, is diploid. NATURE OF SCIENCE In many countries, people are much more informed about the dangers of smoking
compared with a few decades ago. The most important discoveries will provide answers to questions that we do not yet know how to ask ... John Bahcall (commenting on the Hubble space telescope's capabilities) Inaccessible worlds Some scientific fields of exploration have only been possible since suitable technology has been invented, for example answers to questions that we do not yet know how to ask ... John Bahcall (commenting on the Hubble space telescope's capabilities) Inaccessible worlds Some scientific fields of exploration have only been possible since suitable technology has been invented, for example answers to questions that we do not yet know how to ask ... John Bahcall (commenting on the Hubble space telescope's capabilities) Inaccessible worlds Some scientific fields of exploration have only been possible since suitable technology has been invented, for example answers to questions that we do not yet know how to ask ... John Bahcall (commenting on the Hubble space telescope's capabilities) Inaccessible worlds are suitable technology has been invented, for example and the provided in the p
HO H 2 Hydrolysis of a polysaccharide to many monosaccharides. They have also allowed fast and accurate mapping of the genomes of other types of organisms. We will be using some of these databases to see exactly how much information has been stored for scientists and the public to use freely. The xylem phloem brings water to the leaves, while
the phloem carries the products of photosynthesis to the rest of the plant. This figure represents the effect of an enzyme on an exergonic reaction. The group will collect the global data that are important to understanding how conservationists can make a difference to bird survival. Why is the oxygen consumption of non-germinating pea seeds very
low? A.6 Natural selection favours specific types of behaviour. (a) Antidiuretic hormone (ADH). The medical community is essentially unanimous on the validity and power of the placebo effect, and yet the mechanism of how it works is poorly understood. His goal is to produce a pharmaceutical cocktail to prepare the nerves for stimulation. As he
becomes sexually mature, his song will become perfected and he will begin to search for a mate. Michael J. Because it is a cycle, it begins and ends with the same substance. And to make the splittup even more fraught, Lumpers and Splitters have been tussling over the genus Mimulus for years. New connections are formed between the intact
neurones; these neurones are stimulated by activity. Figure 12.21 How receptors function in the olfactory system. A a AA Aa Three out of every four offspring shows the recessive trait In addition, as seen in Figure 10.10, a dihybrid cross gives a ratio of 9:3:3:1. In addition, many people
have the misconception that what Darwin said was 'only the strongest survive'. Although the mechanisms of appetite and satiety are quite complex and not fully understood, they seem to be a combination of feedback loops from the nervous system, and the endocrine (hormonal) system, www.pearsonglobalschools.com Text ©
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The rights of Alan Damon, Randy McGonegal, Patricia Tosto, and William Ward to be identified as authors of this work have been asserted by them in accordance with the Copyright, Designs and Patents Act 1988. This will be important to remember later, when we watch the sister chromatids split during cell division. 5! RNA polymerase adds
nucleoside triphosphates to the enlarging mRNA molecule. • The experimenter wishes to change the likelihood of this behaviour being performed. The smaller peptides will be acted on by other protein-digesting enzymes later in the digestive process. Healthy plant roots need oxygen. DNA polymerase I replaces the primer, and finally DNA ligase
attaches the Okazaki fragment to the lagging strand. Skin cancer in fair-skinned people is associated with a genetic marker. In other words, only those synapses that have a function will survive, and the rest will gradually weaken until they disappear. Exercises 5 What are the three components of gastric juice? Exercises 11 Explain why more men are
affected by colour blindness than women. (7) (7) (Plus up to 2 for quality) (Total 16 marks) 412 7 (a) The photograph below shows the flowers of CCU CCC CCA CCG CUU C CUC CUA CUG Leucine AUU AUC A AUA AUG ACU Isoleucine ACC ACA Methionine ACG start codon GUU
C Stop codon A G Tryptophan Cysteine Arginine Serine Arginine 
software to calculate intakes of essential nutrients from a daily diet. When something could be caused by chance, we say in statistics that it is not statistically significant. For example, blood leaving the right ventricle is flowing through pulmonary arteries, even though it needs to be re-oxygenated in the capillaries of the lung tissue. Other challenges
to our definition of species include the following. Either of these scenarios will result in an enzyme becoming less efficient, and in extreme situations becoming completely inactive. However, some ingested substances will never be digested and thus have no chance of being absorbed into the bloodstream. Fortunately, statistical functions in her
calculator or spreadsheet program on her computer can do this for her in an automated fashion. Exercises 520 5 Draw and annotate a diagram of the human brain. Oxygen is also required to change nitrites into nitrates by soil bacteria, e.g. Nitrobacter. To learn more about taxonomy and classification, go to the hotlinks site, search for the title or
ISBN, and click on Chapter 5: Section 5.3. 10 Suggest one reason why viruses do not fit into the axon cell into the intercellular fluid, and the majority of the potassium ions are transported into the cytoplasm. Imagine the consequences of the
following situation. The steps of meiosis/spermatogenesis A pair of chromatids connected by a centromere is considered to be a single chromosome. After the massive eruption, little was left of the forest and rivers that had existed on and around the mountain. Nearly all birds of paradise court potential mates with a movement and courtship display.
(Total 5 marks) 8 Outline the precautionary principle. In farming, clones have been made for decades by regenerating plant material or by allowing an in vitro fertilized egg to divide to make copies of itself. Normal heart rate and blood pressure are maintained but there is a reversible loss of consciousness. As you can imagine, there can be lengthy
discussions between the two groups. Here is the mnemonic device: Run Carefully Down An Interesting Road. The first international conference dedicated to the creation of an artificial leaf was held in 2011. Whereas prokaryotic cells occur in bacteria, eukaryotic cells occur in organisms such as algae, protozoa, fungi, plants, and animals. It is believed
that lemurs were not successful in competing with apes and monkeys, because as soon as traces of the latter start to become more prevalent in the fossil record, the lemur-like organisms become rare. Except for the very upper end of the oxygen when
haemoglobin has dissociated oxygen. Application: Dual blood supply to the liver and differences between sinusoids and capillaries. In summary, remember that an organism's metabolism comprises all of the reactions that occur within all of its cells. The industrialization of agriculture, as well as the invention of artificial fertilizers, brought about the
Green Revolution, allowing farmers to produce many times more biomass than ever before on the same farms. Blood glucose level declines: less insulin is released. Here is how to begin. Lignin is a complex organic compound that greatly strengthens the cell walls of vascular plants. During this period of diastole for both chambers, the atrial pressure
is just slightly higher than ventricular pressure, and this keeps the left atrioventricular valve open. The requigitation of blood to one another significantly increases their chances of survival. D Child II is not. Carbon dioxide diffuses in the opposite direction through the same two cells. Mitochondria Mitochondria
(singular mitochondrion) are rod-shaped organelles that appear throughout the cytoplasm. According to the American Journal of Industrialized Medicine, excessive noise is a global occupational health hazard resulting in noise-induced hearing loss (NIHL). 27 Plants produce sugars by photosynthesis. The ability of a surface to reflect light is called its
albedo. MATURE OF SCIENCE Using models as representations of the real world: there are alternative models of membrane structure. Only in the 1970s did other scientists repeat studies similar to hers, with the same results, and finally X-rays were replaced with nonradioactive techniques such as ultrasound sonograms. Actin is another example,
mentioned in Table 7.5. It is a major component of human muscle and is involved in contraction. 15 Explain the benefit of knockout mice. What does this say about our perceptions and reality? One specific requirement under these conditions is an increase in the rate of breathing, the ventilation rate. Suggest a reason that might explain the
differences. # Cisternae move in a cisto-trans direction. In effect, a previous event results in a more forceful and frequent future event. (1) (b) State the stage of meiosis of a cell if it contains pairs of chromosomes as shown in the diagram. This DNA polymerase has been named Tag polymerase and its use has greatly increased the number of
discoveries in the field of gene technology. If you follow where the nerve branches are from the upper jaw straight to the left, you will find the medulla oblongata of the brainstem. 138 In addition, the calculation 2n only considers one gamete. The right visual field is giving information to the left side of the primary visual cortex (note the red lines).
Exercises 1 Define the term evolution. The menstrual cycle Starting at puberty, human females begin a hormonal cycle known as the menstrual cycle. C Codons. C C 400 H H Figure 13.19 Repeated use of benzene (m) as the sole carbon and energy source in the presence of 2.5 M NaCl by microorganisms. When making ethical decisions about what is
good and bad, or right and wrong, it is important to be as well informed as possible. People with a mutation of LRP5 cannot make this receptor protein on their immune system's cells and, as a result, HIV cannot infect them. P triose phosphate i 12 NADP! % 12 triose phosphate % i P complex carbohydrates sugar phosphate Refer to Figure 8.23 as you
read about the steps of the Calvin cycle. Rods and cones synapse with the bipolar neurone. Therefore, the ribosomal complex is moving along the mRNA towards the 3 end. (Total 1 mark) (Total 3 marks) 5 Describe the role of sex chromosomes in the control of gender and inheritance of haemophilia. (c) A species of bird is used to laying its light-
coloured eggs on the white pebbles of a beach, and has done so for many generations. • Labelling must be included on all drawings unless the question tells you not to. Protein produced by the ribosomes of the rough ER enters the lumen, inner space, of the ER. The intensity of the fluorescence of each probe is measured. 2 (a) As plants,
phytoplankton, and photosynthetic bacteria are generally more active in the spring and summer months, more carbon dioxide is extracted from the atmosphere and levels drop. This condition is generally known as acid reflux. The transcript carries the code of the DNA and is referred to as messenger RNA (mRNA). The idea of sex-linked genes for
colour blindness and haemophilia was also explored. Why do you think more people are not successful at stopping? Enzymes work by lowering the activation energy required (see Figure 8.2). A plan diagram, sometimes called a low-power diagram, is shown in Figure 9.1. Many leaves have a layer of wax called the cuticle as their outermost layer.
Limit the chemical methods of introducing genes into plants to calcium chloride and liposomes. Placental mammals are the most successful mammals are the most successful mammals. One base can make a big difference From the sections on transcription and translation of DNA, you will remember how important it is for each letter in the genetic code to be in a specific place.
Attached to this receptor is a G-protein. It had rapid humanto-human transmission and unknown virulence. This is why new energy must arrive in the form of sunlight in order to keep the system going. Because of this ability to make food from inorganic substances, autotrophs are referred to as producers, and they are the start of food chains, which
will be explored later in Section 4.2. Earth has various systems that interact. This Pfr is rapidly converted back to Pr in daylight. Problems in regulating the solutes in the many body spaces can arise as the result of some sort of irregularity in the function of the kidneys. They also allow the survival of the sieve tube member they are adjacent to. You
should remember from fundamental chemistry that covalent bonds form when two atoms share electrons. It is the movement of digested molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees that the molecules through the selectively permeable membrane of the villi epithelial cells that guarantees the selectively permeable membrane of the villi epithelial cells that guarantees the selectively permeable membrane of the villi epithelial cells that guarantees the selectively permeable membrane
remember obtuse facts! 598 marker gene promoter transgene termination sequence • A promoter gene must be present in order for a gene to be translated into the protein product. Muscle fibres (cells) contain multiple nuclei that lie just inside the plasma membrane, which is called the sarcolemma. What kind of critical thinking or TOK guestions
should they pose when they pick up a medical journal and read about the latest breakthroughs in drug research? 146 T t T TT tt t Tt tt This grid can be interpreted in two ways: • there is a 75% chance of producing tall offspring will be short.
Taxa Human Garden pea Kingdom Animalia Plantae Phylum Chordata Angiospermophyta Class Mammalia Dicotyledoneae Order Primate Rosales Family Hominidae Papilionaceae Genus Homo Pisum Species sapiens sativum To help remember the order of the taxa, a mnemonic (memory trick) is helpful. Once you understand the details of
photosynthesis, return to Section 2.8. Look again at the section about limiting factors of photosynthesis. 3 Each cell in the culture is grown into an entire plant, which contains the glyphosate-resistant gene Agrobacterium tumefaciens (agrobacterium tumefaciens (agrobacterium tumefaciens) and the section about limiting factors of photosynthesis. 3 Each cell in the culture is grown into an entire plant, which contains the glyphosate-resistant gene Agrobacterium tumefaciens (agrobacterium tumefaciens) and the section about limiting factors of photosynthesis.
effect on the phenotype only when present in the homozygous state. • Reflex arcs comprise the neurones that mediate reflexes. Other high-attitude symptoms can include vision problems, nausea, an abnormally high pulse rate, and difficulty in thinking clearly. In practice, however, a sample size is far smaller than the whole population studied and,
hence, the ratios found in experiments are rarely equal to the expected ratios. For the sake of this illustration, we will assume albinism is controlled by a single gene with two alleles. They have an impressive list of adaptations to reduce transpirational water loss. Doctors use such tests to help decide which medications to prescribe. Statisticians are
rarely completely certain about their findings, but they like to be at least 95% certain of their findings before drawing conclusions. • Guidance The seven applications in this sub-topic are intended to reinforce understanding of the general principles. Industrial microbiology is now growing microorganisms on a large scale to produce valuable products
such as penicillin commercially. Trapped in the fibrin are several red blood cell (shown in yellow). aeruginosa has grown to a biofilm state, it is between 10 and 1000 times more resistant to antimicrobials. The phosphorous events are several red blood cells, platelets, and one white blood cells, 
the difficulty in obtaining phosphorous • the short supply of phosphorous. Sometimes, cells multiply so rapidly that they may form a solid mass of cells called a tumour. This enzyme catalyses a reaction in which carbon dioxide and water combine to form carbonic acid (H2CO3). Different parts of the brain have specific roles. Look at Figure 4.13 and
see how many of these petroleum products you rely on every day. The two bases making up one rung are said to be complementary to each other. Is information absolute or relative? They have a fast growth rate. The nucleoplasm (fluid in the nucleoplasm (fluid in the nucleoplasm) contains free nucleotides, as mentioned earlier. Directional, stabilizing, and disruptive selection
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When a phenotype is favoured over another by natural selection, it is called directional selection. Examples of naturally occurring steroid hormones include oestrogen, progesterone, and testosterone, and testosterone. • Try the 60/60 rule: never turn your volume past 60% and only insert earphones for a maximum of 60 minutes per day. How? Too many offspring
Darwin noticed that plants and animals produce far more offspring than could ever survive. Is it always increasing? to address each of the five points below exhaustively, but this framework can be a good party. If you have
a resting heart rate of 72 beats min-1, you are performing 72 cardiac cycles each minute. This process is sometimes called gene splicing. The presence of excess nitrates and phosphates in rivers and streams in the early days of
research on the pathogen that we now know as HIV. r ar al rti pa Figure 4.6 The carbon in fossil fuels carbon in fossil fuels carbon in fossil fuels carbon in producers tio n carbon in decomposers. The role of autotrophs in the carbon cycle Let's start with food. uring due to LH and es mat F SH maturing follicle oocyte surrounded by zona pellucida Graafian
follicle degenerating corpus luteum ovulation co rp us l corpus luteum ovulation co rp us l corpus luteum g uteu ishin m first forming then dimin Figure 6.27 Ovary events during a single menstrual cycle. 3 Obtain five test tubes and place them in a test tube rack. Using models is a way in which scientists explain complex structures such as cellular
membranes. • • NATURE OF SCIENCE Developments in apparatus: fluorescent calcium ions have been used to study the cyclic interaction. Option B: Biotechnology and bioinformatics Microinjection As the term suggests, with microinjection the DNA is injected into a protoplast with
a microneedle. (1) (Total 3 marks) 3 In some maize plants the seed is enclosed in a green sheath called a tunica. pdf, p. A hierarchy of taxa The term taxa (singular taxon) refers to the categories that scientists have generated names for. Metabolites of interest The alcohol produced by E. These calcium ions bind to troponin, which stimulates the
tropomyosin filament to slide, uncovering the actin binding sites. These elements are used in the molecular structures of carbohydrates, proteins, lipids, and nucleic acids by forming covalent bonds with each other. Thus lipids have about twice the energy content per gramme compared with other
molecules, such as carbohydrates and proteins, that are also used for cell respiration. Together, they are called sister chromatids. Computer artwork showing the two kidneys in a male. Look at the false-colour electron micrograph (above right). This process involves several steps: • find beneficial molecules that are produced naturally in healthy
people • find out which gene controls the synthesis of a desirable molecule • copy that gene and use it as instructions to synthesize the molecule in a laboratory • distribute the beneficial therapeutic protein as a new medical treatment. The answer lies in the hormones that are produced by each embryo. The entire mix of cells is now transferred to an
environment in which only the hybridoma cells can survive, and all of the B cells and myeloma cells that did not fuse die. 

The structure of cells of the epithelium of the villi is adapted to the absorption of food. Saltatory conduction is the term used to describe the phenomenon whereby an action
potential of myelinated axons skips from one node of Ranvier to the next as the impulse progresses along the axon towards the synaptic terminals. Setting up a table to help keep track of the numbers is helpful. The hormonal events associated with birth Most feedback mechanisms in physiology are designed to work by negative feedback. From the
cytochrome complex, the electrons move down the remaining electron transport chain allowing ATP production via chemiosmosis. 5.2 Natural selection Understandings: Natural selection can only occur if there is variation amongst members of the same species. Cholesterol Membranes must be fluid to function properly. 624 Use of viral vector to treat
SCID The first human gene therapy was carried out in 1990 on a 4-year-old patient named Ashanti DaSilva. These penetrating invaginations (infoldings) are called transverse tubules or T tubules. It first converts the mercury to merc
coding for the fourth of these enzymes has been shown to be universally defective in all humans, thus making it essential that vitamin C is present in our diet. Using Figure 13.26, answer the following questions. CHALLENGE YOURSELF Cancer cells have a higher rate of mitotic division than normal cells. Adapted from Hille 2001 primary transmitter
out primary transmitter receptor gate internal second messenger in second messenger receptor Look at the diagram that compares fast-acting and slow-acting transmission in the brain (Figure 12.39). Gene function can be studied using model organisms with similar sequences. They are all single-stranded and each is transcribed from a gene (a
section of DNA). Escher's Waterfall is a prime example of an optical illusion. Besides ingesting haemoglobin, they can also ingest cellular debris and bacteria within the bloodstream. First base in codon U C A G Second base in codon Phe Ser Tyr Cys U Phe Ser Tyr Cys C Leu Ser — A Leu Ser — Trp G Leu Pro His Arg U
Leu Pro His Arg C Leu Pro Gln Arg G Ile Thr Asn Ser U Ile Thr Lys Arg G Val Ala Glu Gly G What is the sequence of the amino acids that is being translated from the following mRNA sequence? substrate enzyme allosteric inhibitor Figure 8.4
An allosteric (noncompetitive) inhibitor combines with the allosteric site of an enzyme, causing the active site to change shape; the substrate cannot then bind to it. On days 3 and 4, repeat the above procedure. 240 Today, there are hundreds of specialists who, like Linnaeus, describe and name new species. The SA node acts as the pacemaker. For
example, the base thymine (T) might be put in the place of adenine (A) along the DNA sequence. Water therefore moves from a hypotonic solution to a hypotonic solution across a partially permeable membrane (study Figure 1.18).
 'self' or 'notself'. The colour and spots help to camouflage them from predators. Place a cover slip over the root tips, and place several layers of paper towel over the slide and cover slip. List the apes shown in the diagram. Shake the tubes hard for 30 seconds and then lift the parafilm to allow any gas to escape. We are now going to look at the
astounding genetic techniques, developed during the past few decades, that enable scientists to explore and manipulate DNA. People can live normally with a single kidney, so it is possible for a healthy, close family member to donate a kidney if the blood and tissue type match appropriately. This process is referred to as fermentation. When water
cools below its freezing point, the molecular motion has slowed to the point where these hydrogen bonds become locked into place and an ice crystal forms. It includes the following processes. Darwin was not the only person to develop a theory to explain evolution. This is because carbon-14, also written 14C, is 219 05 Evolution and biodiversity
radioactive but slowly loses its radioactivity; as it gives off its radioactivity its radioactivity.
increases the chances of survival and reproduction, has acted on genetically caused behaviours. These bile salts enter the bloodstream and attach to the plasma protein called albumin. You need to become comfortable with using the steps of the chi-squared test. Quite a lot of factual information in biology can be remembered more easily if you make
up a mnemonic device. Also in the anterior end are chemoreceptors that respond to certain chemicals. • 171 04 Ecology Applications and skills: Skill: Classifying species as autotrophs, consumers, detritivores, or saprotrophs from a knowledge of their mode of nutrition. To test this, a group of scientists, led by Denise Seliskar, took samples of the
cordgrass from three different states from different states from different latitudes: • Massachusetts (41° 34 N) • Georgia (31° 25 N). The large grey atom is carbon. Use of monoclonal antibodies to diagnose pregnancy Monoclonal antibodies to diagnose pregnancy Monoclonal antibodies can be used for a wide variety of diagnostic purposes. You should note all the characteristics that
chloroplasts and mitochondria have in common with prokaryotic cells. If drilling into your tooth causes you pain, the drilling can be considered the UCS, and the pain the ucr. Using another example, explain how an environmental change can lead to evolution. The choice of the antigen is very important because the antibodies that will be produced
will bind only to this specific antigen. Imagine comparing certain DNA sequences from three species, A, B, and C. Dissection of various types of seeds in a laboratory setting, as well as studying seed diagrams, will be a great help in developing this skill. When we burn natural gas provided by the petroleum industry, we return that carbon to the
atmosphere in the form of carbon dioxide. There are many factors involved in the transport of water and minerals in plants. 627 13 Option B: Biotechnology and bioinformatics BLAST A biological database is an organized body of data usually supported by a computerized software program. • A scientist clones a gene. With two or more allelic pairs
found at different loci, the number of possible genotypes is greatly increased. Jenner later vaccinated more children in the same way, including his own son. Many feel these sections have lost their function due to a mutation involving a base sequence change. Because of this, cancer tissue has a higher mitotic index than normal tissue. How does a
vaccine confer immunity without resulting in symptoms? 728 A cow fitted with a fistula for observing and taking fluid samples from the rumen (one of its stomachs). The cross would be IAi × IBi and the grid is shown in Figure 3.29. The coenzyme FAD is reduced to form FADH2. The portal veins that connect the capillary beds within the hypothalamusers.
to capillary beds in the anterior pituitary comprise one of three places in the body where a portal system of circulation is used (two capillary beds in one circuit). Tumour markers are proteins that show a change in gene expression. (1) (c) Compare the DNA found in prokaryotic cells and eukaryotic cells. HeLa cells were the first cells to be successfully
cultured on a large scale and have been used extensively in biological research, including the development of the first polio vaccine. As you have seen, there are three possible genotypes for males. High-quality carbohydrates, such as fruits, vegetables, legumes, grains, and dairy, are the best source of
glucose. Notice that water is always a product of a condensation reaction and that one of the two monosaccharides 'donates' a hydroxide ion (-OH) and the other monosaccharide of a significant improvement in air quality thanks to measures such as the UK
Clean Air Act of 1956. Therefore there is a difference in the process of 330 assembling the two new strands of DNA from the templates. 6 What would a genetic counsellor look for in a karyogram to find out if an unborn child has Down syndrome? The second cross does not follow Mendel's ratio of 3:1 and instead has a ratio of 1:1, because for every
one fly that has red eyes, there is one that has white eyes. To learn more about epigenetics, go to the hotlinks site, search for the title or ISBN, and click on Chapter 7: Section 7.2. 10 What organisms enable effective studies of epigenetics? The carbon atoms that make up the cells of the flesh and blood of the giraffe, for example, came from the
vegetation the giraffe ate. • Gag reflex: this must be absent (the insertion of a small tube into the throat of a comatose patient will cause a gag reflex). Worked example The length of an image you are looking at is 50 mm. Researchers have shown that this can work. B Binding to an anticodon and then combining with an amino acid. What challenges
does that pose to the definition of species? Consider the following example of metabolism in order to see how living processes are actually chemical substances interacting in predictable patterns. Antibiotic-resistant pathogens such as MRSA are causing hospitals and clinics all over the world to rethink their standards of hygiene. left visual field right
visual field left eye right eye Figure 12.20 Two eyes connected to the brain by optic nerves. • The labelled transferrin attaches to the cancer cells. The phosphate group is the same in DNA and RNA. The intestines produce various hormones to send signals about hunger and satiety to the brain. Immediately mix well and start a timer. Figure 10.2 Some
of the crucial steps in meiosis. Malaria affects millions of people and kills 650 000 a year. People breathing carbon monoxide are depriving their tissues of oxygen as the carbon monoxide molecules bind to haemoglobin and prevent haemoglobin from carrying a normal load of oxygen. 23 Name two other environmental factors that could affect the
microorganisms that are released from ballast water and that could also be studied. The only rest that it gets is during the period within the cardiac cycle when any one chamber is not undergoing systole. Figure 2.38 Meselson and Stahl's results. The process works even better if a second molecule is glycerol. If DNA
replication works correctly, this should not happen (see Section 2.7). • • Application: Use of knockout technology in mice to determine gene function. Penicillin was used to treat the thousands of wounded during World War II, thus saving many lives. One fraction that is not shown in the diagram is naphtha, which might not
 sound familiar but it is the main ingredient used to make plastics. In this process, the carbon is released from the cell (after combining with oxygen) as carbon dioxide. Although the graph clearly shows an increase in the risk of non-disjunction as the mother's age increases, many babies with Down syndrome are born to mothers under the age of 35
Then, and only then, does myoglobin dissociate its oxygen and thus delay the onset of lactic acid fermentation. Calculate an average and standard deviation for each nutrient and pH. and Palladino, Michael Angelo 2013), fig. et al 1995), Copyright © 1995 by The American Association for the Advancement of Science, reprinted with
permission from AAAS; Figure on page 715 adapted from Temperature and embryonic development in relation to spawning and field occurrence of larvae of three Antarctic echinoderms, The Biological Bulletin, 194, pp. The SA and AV nodes take advantage of this natural ability and provide the timing necessary to synchronize the entire heart. Are
suggestions given by established scientists more likely to receive acceptance than suggestions from lesser known researchers? (1) (b) (i) Compare the percentage of heat lost through respiration by the autotrophs with the heterotrophs. 3 Hybridization: apply the cDNA mixture to a DNA mixture to 
are wrinkled. Sex determination The 23rd pair of chromosomes are called the sex chromosomes because they determine whether a person is a male or a female. Some cows produce better milk, another in better meat. Nodes show a common ancestor for the descendants
that appear above them in this cladogram. • Suggest some ways in which this procedure could be altered so that more reliable data could be attained. Discuss why it is important to learn about theories that are later discredited. Seeds, dropped by birds or blown in by the wind, germinated in the fertile volcanic ash. Some scientists refer to the
sections of DNA that appear to not have a coding function as pseudogenes. Figure 5.17 shows some key characteristics of a cladogram. But if someone has a predisposition to skin cancer, we can only see the genetic marker by using biotechnology techniques, some of which we will learn about in this section. Commodities: • food additives such as
amino acids and vitamins • solvents such as alcohol and acetone • biofuels such as ethanol and methane. They have similarities that help us to identify them, know some of their properties, and have a good idea where they like to grow. The botanists have a point, too. When a macrophage encounters a not-self antigen found on a pathogen, it engulfs
the 452 pathogen by phagocytosis and partially digests it. After this has occurred, 536 dorsal root ganglion spinal nerve relay neurone Figure 12.34 A reflex arc showing the path of a spinal reflex. The yellowcoloured cells are cells that produce digestive enzymes that are released into very small ducts (look closely at the lower left of the picture) that
eventually join into the pancreatic duct that leads to the small intestine. C D (a) Which letter represents the stroma where all the enzymes necessary for the light-independent reaction occur? What are the chances that the parents' next child will be a haemophiliac? These patterns include both hypermethylation (many methyl groups present compared
with normal tissue) and hypomethylation (very few methyl groups present compared with normal tissue). 610 SNP stands for single nucleotide polymorph. We count on the Sun as a constant energy source for both warmth and food production for all of our planet. What is a nerve impulse? Disassembly of the components follows termination of
translation. The idea of eugenics is that, if human breeding is controlled, it could improve the population by favouring desirable ones. Telophase II 1 2 anaphase II Chromosomes unwind their strands of DNA. This kind of formation allows large quantities of useful gas and oil to collect together in a productive
reservoir. Your lungs have only one opening to the outside air, and that is through your trachea (via your mouth and nasal passages). The lung tissue increases its volume because there is less pressure exerted on it. Next learn the function by covering up one side of Table 12.6 with a piece of paper and trying to recreate it. The lever will automatically
give the injection if it is pushed by the animal (selfadministration). The production of biofuels can only compound the problem. amount of time drinking from the river number of individuals 12 10 Figure 7 A histogram of the 8 time spent by individuals of a species drinking from the river. Other cells, including epithelial cells such as skin, retain the ability
to reproduce rapidly throughout their life. However, new technologies using recombinant DNA to produce transgenic crops may be able to increase the yield of some of the basic crops. This primer is a short sequence of RNA, usually only 5-10 nucleotides long. Does your heart look and work like that of the elephant seal pictured? These microbes are
 also common in wetlands, where they produce marsh gas, which can sometimes glow mysteriously at night, but they are also responsible for producing methane gas in the digestive tracts of mammals, including humans. • The amino acid sequence determines the three-dimensional conformation of a protein. • A community forms an ecosystem by its
interactions with the abiotic environment. Each one represents a different kind of bacterial colony in the mud, and each of those transforms molecules for the membrane. Biological research laboratories all over the world are very active in this area.
Prior to the mid 1960s, research from scientists at various facilities around the world seemed to indicate that DNA replication was continuous on both strands. The evidence for this is that the fibre contains many nuclei: it is said to be multinucleate. One final adaptation of both halophytes and xerophytes to reduce water loss is to simply close the
stomata using the action of the guard cells. Pepsin is one of many protease (protein-digesting) enzymes. Let's consider some examples of essential nutrients and the ramifications of a deficiency of those nutrients in the diet. Here is a summary of some of those transport mechanisms. The process of differentiation from neuroblast to neurone is called
neurogenesis. • Sequence differences accumulate gradually so there is a positive correlation between the number of differences between two species and the time since they diverged from a common ancestor. Such very large or very small data points are called outliers. C Figure 2.8 A generalized fatty acid. Life as a cub is dangerous. This is shown in
the following table: the volume increases by a factor calculated by cubing the radius; at the same time, the surface area increases by a factor calculated by squaring the radius. The implication is that it is a loss of biodiversity that is driving the reduction in fish stocks. A gene that makes an antibody to hepatitis B is inserted into a modified version of
the tobacco mosaic virus (TMV). Specific examples could be used for illustration. The first type of leucocyte to encounter an antigen is usually the large phagocytic cell known as a macrophage. In order to understand the many properties of water, and the
importance of those properties to living organisms, we must first consider the structure of water molecules. 1997), reproduced with permission; Figure on page 571 (top) from Ecology: principles and applications, Cambridge University Press (Chapman, J. This decreases the hyperactivity and allows patients to be more focused. cell division G1 phase
erphase nt The cell cycle describes the behaviour of cells as they grow and divide. In other cases, the biochemical evidence can be contradictory, which encourages scientists to reconsider their initial ideas. • Pipette the red and green cDNA molecules onto the plate. And the biosphere includes us. One indication of temperature is the frequency of
different types of isotopes (versions of atoms) found in the air bubbles. If a message sent by a pain sensory receptor arrives at the CNS, you will feel the pain. These Greeks postulated that blood was constantly being used up within the body, and they did not consider the closed circulation pattern we now know exists. Among the many other conditions
that must be met, a protein to pr
Notice the active site on the left-hand side of the enzyme. It is required for photosynthesis, and it controls many aspects of plant growth and development. What kinds of technology are necessary in order to collect the data? In such a case, use a smaller quadrat, maybe one that is 50 cm2. Is there a conflict here? Rf refers to retention factor or relative
mobility factor. Passive and active transport There are two general types of cellular transport. • passive transport the term, notably for human behaviour. left lung capillary bronchioles alveoli 292
The mechanism of ventilation A double-exposure photograph showing the position of the chest during inspiration and expiration. The shaded bars below show when spawning occurred in echinoderms. Using an open reading frame CHALLENGE YOURSELF 14 In this example two of the three possible reading frames are open. Justify your answer. The
resistant rats are better adapted to survive in the presence of the pesticides and now, thanks to the farmer's actions, have no other rats to compete with for a food supply. Amflora starch is beneficial to the paper and adhesive industry. The synthesis of proteins necessitates the activation of genes in the nucleus of the neurone. The tall plant could, in
fact, be Tt but by chance it only passed on T and never passed on t. Try to make three to five test groups with as many test subjects in each group as possible. The markschemes used by examiners when marking these questions are given in the eBook, at the end of each chapter. 588 1 Describe pathway engineering. Plasmid DNA is not required by the
cell under normal conditions but it may help the cell adapt to unusual circumstances. • Calculate the values (O - E), then square them (O - E), then square them (O - E), then square them the values of the values 
will not be affected by albinism, whereas all the aa offspring will be albinos. generation 0 100% 1 Meselson and Stahl's experiment was performed half a century ago, but it employed techniques widely used in today's biological research. Birdsong is a good example of the acquisition of a skill or knowledge by an animal. Each of the four stages requires
specific bacteria. Had he stumbled upon linked genes by bad luck, it is difficult to imagine how differently the history of the discovery of genetics would have played out. However, because an animal can imprint on an inanimate object, like a box on a model train, the consequence of the behaviour is not something that reinforces it. But if you can't find
one, should you make one up? Production of citric acid In this molecular model of citric acid carbon is shown in black, hydrogen atoms of a single water molecule are categorized as polar covalent bonds. Insulin is a protein hormone that facilitates the
movement of glucose from the bloodstream to the interior of cells. He designed tubing that acts as a synthetic, biodegradable scaffold. All of your metabolism is based on this fundamental scenario. However, there is a risk that GRCs might directly alter food safety. Because of this, cells are limited in the size they can reach and still be able to carry out
the functions of life. 699 14 Option C: Ecology and conservation Natality, mortality, immigration, and emigration, and emigration emigration, and emigration emigration emigration emigration.
(mortality + emigration) The sigmoid growth curve is an idealized version of population growth. 440 q2 = 0.01, so 1% of the population is tt. It also waterproofs plant parts and adds protection against pathogens. The reward of increased dopamine can result in addiction. Applications and skills: Application: Cholesterol in mammalian membranes
 ELISA diagnostic test can be used to screen blood donors. This interpretation is done in the brain, so in fact, do we see with our eyes or our brain? Now when you may feel the pain return to your tooth (CR). (i) Identify, with a reason, whether the stem cell in the
micrograph is in interphase or mitosis. 19 Compare the data for 0.25 days after the first dose with the data for 1 day after the first dose with the data for 1 day after the first dose. 320, Copyright © 2001, Sinauer Associates, Inc.; Figure 12.38 adapted from Ion channels of excitable membrane, 3rd ed., Sinauer Associates, Inc.; Figure 12.38 adapted from Ion channels of excitable membrane, 3rd ed., Sinauer Associates, Inc. A mountain range in the USA called the Great Smokey Mountains
got its name because of the continual haze above it created by transpiration from the abundant trees present. What about digging up fossils? Lorenz came to the understanding that imprinting happens at a particular stage in life. Figure 5.11 The giant anteater, Myrmecophaga tridactyla. When a group can be split into two parts, one having certaining that imprinting happens at a particular stage in life.
derived traits that the other does not have, the groups form two separate clades. The stretches of non-coding DNA are called introns. Plasma protein is synthesized (translation). Sometimes, the bell-shape is very flat. 18 Describe the three methods of fixing nitrogen in the nitrogen cycle. Below are some knowledge issues/knowledge questions to
consider. This helps you to see the relevance and context of what you are learning. (1) (Total 3 marks) 8 In the bee Centris pallida, the male performs one of two mating behaviours known as patrolling or hovering. The only way identical twins, and even
then there are slight genetic differences between the siblings. Denitrification also destroys the ozone layer. Exocrine glands are those that produce a secretion (enzyme, saliva, etc.) that is carried to a nearby, specific, location via a duct. Together, sensory neurones and motor neurones make up the peripheral nerves. layer of pigmented cells rod cell
bipolar neurone nerve fibres of ganglion cells Table 12.6 summarizes the functions of the various parts of the eye. The result is a greater elongation of cells on the stem side away from the light source. Sometimes people changed the oil in their car and just dumped the oil on the ground. The eye blink is
called the unconditioned response (UCR). The symbiotic relationship between Elysia and the green algae allows the adult form of Elysia to take on a more sedentary lifestyle, depending on light being available to carry out photosynthesis. polarized area Na! K! Na! depolarized area R! polarized area Elysia and the green algae allows the adult form of Elysia to take on a more sedentary lifestyle, depending on light being available to carry out photosynthesis.
a depolarization. In effect, these bacterial colonies are being overfed. The Ganges River in India is the site of a hugely popular festival where people ritualistically bathe in the river, which is now contaminated with human faeces. To obtain the sperm cells that are needed for fertilization, the man ejaculates into a container. On the other hand, it is very
common to not be hungry but see something that looks too good to resist. In an experiment on rats, scientists at the University of Illinois College of Medicine found that young rats have a good supply. For a human egg cell, n = 23.
But nature is often counterintuitive. • Every label must have a line leading exactly to the part it is referring to. • Bipolar neurones are cells in the retina that carry impulses from a rod or a cone cell to a ganglion cell of the optic nerve.
there is water present and there is a large number of phospholipid molecules. Assuming there is no pregnancy, the corpus luteum begins to break down after 10-12 days, and this leads to a decline in both progesterone and oestrogen levels. The stimulus. If the burner lights it is methane gas rather than just carbon dioxide. All these
adaptations make it difficult for a new arrival to find enough resources. 10 Apply the terms negative phototropic to the root and positive phototropic to the root and stem of most plants. All cellular membranes, whether plasma membranes or organelle membranes, have the same general structure. (d) Homologous chromosomes are separated and pulled to
opposite sides of the cell. • Activated B cells multiply to form clones of plasma cells and memory cells. What about the robins? shoot apical meristems (in buds) Figure 9.17 An overview of primary and secondary growth. Examples of non-competitive inhibition include metallic ions, such as mercury, binding to the sulfur groups of the component amino
acids of many enzymes. MRSA stands for methicillinresistant Staphylococcus aureus. The line of the graph would be almost right on the non-germinating (22°C) line that exists now. Before you read on, can you reach your own conclusion? This is called selective pressure. Chemoreceptors in the medulla are sensitive to carbon dioxide changes in the
blood as it passes through. To this end, epithelial cells of villi are sealed to each other by membrane-to-membrane protein 'seals' called tight junctions (see Figure 15.5). Many heart conditions have been studied, and there are now very effective treatments for several of those conditions. Each chlorophyll. This time five puffs are now very effective treatments for several of those conditions.
of serotonin were given to the Aplysia. Once the potometer is assembled, select one factor and determine its effect on the rate of transpiration in the plant species you have chosen. hypothalamus thyroid testes pancreas ovaries Selected hormone into
nearby capillary beds for distribution to body cells. Fortunately, with online databases and user-generated content in web-based encyclopaedias, names can be left about the previous name, so that specialists doing research can usually find a species whether or not a new or an old name has been used. For example, most
people who have inherited a light skin colour can darken their skin by tanning in the sun. NATURE OF SCIENCE Curiosity about particular phenomena: investigations were carried out to determine how desert animals prevent water loss in their wastes. Mutation, meiosis, and sexual reproduction There are three main mechanisms that give organisms
in a species their variation: • mutations in DNA • meiosis • sexual reproduction of lactose-free milk and its advantages. One final function of HCl in the stomach is to help control the ingestion of some pathogens. A karyogram is
used to show a person's karyotype, which is the specific number and appearance of the chromosomes in his or her cells. The replication of DNA begins at special sites called origins of replication. Asbestos, once commonly used in building insulation products, is another carcinogen that can result in lung cancer. • 184 The importance of sunlight to
ecosystems The best studied ecosystems are those found on Earth's surface, whether they are on land or in surface water. You can either prepare your own root tip preparations from a laboratory, or you can examine pre-made root tip preparations from a laboratory, or you can examine pre-made root tip preparations from a laboratory supply company. As DNA is the genetic code for proteins, this
means that each individual has a unique set of proteins that he or she is capable of synthesizing. In the second half of the 20th century oil spillage and pollution in the marine environment was a huge problem. This electron is captured by the primary acceptor of the reaction centre. Primer Fluorescently marked chain terminator nucleotides Standard
free nucleotides Primer ddT? The structure of the chloroplast is adapted to its function in photosynthesis. Evolution and biodiversity A C D E B F G A B C D E F G Every once in a while a new idea comes along and shakes the scientific community to the core. The same is true for a trait whose possibilities can be represented by just a few choices,
such as blood type (A, B, AB, or O). This area of the enzyme is called the active site. Look again at the step: 'The released calcium ions flood into the sarcoplasm.' Remember that the sarcoplasm is simply the cytoplasm inside the muscle fibre (the cell) and thus the calcium ions are temporarily at a high concentration inside the cell, where many actin
filaments are located within the sarcomeres. This could also be interpreted as a 25% chance that a chromosome in that population has the allele at that particular locus. The transgenic soybeans are an example of a genetically modified organism (GMO). Some mammals, such as whales and dolphins, are adapted for life in the water, and others, such as whales and the transgenic soybeans are an example of a genetically modified organism (GMO).
as bats, are adapted for flight. When haemoglobin reversibly binds to an oxygen molecule, it is the iron atom within the haem group that is bonding with the oxygen. • • Applications and skills: Application between smoking and incidence of cancers. In 1999 a group of researchers at Cornell University carried out a study in their
laboratory to find out if the pollen from genetically modified Bt corn could have a negative effect on the larvae of the much-beloved monarch butterfly, a beautiful species admired for its impressive annual migrations from southern Canada and the USA down to Mexico for the winter. circular muscle contracted • The optic nerved monarch butterfly, a beautiful species admired for its impressive annual migrations from southern Canada and the USA down to Mexico for the winter.
receives the messages from the retina at the back of the eye. To learn more about micro-ecosystems setting up sealed mesocosms, go to the hotlinks site, search for the title or ISBN, and click on Chapter 4: Section 4.1. Exercises NATURE OF SCIENCE 4.2 Use theories to explain natural phenomena: the concept of energy flow explains the limited
length of food chains. Be sure you know when the chisquare test can be used, the steps of how to do it, and how to interpret the results. Further experiments will shed more light on this. You do not need to memorize the tables for p values. evolibrary/news/060101 batsars As we realize the importance of bird migration to bird survival and
reproduction, it is exciting to see that international organizations are recognizing the need to conserve migration routes. Like the next two phyla, annelids have a gastric tract with a mouth at one end and an opening at the other end where wastes are released. • Application: Tissues or organs to be used in medical procedures must be bathed in a
solution with the same osmolarity as the cytoplasm to prevent osmosis. How DNA profiles are analysed In the photo on page 158, showing gel electrophoresis of nine samples of DNA, the line marked C2 (child number 2) and the one being pointed to, F (father), show similarities in their banding patterns. Would you want a scan done of your thoughts?
753 15 Option D: Human physiology Table 15.5 Selected hormones produced by the two lobes of the pituitary gland Controls Unfortunately, many athletes in many sports have given in to the temptation of using performance-enhancing drugs (PEDs). The sense strand has the same base sequence as the new messenger (m) RNA. 174 As well as bodies
of water, there are other ways in which populations of the same species can be isolated from each other, such as mountain ranges or deep canyons. Notice that some have formed four daughter cells ready to be used in fertilization. 8 (b) Limbs present, but they do not have digits ....
of carrying out photosynthesis. NATURE OF SCIENCE Most, but not all, organisms assemble proteins from the same 20 amino acids. A cladogram only shows common ancestry and does not include the length of divergence. Part of what determines whether or not a female animal becomes pregnant is that all the conditions must be right inside her
body, and that sperm cells must be present at the opportune moment when an egg is ready. During this series of reactions, two more carbon dioxide molecules are produced from each original pyruvate molecule that entered it. These colours skip a generation and show up again in the last row. Each group will need to use the above standard
procedures to design and carry out their own investigation by altering the solution pH, solution temperature, or the mass of the substrate and enzyme when in powder/tablet form). These subunits are often of a particular size, but all are
microscopically small. scaffold protein supercoil within chromsome coiling within supercoil looped domain chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) DNA double helix (duplex) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) 42 DNA chromatin fibre solenoid - coil of nucleosomes (shown in simplified form) 42 DNA chromatin f
polyclonal immune response has occurred, it is very difficult to separate the different kinds of antibodies that have been produced. By permission of the Royal Society (b) Draw an arrow on the diagram above to indicate the direction in which light is moving. Figure 7.10 DNA strands in the transcription process. 98 Glycolysis is the first step in the cell
respiration process Assuming that glucose is the organic nutrient being metabolized, all cells begin the process of cell respiration in the same way. • Hairs in the semicircular canals detect movement of the head. 2 The individual chromosomes line up along the equator of each cell in no special order; this is called random orientation. In genetics, they
recombinants * produced by crossing over during meiosis Look at the two possibilities for offspring in the middle of Figures 10.16 and 10.17 (the second and third possibilities in each molecule is indicated. To
learn more about chromosomes, go to the hotlinks site, search for the title or ISBN, and click on Chapter 3: Section 3.2. Exercises NATURE OF SCIENCE 3.3 Making careful observations: meiosis was discovered by microscope examination of dividing germ-line cells. When Figure 12.53 Blood sharing in vampire bats. The journal Science has published
small-scale experiments that show that less diverse ecosystems produce less yield. Make sure that the light conditions for the entire experiment remain constant. • Guidance Image of the brain should include the medulla oblongata, cerebellum, hypothalamus, pituitary gland, and cerebral hemispheres. 417 10 Genetics and evolution Chiasmata
formation As we have seen, the process of crossing over happens when two non-sister chromatids swap segments of their DNA. We call the soybeans glyphosatetolerant soybeans glyphosatetolerant soybeans glyphosatetolerant soybeans glyphosatetolerant soybeans. Enzyme action can also be summarized by the following equation: E + S ES E + P where E is the enzyme, S is the enzyme, S is the enzyme-substrate complex, and P is
the product. Repeat steps (b), (c), and (d). Using a scalpel or dissecting needle, slice up the anther into sections that are as thin as possible (see Figure 1.25 Pasteur's broth experiment. Thus the first amino acid is brought into the translation process. Some people have even modified their cars so that they run on the waste oil from deep-
fat fryers at fast food restaurants. Exactly which animals survive and which do not is determined by their surroundings and the compatibility of their characteristics with those surroundings. The box was small and the animal had not much to do except explore the cage. The longitudinal and circular muscles of the wall of the intestine are also visible at
the bottom of the photograph. Figure 10.1 Two pairs of single chromosomes being replicated. The initial processes in the germination of a seed are: • • • • the absorption of water release of a plant growth hormone called gibberellin or gibberellin causes production of amylase, which hydrolyses starch into maltose maltose is further
hydrolysed into glucose, which can be used in cellular respiration the early glucose may also be converted into cellulose so that the cell walls of new cells may be produced. Would you predict exponential growth for the first few days? Seen here is technique for treating disease by altering a patient's genetic material. At first the task is impossible for
him, but slowly his bad arm begins to remember how to move, and eventually he is back playing tennis. They are therefore phagocytic and contain many lysosomes. 140 Exercises 6 Look at Figure 3.20. 421 10 Genetics and evolution Observing the stages of meiosis *Safety alerts: Attention: sharp utensils. The right hemisphere is not involved in
communication, although it does help us to understand words. Often sufferers of anorexia have an imagined 'ideal' body image that is far too underweight for good health. Virtually every reference concerning amino acids will tell you that there are 20 amino acids will tell you that there are 20 amino acids will help you to identify the core learning points within each section. By
During metaphase I. • A protein may consist of a single polypeptide or more than one polypeptide linked together. How do we know that Lysenko's critics were not simply trying to push their own opposing political agenda? In what ways does this go against the very nature of peer-reviewed scientific publications, which is the norm today for sharing
experimental results? Figure 6.21 The mechanism of synaptic transmission. Nucleolus is a dense, solid structure involved in ribosome synthesis. Are the big biotech companies investing huge sums of money into this research to help their fellow citizens, or are they just in it for the economic profit? • A developing neurone forms multiple synapses. The
pattern of inheritance is different with sex-linked genes due to their location on sex chromosomes. • Many genetic diseases are due to dominant or co-dominant alleles. human 13 pig duck snake fish moth yeast 17 time 20 Figure 5.16 Biochemical differences
(dotted red lines) can be used to see how far apart species are on a phylogenetic tree (in blue). glucagon An endocrinologist is a physician who specializes in disorders associated with one or more hormones that are either under-produced (hyposecretion). Note that A is from a plant cell and B is from an animal cell. In
 addition to acting as the appetite control centre, the hypothalamus has a variety of other functions important to your physiology. The human genome can be thought of as a map that can be used to show the locus of any gene on any one of the 23 pairs of chromosomes. PCR: how to make lots of copies of DNA Polymerase chain reaction (PCR) PCR is a
laboratory technique using a machine called a thermocycler that takes a very small quantity of DNA and copies all the nucleic acids in it to make millions of copies of the DNA (see Figure 3.36). However, the high standard deviation of the bean plants grown in the shade indicates a very wide spread of data around the mean. 9 9 (a) Presence of hair on
the body, can make milk to feed young ...... What is the evidence for this answer? How does solubility in water affect the mode of transport of molecules in organisms? As the ovaries reduce their secretion of oestrogen, calcium is gradually lost from bones, weakening them and increasing the chance of fractures. Are there similar situations in society?
ADP is released, leaving a phosphate group attached to the protein. The blood type patterns for the Rh blood type are: False-colour scanning electron micrograph (SEM) showing many macrophages that have identified this parasitic nematode as not-self. Genetic modification can be used to increase crop yields or products. Lysosomes
Lysosomes are intracellular digestive centres that arise from the Golgi apparatus. There may be a high correlation, but only carefully designed experiments can separate causation from correlation. In order for the axons to find and connect with an appropriate target cell, a scaffold was needed. Once a peptide hormone has chemically bonded to a
receptor protein, a secondary messenger molecule is triggered into action in the cytoplasm of the cell. (4) (b) Outline the structure of ribosomes. The antisense strand is the template for transcription, so the new mRNA has a base sequence that is complementary to it. The resulting embryo begins developing immediately as it continues its journey.
towards the uterus. Saprotrophs are heterotrophs that obtain organic nutrients from dead organisms by external digestion. By accident they left the bacteria in a culture dish for 4 days over a holiday weekend. Currently, there are three types of methods: physical, chemical, and bioremediation. As a result of sexual intercourse, millions of
spermatozoa are ejaculated into a female's vagina. In a vegetable garden, a compost pile is used to convert plant waste from the garden and kitchen into rich humus that can then be used to grow new vegetables. About a decade later, Ernst Chain and Howard Florey picked up on Fleming's work and isolated a small amount of the penicillin compound
Greenhouse gases (GHGs), such as water vapour and carbon dioxide in Earth's atmosphere, can be thought of as the glass of a greenhouse, although, like many models, this is not a very accurate representation of the natural phenomenon. To make a functional mRNA strand in eukaryotes, the introns are removed. However, there is a growing
popularity for therapeutic cloning because the potential of stem cell research is so enticing. Tables Table 14.7 from Mercury bioaccumulation and biomagnification in Ozark stream ecosystems, Ecotoxicology and Environmental Safety, 74 (8), November, pp. In his book Systema Naturae (The Natural World, 1735), he listed and explained the binomia
system of nomenclature for species that had been brought to him from all over the world. A frog is an animal that has been studied extensively because it is (or was) readily available and can be collected from local ponds by scientists. The movement of positive ions back into the synaptic cleft chemically depresses the postsynaptic neurone and makes
it much harder to excite. But not always. Meiosis Meiosis, you will recall from Section 3.3, enables the production of haploid cells to make gametes (sperm cells and egg cells). Table 12.6 The functions of various parts of the eye Part Function Iris Regulates the size of the pupil Pupil Admits light Retina Contains receptors for vision Aqueous humour
Transmits light rays and supports the eyeball Vitreous humour Transmits light rays and supports the eyeball Rods Allow black and white vision in bright light Fovea An area of densely packed cone cells where vision is most acute Lens Focuses the light rays Sclera Protects and supports the eyeball Cornea
 Focusing begins here Choroid Absorbs stray light Conjunctiva Covers the sclera and cornea and keeps the eye moist Optic nerve Transmits impulses to the brain Eye lid Protects the eye The retina (see Figure 12.23). The sieve plates have pores that allows to the brain Eye in the photoreceptor cells of the retina (see Figure 12.23). The sieve plates have pores that allows to the brain Eye in the photoreceptor cells of the retina (see Figure 12.23).
the movement of water and dissolved organic molecules throughout the plant. There is no cell wall Chloroplasts are present in the cytoplasm area There are not usually present or are small Carbohydrates are stored as glycogen Do not
 contain centrioles within a centrosome area Contain centrioles within a centrosome area Because a rigid cell wall is present, this cell type has a fixed, often angular, shape Without a cell wall, this cell is flexible and more likely to be a rounded shape Most cell organelles are present in both plant and animal cells. If we see that 83 nucleotide differences
is approximately three times more than 26 differences, we can hypothesize that the split between species A and B. 576 • Chemoautotroph organisms use inorganic compounds for energy, and carbon dioxide as their carbon source. So what is going
on? Within the right atrium there is a mass of specialized tissue that has properties of both muscle and nervous system cells within its walls; this tissue is called the sinoatrial node (SA node). Use the hotlinks at the end of this section to look at a range of models. That same solution with a pH of 4 has 100 times more relative hydrogen ions compared
with a solution with a pH of 6. Can we be so sure that this fossil is the transition between the two? Have you ever heard of desert varnish rocks? The conventional wisdom at that time was that stomach ulcers were caused by excess production of HCl, perhaps brought on by stress. Later, we will also look at DNA evidence. They are specialized leaves
called bracts that develop at the same time as the plant's tiny flowers; the tiny flowers are at the centre of eukaryotic cells based on electron micrographs. Atmosphere = where all the gases in the air are found. These trees were knocked down by the Mount Saint Helens eruption in 1980
 Anandamide may be involved in eliminating information from our memory that is not needed. Meiosis is also called 'reduction division' because it reduces the original diploid number of chromosomes to the haploid number in gametes. GM plants can overcome these factors that limit crop yields. A Pyruvate is carboxylated, acetyl reacts with coenzyments
A, reducing NADH + H+ B Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ C Pyruvate is decarboxylated, reacting with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, reacting with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, reacting with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H+ D Pyruvate is decarboxylated acetyl reacts with a ceen acetyl re
the xylem of plants. Exercises 9 Briefly describe the blood supply into and out of the liver. To calculate the magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph, a simple formula is used: magnification of a drawing or photograph or photograph of a drawing or photograph of a drawi
fuse together, a certain amount of chance and luck are involved. This is one of the reasons why discoveries need to be published. It is a means by which DNA replication can be carried out artificially in a laboratory setting. (1) gross photosynthesis 40 35 30 25 net photosynthesis 20 15 10 20 25 30 35 40 45 leaf temperature / °C 50 55 Ribeiro et al.
Rules must be established to avoid cheating such as holding the stomach under the desk and pushing food into it. The steps of the vision pathway in the retina are as follows. All of our closest relatives in the great apes clade have 48 chromosomes whereas we have 46; this would suggest that, if one pair of chromosomes fused with another, we would
have gone from 24 pairs to 23 pairs. Skill: Interpretation of the thoracic cavity, which contains the heart and lungs, compared with the abdominal cavity, which contains all of the digestive structures shown apart from the mouth and oesophagus.
30 1.4 Membrane transport Understandings: NATURE OF SCIENCE Experimental design: accurate quantitative measurements in osmosis experiments are essential. Temperature, light intensity, and carbon dioxide concentration are possible limiting factors on the rate of photosynthesis. It is arguable that they should be with other consumers in
meat section. Until recently, cloning was only possible using genetic information from a fertilized egg cell. parent Protein synthesis. t = allele for a short plant. The majority of people diagnosed with ADHD are children. Meiosis I takes place in order to produce
two cells, each with a single set of chromosomes (see Figure 3.17). The most data-rich area of bioinformatics is genomics. Blood is always contained in blood vessels, with chemical exchanges occurring between capillaries and any fluid surrounding those capillaries. The flower parts and their functions are summarized in Table 9.5. Table 9.5 A
comparison of flower parts Flower part Function Sepals Protect the developing flower while it is inside the bud Petals Often colourful to attract pollinators Anther Part of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces the male sex cells (pollen) Filament Stalk of the stamen that produces th
the carpel that supports the stigma Ovary Base of the carpel, in which the female sex cells develop The entire female part of the flower is called the carpel division. By doing this, there are more substrate molecules to bind with the active sites as they become available, and the chemical
reaction may proceed more rapidly. Adding labels to an existing diagram is relatively easy compared with starting from a blank piece of paper and producing an entire diagram with labels and/or annotated functions. In order for it to be usable as a fuel, cut peat is dried out to reduce its high levels of humidity. Allergies are the result of an immune
response releasing histamine You have seen that the immune system of humans and other animals is designed to protect us from pathogenic 'invaders'. Intermediate particles are distributed in between. Any chromosome that is not a sex chromosome that is not a sex chromosome that is not a sex chromosome, or autosome, or autosome, or autosome, or autosome, or autosome, or autosome. In 1663, the Roman Inquisition condemned Galilecture.
for defending the idea that the planet Earth goes around the sun and he remained imprisoned for nearly a decade before he died. The components can then be reassembled into larger molecules (macromolecules) that are useful to our bodies. The evolution happened in the population, not in any single rat. The sequence of sub-topics within each
chapter is given in the contents page. This implantation must occur when the uterine inner lining (the endometrium) is rich with blood vessels (i.e. highly vascular). This also partially explains why, unless they are identical twins, brothers and sisters never get the same combination of their parents' alleles. No part of this publication may be
reproduced in any form or by any means (including photocopying or storing it in any medium by electronic means and whether or not transiently or incidentally to some other use of this publication) without the written permission of the Copyright, Designs and Patents Act 1988 or under
the terms of a licence issued by the Copyright Licensing Agency, Saffron House, 6-10 Kirby Street, London EC1N 8TS (www.cla.co.uk). 1966, The Royal Society, by permission of 
permission; Figure 12.27 from Neuroscience, 2nd ed., Sinauer Associates (Purves, D., Augustine, G. 

Skill: Analysis of a simple microarray. In embryos, the presence of one tissue that is developing causes the developing
cells migrate to their final home and the brain matures, millions of connections are formed and then lost. This allowed him to sequence the steps of the overall process and to elucidate the pathways of carbon fixation (the Calvin cycle). Each pyruvate produces one acetyl CoA that enters the cycle. Note AUG is the start codon. A full 4 × 4 grid is not
exposure to the pathogen. Spermatozoa ejaculated into the vagina swim up through the cervix, then the inner lining of the uterus, and enter the Fallopian tubes. For example, you could think about a historical approach (evolution) versus an experimental approach (lab investigation). A.2 The human brain Understandings: The anterior part of the
neural tube expands to form the brain. In some cases the metastasis of the primary tumour cells is so extensive that secondary tumours are found in many locations within the organism. Vitamin C is produced from glucose in the kidney tissue in some animals, and in the liver in others. The lower temperature minimizes water loss from the pores and
the plant, so the lower epidermis usually has a thinner cuticle than the upper epidermis. The honeycreepers have a wide variety of beak shapes, some of which are adapted exclusively to sip the nectar of flowers found only on Hawaii. Thus enzymes lower the activation energy of reactions. You do not control reflexes with your brain. In the 1890s Emil
Fischer proposed the lock-and-key model of enzyme action. Neurotransmitter fragments diffuse back across the synaptic gap to be reassembled in the terminal buttons of the presynaptic neurone (often called reuptake). To learn more about allergic reactions and histamine, go to the hotlinks site, search for the title or ISBN, and click on Chapter 11:
Section 11.1. 458 11.2 Movement Understandings: Bones and exoskeletons provide anchorage for muscles and search for warmblooded prey. Get used to saying 'big A' and 'little a' when reading alleles and genotypes. 507 12 Option A: Neurobiology
and behaviour might not be able to identify melodies, for example. However, outbreaks still occur regularly in some areas of the world, and specifically in areas that have suffered catastrophic disasters such as tsunamis or major earthquakes. Protein exits the ER and enters the cis side or face of the Golgi apparatus; a vesicle is involved. A High proton
concentrations are rapidly developed. Spermatozoa production starts at puberty and continues throughout life. • Frequently, a scientific discovery is not appreciated immediately for its importance, zona pellucida & Acrosome enzymes allow cell membranes of sperm and ovum to meet and fuse together. H chain of carbon atoms Figure 4.10 A
hydrocarbon chain. The parasitized hosts often raise the resulting cowbird offspring as their own. D.2 Digestion is controlled by nervous and hormonal mechanisms. (e) If you know or have been given the chemical formula of the substance, count the number of each type of atom and check that number against the known formula. The left hemisphere
contains areas important for all forms of communication. • Transcription is the synthesis of mRNA copied from the DNA base sequences by RNA polymerase. The bronchiole is shown in section (with many invaginations) and all of the surrounding (somewhat) circular areas are sectioned alveoli. • Applications and skills: Applications and skills: Applications are sequences by RNA polymerase.
sickle cell anaemia, including a base substitution mutation, a change to the base sequence of mRNA transcribed from it, and a change to the sequence of a polypeptide in haemoglobin. One statistically significant is the chi-squared (2)
test (the Greek letter chi, , is pronounced like 'sky' without the s). Temperature, pH, and substrate concentration affect the rate of activity of enzymes. These long-lived cells are called memory cells. Identical twins share the same genetic makeup, and fraternal twins have a 50% genetic similarity. For example, a cow (the consumer) grazing in a field
of grass (the producer) is taking chemical energy from the grass and digesting the organic compounds to help build meat or milk inside its own body. Although he was not the first to use the idea of genus (plural genera), he popularized its use along with the species name in a consistent way, 5 oxygen consumption (ml) Figure 2.47 Oxygen
consumption by germinating and non-germinating and non-germinating pea seeds at 12°C and 22°C. 160 Genetics the study of DNA in the biosphere has given new credibility to the ideas of evolution: DNA evidence can often reinforce previous evidence of common ancestry based on anatomical similarities between species. People addicted to nicotine become very
agitated if they cannot have a cigarette. Wash your hands thoroughly with soap and water before and after handling cell sources. • Movement of the body requires muscles to work in antagonistic pairs. Algae (hint: they have a nucleus).
metabolite. Genes, segments of DNA on a chromosome, enable the products of photosynthesis. Discuss whether the plant or the animal products were more effective at reducing calcium loss. When radiation hits a DNA
molecule, it can sometimes knock one or more base pairs out of place, modifying the genetic code. During cocaine use, dopamine builds up in the synapse. Three trophic levels can be seen in this photograph: a producer, a primary consumer, and a secondary consumer. How does this compare with the frequency of d in the two other populations? •
Now everything is ready for the sequencing: the multiple chains of varying lengths (each with a fluorescently marked end) are placed in order from longest to shortest. 483 11 Animal physiology Mature spermatozoa and 'ova' The mature male and female gametes are very well suited for their purpose. 777 Science vocabulary Does scientific language
and vocabulary have a primarily descriptive or interpretive function? Pollination is the process by which pollen (containing male sex cells) is placed on the female stigma. 770 770 births and the full moon. The heart rate slows and stroke volume is reduced. 115 (systolic) 68 (diastolic) These values are read as 115 over 68 (both in mm of Hg)
Even if a convenient number of plants was produced, such as 100 plants, farmers and breeders would not be surprised if they got 22, 26 or even 31 short plants instead of the theoretical 25. Digested nutrients in the lumen of the small intestine pass through the single-cell thickness of the villus epithelium to get to the capillary bed or lacteal. To what
extent are we dependent on technology for our knowledge of biology? • Evidence from cladistics has shown that classifications of some groups based on structure did not correspond with the evolutionary origins of a group or species.
are held together by covalent bonds. C4 plants have stomata that open during the day but take in carbon dioxide more rapidly than non-specialized plants. Many species that could escape fled the area. This hormone is oestrogen. Skill: Use of databases to identify the locus of a human gene and its polypeptide product Garage fled the area. This hormone is oestrogen.
karyotype and karyogram have different meanings. Her statistical analysis in the early 1950s demonstrated that children whose mothers did not have prenatal X-rays. • Skill: Design of experiments to test hypotheses about factors affecting germination. This was
able to detect the presence of antigens causing the influenza. Arteries have muscle cells and elastic fibres in their walls. An obese mouse (knockout mouse with mutant gene Lep) unable to produce leptin next to a normal mouse.
be substituted by valine as the sixth amino acid in the haemoglobin polypeptide. Molecules of the same type have certain qualities in common and become fairly easy to recognize with a little practice. Recall from Section 3.4 that a monohybrid cross is one that examines only one genetic trait, and its purpose is to see what kinds of offspring two
parents with different alleles can produce. The smallest, least massive, and most charged particles pass through the gel to the other side with little difficulty. Vitalism was the belief that living organisms and inanimate things differed fundamentally because living organisms contained a non-physical or vitalistic element, and were subject to different
principles of nature compared with non-living things. Nicotine in tobacco products mimics Make an argument for which addiction model is the most 'scientifically according to the principles you have studied in your theory of knowledge course? Without evidence, there was no support for
their hypothesis. (the dialysate) that is similar in chemical makeup to the patient's blood but does not have urea in it at the start of the dialysis. DN A C T A P free RNA nucleotides G C G G C T helicase-like activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription) mRNA (codon) The mRNA molecules activity is n o t t rans cription activity is n o t t rans cription activity is not activity i
produced by transcription represents a complementary copy of one gene of DNA. Therefore, as we know glucose is a product of photosynthesis, the result of the light-independent reaction must be the production of glucose. Thanks to modern communication technologies, it is possible for scientists working all over the world to collaborate and
contribute to a scientific endeavour such as sequencing the genome of plants that help feed the world. If a Punnett grid is set up for this cross and all the alleles could be shuffled in any random order, we find that there are 16 possible random combinations (see Figure 10.10). This ability of myoglobin to 'hold onto' its oxygen, even at low oxygen
partial pressures, allows myoglobin to serve its function of delaying tissues going into anaerobic conditions. Figure 10.4 shows a chiasma between such a gene's locus and the centromere. Integral proteins show an amphipathic character, with both hydrophobic and hydrophobic and hydrophobic and the centromere. Integral proteins show an amphipathic character, with both hydrophobic and hydrophobic a
each other, the entire muscle gets shorter. Using an electrical current, the egg cell and the nucleus from the cultured somatic cell were fused together. There are many of these proteins produced by the liver, but two whose functions are documented elsewhere in this text are: • albumin, which helps regulate blood osmotic pressure and acts as a
carrier for bile salts and some other fat-soluble substances • fibring en, which when converted to fibrin forms the meny genes that were located during the Human Genome Project
Short or tall pea plants? That is not true for water molecules: each water molecules: each water molecules with other water molecules. • Starch has two subcomponents, amylopectin and amylose. • Design and create a graph with exercise durations on the x-axis (with appropriate units) and
mean percentage increases (% unit) on the y-axis. • If an apparatus is being prepared which will utilize the movement of an air bubble for readings, a calibration period of 15 to 20 minutes should be allowed for the plant and apparatus. Note that the two paternal sister chromatids no longer carry identical alleles. So how did this phenomenon occur
and why is it something you no longer see? Female lions are the main hunters and hunt in groups. This organelle also produces and contains its own ribosomes; these ribosomes are of the 70S type. Study the micrographs on page 46 to note the main events of the stages of mitosis and to note the differences between plant and animal cells in mitosis.
Kupffer cells hepatocytes venule to hepatic vein arteriole from hepatic vein atteriole from hepatic vein atterior 
pass of the blood through the liver sinusoids. • Both the vena cava and pulmonary veins are veins, and thus have internal, passive flap valves characteristic of all veins. This type imprinting is strongest in chicks of species that do not stay in a nest after hatching, such as ducks, geese, and grouse. 12 Using the CR and CW alleles for co-dominance in
snapdragon flower colour, show how two plants could have some white-flowered offspring, some pink-flowered offspring and some red-flowered offspring within one generation. It increases dopamine levels by lessening its reuptake. Scientists naming organisms sometimes have a sense of humour. 

Skill: Production of biogas in a small-scale
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fermenter. The IB policy on animal experimentation must be followed at all times. Some of this infrared heat escapes into space but some (shown in red) is radiated back by greenhouse gases. Solution magnification = 50 mm/5 \mum = 50 × 10-3 m divided by 1 × 10-6 m = 10 000× 80 mm/5 \mum = 50 mm/5 \mum = 50 × 10-3 m divided by 1 × 10-6 m = 10 000× 80 mm/5 \mum = 50 mm/5 \mum = 50 × 10-3 m divided by 1 × 10-6 m = 10 000× 80 mm/5 \mum = 50 
Limiting cell size So, the cell is a small object. Again, the removed carbon combines with oxygen and is released as carbon dioxide. In plants, these two generations alternate with one another. Note that the neurotransmitter is received by a receptor but does not enter the postsynaptic neurone. Consider the following scenario. These seven tracks were
produced by gel electrophoresis to allow investigators to analyse and match DNA samples. 480 Four resulting cells differentiate into spermatozoa Spermatozoa n n n n Meiosis I occurs and two cells result, each with the haploid number of chromosomes (23) because the homologous pairs have been separated. Good examples are the proteins that
attach into and extend out of a cell membrane. When the symptoms of AIDS do begin, the infected person can no longer fight off pathogens as he or she could before, and a multitude of infections of various types begins. Rather, the old system was grouping together plants that belonged to separate branches, making it impossible to fit them into a
cladogram. These first 100 days are called the sensitive period. This is called myogenic control. Look at the food chains in Figure 4.5 showing a river ecosystem. 1 Determine the total magnification of each objective lens Because you are using a compound microscope, there are two types of lens present. Many hypotheses have been formulated and
work on this is ongoing. • The implant acts like a miniature computer, deciphering the digitized sound and transferring it into electrical signals. Some animals that use internal fertilization also display a high level of parental care of the young. The biogas produced can be used to run electrical machinery, which reduces a farmer's costs. • These
hydrogen ions cause a drop in pH, resulting in the hydrogen bonds between cellulose fibres of the cell wall breaking. A donor bat gives food to a recipient bat whose chances for survival are then increased. We now know a gene may produce several, if not many, different proteins. P A P G Single strand or double strand P RNA is composed of a single
chain or strand of nucleotides, while DNA consists of two separate chains or strands of nucleotides connected to one another by weak hydrogen bonds. The embryo developed normally. The pattern of inheritance with sex-linked genes Carriers of sex-linked recessive alleles such as Xb are rare in most populations of humans worldwide
What could you bring with you that could supply oxygen regularly? mRNA finds a ribosome located on rough endoplasmic reticulum (ER). The pigment called chlorophyll a is the principal pigment. To find out if a new drug is effective, one group of volunteers in a study is given the new drug and another group is given a placebo. This fifth histone leads
to further wrapping (packaging) of the DNA molecule, and eventually to highly condensed or supercoiled chromosomes. The three methods used currently are: electroporation, microinjection, and biolistics. Many steps are necessary. After germinating some of the seeds, the biologists found them to be nearly 1300 years old. Extracellular Extracellular
P Na! K! Intracellular There are many other examples of active transport in cells besides the sodium-potassium pump. To learn more about work with spinal cord injuries and see the work of Professor Courtine, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: Section A.1. Two Mayo Clinic scientists have worked as a team
to address the problem of regeneration of nerve tissue in spinal cord injury patients. If you are ever stung by a stingray or jellyfish, you should seek medical attention. Benzene C6H6 = = H C C In an experiment using Marinobacter, published in the Journal of Applied and Environmental Microbiology in September 2003, it was shown, by
using genetic analysis, that the bacteria Marinobacter was the dominant member of a culture mix that degraded benzene consistently over a 2.5-week period at room temperature in brine conditions (see Figure 13.19). Stain them with orcein, allowing it to soak in for a few minutes. In a normal distribution, about 68% of all values lie within ±1
standard deviation (SD) of the mean. For example, if we wanted to introduce the idea that an extra-terrestrial visitor came down to the experimental marsh where the plants were growing in order to somehow influence their growth with a special ray gun, we could. Proteins Understandings: Amino acids are linked together by condensation to form
polypeptides. Heterotroph III. It is essential that repeated measurements are taken and that large numbers of readings are taken so that the data collection is reliable. Others use molecules as small as methane, CH4. embryogenesis and continues to the final years of life. Studying catches For the North Atlantic Ocean, scientists from the International
Council for Exploration of the Sea (ICES) sample fish catches at seaports. Table 13.1 Examples of metabolism of microorganisms What are some of the products made from microorganisms? Worked example Competitive and non-
competitive inhibitors are examples of reversible enzyme inhibitors. 702 Gathering information from fishermen Who is better informed about the number of fish caught than the people who catch them? These centrioles are involved with the assembly of microtubules, which are important to a cell because they provide structure and allow movement
Breeding strategies in coho salmon A brightly coloured hooknose salmon swimming upstream. 4000 2000 0 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 age 0 37 Use Figure 14.42 to explain what is happening to the population of large, mature groupers. The purpose of neural pruning seems to be to remove the simpler connections made in
childhood and replace them with the more complex wiring made in adulthood. Because your mother has two X chromosomes, an ovum can only contain an X chromosomes are constructed in the nucleolus of eukaryotic 339 07 Nucleic acids cells and exit
the nucleus through the membrane pores. If the molecules that are colliding do so at a high enough rate of speed and the molecules have the capability of reacting with each other, then there is a chance that are colliding do so at a high enough rate of speed and the molecules have the capability of reacting with each other, then there is a chance that are colliding do so at a high enough rate of speed and the molecules have the capability of reacting with each other, then there is a chance that are colliding do so at a high enough rate of speed and the molecules have the capability of reacting with each other, then there is a chance that are colliding do so at a high enough rate of speed and the molecules have the capability of reacting with each other.
animal's body is directed away from the stimulus, we say it has a negative response. Waterlogging can interfere with the normal cycle of nitrogen moving from the atmosphere to plants as nitrates and then back to the atmosphere. In Figure 3.9, we can see that the locus shown contains different coloured bands, revealing that this individual got a
different allele from his or her mother than from his or her father for this particular gene. Many inbred strains and genetically engineered mutants are available for researchers. Blackmann, and Walter Taylor. Chi is the Greek letter and is pronounced like the word 'sky' without the s at the beginning. Books are printed on cellulose, because paper pulp
is from plant material. Application: Production of citric acid in a continuous fermenter by Aspergillus niger and its use as a preservative and flavouring. • Although specific functions can be attributed to certain areas, brain imagery shows that some activities are spread in many areas, and that the brain can even reorganize itself following a
disturbance such as a stroke. They contain and transport enzymes. Water molecules are highly cohesive. Type I pneumocytes This type of alveolar cell is very thin but has a very large membrane surface area, making it well designed for diffusion. The process of using a DNA microarray is: • • • • • • isolate mRNA from a sample translate mRNA into
cDNA (single-stranded DNA) label the cDNA with florescent labels hybridize the cDNA with florescent labels hybridi
by one or a few bases. Another NAD+ is reduced to form NADH. Another example of the difference that causes the genetic condition cystic fibrosis. This may reduce the likelihood of skin cancer occurring. One example of the difference in plasma membrane proteins is the difference that causes the genetic condition cystic fibrosis.
on the plasma membranes of human red blood cells (erythrocytes). The answers are often dependent on evolutionary relationships, but the simplistic answer is frequently 'not much difference'. Two of the clotting proteins are prothrombin and fibrinogen. 1995 (a) Identify which crab shows the greatest lateral movement. The raw materials were
glucose and oxygen. Both insulin and the channels within the plasma membrane are proteins, therefore they must both be coded for by deoxyribonucleic acid (DNA) within the cells of the organism in which they are working. Temperature and humidity, for example, have a large influence on the types of plant life found in a community; an open marsh
will not have the same kinds of plants as a dense forest. Think of the immovable bone as an anchor for the desired movement. da Vinci kept detailed anatomical notebooks about cadavers. Table 1 shows the raw data sets at the end of the experiment looking at bean plants grown in sunlight and in shade. For example, we say that when all metals are
heated they expand. Pain protects us from danger. Anatomical diagrams identify right and left sides as if it is your own body that is being shown. Patrolling bees search close to the ground, waiting to mate with virgin females as soon as they mature and emerge from their burrows. This can be challenging when looking at algae. Embedded in the
membranes involved are molecules that are easily reduced and oxidized. Feature RNA DNA Table 2.10 Number of strands Bases present Pentose present Pentose present Pentose present Name of monomers Exercises 15 Why do researchers often give DNA information as the sequence of nitrogenous bases without indicating the presence of the phosphate group and sugar component
of each nucleotide? This same process was continued so that four generations were obtained, each being processed and centrifuged. Figure 8.16 The oxidation- reduction reactions of the electron transport chain. An advantage of this alternative lab is that the person scattering the disks or sticky notes knows how many there are in total, and it is
interesting to see how close the groups' estimations are to the known number. 

Bipolar cells send the impulses from the cardiac cycle is a series of events that we commonly refer to as one heart
beat. Another bird that did this was the European robin. • In a eukaryote species there are different chromosomes that carry different genes. (Total 1 mark) 7 Describe the relationship between the rise in the concentration of atmospheric carbon dioxide and the enhanced greenhouse effect. Scientists form hypotheses that can be tested by observation
and/ or experimentation. Veins receive blood at a relatively low pressure from the capillary beds. These adaptations allow water conservation. Ethical issues also arise when groups or individuals who are receiving money from pharmaceutical companies actively promote these drugs. Figure 5.10 The bacterium on the left is passing genetic information.
to the bacterium on the right in a process called plasmid transfer. Research indicates a rather sophisticated communication ability in plants. 35, © Don W. Most flowering plants coevolved with pollinator species, such as insects, bats, and birds. For example, see Figure 12.33. The two boys in this photo are fraternal twins. 317 06 Birth control pills to the bacterium on the right in a process called plasmid transfer. Research indicates a rather sophisticated communication ability in plants.
contain both oestrogen and progesterone. Skill: Identification of polysomes in electron micrographs of prokaryotes and eukaryotes and eukaryotes and eukaryotes and eukaryotes. A placebo is a pill that contains no active ingredients: it is often just a sugar pill. 9 Can you guess the name of an invertebrate animal that has a high EQ? Lateral meristems Lateral meristems allow the growth in
thickness of plants. 1 Why were 32P and 35S used in the experiment? The warmed Earth emits longer wavelength radiation. When the contraction is over,
the elastic fibres provide another source of pressure as they return to their original position. These carriers of electrons (energy) are close together and pass the electrons from one to another because of an energy gradient. There are several different pigments in plants, and each effectively absorbs photons of light at different wavelengths. Another
culture included a radioactive form of sulfur-35, 35S. In the case of round versus wrinkled seeds, there are two classes into which the data fall, so there is 2 - 1 = 1 degree of freedom. This is because the pathogen is typically being recognized as many antigens and not just one. CHALLENGE YOURSELF 3 Cytochrome c is a protein
found in mitochondria and it plays a key role in cell respiration by shuttling electrons from one place to another. AV node atrial systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials follow conducting fibres ventricular systole (0.1 sec delay) action potentials fibres ventricular systole (0.1 sec delay) action potentials
the SA and AV nodes) plotted on the y-axis and time on the x-axis. The cortex is where you perform tasks such as: • visual processing • motor movement • remembering • speech. There is a major blood vessel called the renal artery that takes blood into each of the kidneys. Carbon-based life Carbon dioxide is one of the very few carbon-containing
substances that is not classified as organic. 

Guidance Examples of environmental problems caused by biofilms could include clogging and corrosion of pipes, transfer of microorganisms in ballast water, or contamination of surfaces in food production. Because there are two possible outcomes (fern present or fern not present), the number of
degrees of freedom is 2 - 1 = 1. Metabolism Your metabolism is the sum of all the chemical reactions that occur within you as a living organism. Place foil or plastic wrap over each tube and store for 24 hours. The energy is converted to
chemical energy and passed on from one trophic level to the next. In Figure 2.31 each adjoining nucleotide structure. The question posed by the study was how the effect of top-down herbivore and bottom-up nutrients affected the competition of harmful and beneficial algae. 
Diploid
nuclei have pairs of homologous chromosomes. Just because a committee of taxonomists insists that a certain difference in cell structure is a significant enough reason to change a classification, does not mean that everyone will embrace the decision. These molecular conversions are done for a variety of reasons, and we will look at a couple of
examples in this section. 290 The long-term use and overuse of antibiotics has now led to many pathogenic species of bacteria that have strains that are resistant to nearly all of the antibiotics in existence today. One trick goes something like this: a company will set up a 2-year trial to test a new drug and then, after only 6 months, it decides to stop
the trial and publish the data because the numbers show that its drug is performing well. Thus negative feedback functions to keep a value within the narrow range that is considered normal for homeostasis. 165 03 Genetics Animals cloned from adult cells Clones and cloning This is Dolly with Ian Wilmut, a member of her cloning team. The gardeners
have a point: there were reasons why these plants were bound together under one roof. Each side of the heart has a collection chamber for the blood that moves in slowly from If all the tissue except blood vessels and heart were removed from a body, the shape of the body would still be visible. It seems that the behaviour has been suppressed because
of changes in the: • style of milk (whole milk is now homogenized so that the cream does not separate and rise to the top) • style of the container (it is difficult for the birds to remove the plastic tops) • delivery method (most people now buy their milk at a shop rather than have it delivered). Studies have shown that when birthing of the cubs occurs at
the same time, it has a distinct advantage because it increases the survival rate of the cubs. In fact, these plants have two types of lateral meristem: • vascular bundles, on the inside it produces secondary xylem, which is a major component
of wood, and on the outside it produces secondary phloem • cork cambium, which occurs within the bark of a plant and produces the cork cells of the outer bark. Use any resources available, including texts and the internet, to identify any structures you can see. The chi-squared value is calculated to be 4.91. NATURE OF SCIENCE The error giving
an extra chromosome to the 21st pair can happen during meiosis I. If damaged, these cells are incapable of mitosis for replacement. The enzymes required to catalyse every reaction in these pathways are determined by the cell's genetic makeup. Sieve tube
members are connected to one another by sieve plates to form sieve tubes. The movement of the ions is not along the length of the axon to the outside. In other words, it answers the question 'What eats what?' The direction of the arrow shows the
direction of the energy flow. (3) (Total Total 6 marks) Adapted from Nelson and Cox 2000, © Don W. Without the precautionary principle, industries and consumers tend to proceed with their activities until it becomes clear that harm is being done to the environment.
light stimulus. The placenta forms from tissue from both the embryo and the mother. meiosis I cases 6 5 4 Figure 3.20 Correlation of age of mother and occurrence of Down syndrome in children. The amino acid that would be bonded to the tRNA is not shown. These two identical molecules are held together by the centromere, and
each molecule is referred to as a chromatid. These two cells have the same genetic material and are referred to as daughter cells. There is also a difference in molecular makeup. This is called ORFing! Linking the target gene to other sequences that control its expression When a scientist is working with DNA that is to be transferred into a vector like
agrobacter, the gene must undergo several modifications in order to be effective. D I, II, and III. 12 Explain the value of polysomes to a cell and an organism. E 435 10 Genetics and evolution • Determine the degrees of freedom (d.f.) by taking the total number of classes into which the data fall and subtracting 1. Use an online calculator to calculate a
Student's t-test to examine whether the differences measured are significant. First, when referring to meiosis, be sure to keep track of the differences between homologous chromosomes and sister chromatids. • Experiments showing zone of inhibition of bacterial growth by bacterial growth by bacterial cultures. They do not have mouths or
digestive tracts. We need to duplicate the starvation mode for the mould so that it will make large quantities of penicillin. Generally, plant stems exhibit positive phototropism, and plant roots demonstrate negative phototropism.
Figure 1.5. Mitochondria are organelles that carry out respiration. You are the knower. Table 12.7 provides a comparison of rods and cones. Agrobacter contains a circular piece of DNA called a plasmid that carry out respiration. You are the knower. Table 12.7 provides a comparison of rods and cones. Agrobacter contains a circular piece of DNA called a plasmid that carry out respiration.
thinking and the steps used in solving the problem. 3 5 5 3 3 Hybridization/ annealing stage 2 Cool to allow primers to bind (hybridize). These resources are then locked up and unavailable to others, except, of course, through feeding and decomposition. glycolysis net gain of 2 ATP pyruvate 3C CO2 ethanol 2C Lactic acid fermentation All alcohol that
is sold to be drunk is ethanol. In other words, all the females in the pride are protecting the genes they share in common. Research indicates that this receptor is used by the human immunodeficiency virus (HIV) to infect the cells (see Section 6.3 for a description of HIV).
disease. Therefore, one tube contains A* (adenine dideoxynucleotide, corresponding to the adenine nucleotide, and so on), C*, and G*. In Part 1, we will explore the kinds of mathematical skills needed by a student of biology in order to understand some basic operations and ways of statistically analysing scientific data
• Immunity depends upon the persistence of memory cells. The other six categories are all invertebrates: they do not have a backbone. These special potatoes were grown indoors to prevent them from being mixed with other naturally grown potatoes were grown indoors to prevent them from being mixed with other naturally grown potatoes in the wild.
models are wrong, but some are useful. The process continues until the ribosome gets to the last codon triplet. Likewise, ggll is shown as: g \mid l = g \mid T or read the genotype of the individual for these two linked traits, the pairs of alleles are read vertically: the above symbol's genotype is g \mid l = g \mid T or read the genotype of the individual for these two linked traits, the pairs of alleles are read vertically: the above symbol's genotype is g \mid l = g \mid T or read the genotype is g \mid l = g \mid T or read the genotype of the individual for these two linked traits, the pairs of alleles are read vertically: the above symbol's genotype is g \mid l = g \mid T or read the genotype is g \mid l = g \mid T.
Identify each of these reproductive cells as being haploid or diploid: (a) a spermatogonium located in a seminiferous tubule (b) a secondary spermatocyte located in an ovary of a newborn baby girl (e) a
secondary oocyte soon after ovulation in an adult female (f) a recently fertilized zygote. 8 Explain why meiosis rather than mitosis is necessary for gamete production. In cell cultures it is possible to watch axons grow. If you have ever played a guessing game in which the rule is that you can only ask 'yes' or 'no' questions, then you already know how a
dichotomous key works. Which strategy works the best? The peripheral nervous system is considered to have two parts, the somatic system and the autonomic system and the autonomic system (ANS). Exploring chromosome 21 in the database Ensembl Another database we can use is Ensembl. For a long time, biologists have grouped angiosperms into two classes: the
monocots (monocotyledonous plants) and the dicots (dicotyledonous plants). Simple eyes found in molluscs such as the Nautilus function as pinhole cameras without a system of lenses, whereas highly evolved eyes like those of birds of prey use crystalline lenses, adjustable irises, and muscles to help focus on objects at different distances. The
cytoplasm occupies the complete interior of the cell. • Read the Description. Research has demonstrated that 10% of the plant's entire genome (2500 genes) has altered transcription regulator, leading to an increase in messenger (m)RNA and thus a
resultant increase in proteins. Be careful with the order of operations; anything that needs squaring should be done first, then perform any multiplications, then the additions. The anterior pituitary (right) with its connection to the hypothalamus via portal blood vessels. Calculating genotype frequency Using the information from example 1, consider
the following. No moon at all because, it's the new moon. Ecology The oxidation of methane How does the burning of fossil fuels produce carbon dioxide? To remember these confusing systems try to make sense of the terms. Which look most like they would be part of the Figwort family? The kangaroo rat from a desert region of the USA gets 90% of
its daily water intake from water of metabolism. The slow-acting NTs act on a second messenger molecule. P P ADP A Intracellular potassium ions bind to different regions of the protein, and this causes the release of the phosphate group. The vertebrates We will now explore the characteristics used to classify
vertebrate organisms into the following five classes: • fish • amphibians • reptiles • birds • mammals. A sample of each flask was then transferred to a plate containing solid medium and incubated. A I and II only. David Hall 586t, Professors P. This freshwater organism is in the same phylum as sea jellies, sea anemones, and coral polyps. It is
important that scientists are able to share knowledge. The blood that did not get filtered, including all of the cells and proteins as well as many other molecules, exits the Bowman's capsule in the efferent arteriole. A fourth holds his ear and
says 'It's like a sail'. Would he have given up in frustration, or decided not to publish his discordant results? • The resulting action potential moves through the T tubules, causing the release of calcium ions (Ca2+) from the sarcoplasmic reticulum. The top three countries for the number of people with diabetes are: (1) China (more than 90 million); (2)
India (more than 60 million); (3) USA (more than 23 million). In the 1970s, Frederick Sanger developed the first sequencing procedure. Now you can see why standard deviation tells you how widespread Key your data points are from the mean of y! 1 standard the data set. • Water free of dissolved carbon dioxide for photosynthesis experiments can
be produced by boiling and cooling water. Biolistics As you can see from Figure 13.13, with biolistics DNA is coated onto microparticles of gold or tungsten and fired with an explosive charge from a particle gun. Speed and accuracy of replication Even though this process seems quite complicated, it occurs at a phenomenal rate: up to 4000
nucleotides are replicated per second. Make sure to label the following on each diagram: Z lines, actin filaments, myosin filaments, area of light bands, and area of dark bands. * fight sneak Figure 12.55 The two breeding strategies in male coho salmon. Many of the enzymes active in the human body are most active when in
hypertonic to a hypotonic freshwater environment. outer membrane inner membrane granum (pile of thylakoids) stroma one thylakoids) stroma one thylakoids 21 01 Cells Centrosome The centrosome occurs in all eukaryotic cells. It does not go 'in' the door. The areas in blue are diseased with emphysema and there is a large infected diseased cavity in the right lung (left side
of photo). Haemoglobin actually has four possible shapes, depending on how many oxygen molecules are bound to the iron atoms of the haem groups. Simple apparatus, such as blotting or filter paper, porous pots and capillary tubing, can be used. The same questions can be asked about food and water. Once spermatozoa have completed
differentiation, they detach from their Sertoli cell and move through the lumen to the storage area of the testis called the epididymis. The frequency of the cardiac cycle is your heart rate, and is typically measured in beats per minute. In the absence of oxygen, denitrifying bacteria reduce nitrate in the soil. It will produce 70 million doses a year. Are
example of an abiotic factor is temperature. Be careful of light sources as they may be hot. By examining these ratios in ice and in the shells of marine fossils, climatologists can trace the colder and warmer periods of the past. To make it more challenging, calorie values could be given so that the most difficult food to pick up is worth the most calories
answer the question that was most probably on his mind: Why do traits get passed on independently from each other? A fish with a slightly different shaped mouth might be able to feed from parts of a coral reef that other fish are not able to access. Record your results below. Users teach new users what effects to expect and what altered state is
desirable. Another feels a leg and says 'Elephants are round and vertical like a pillar'. Critics point out that allocating farmland for this use might drive up the price of food crops. This is the idea of using quantitative biochemical data as an evolutionary clock to estimate the time of the speciation events (see Figure 5.16). The objective of developing
new sequencing techniques is to have a fast, inexpensive way to map anyone's genome. The photo shows two partial epithelial cells. A passive process does not need the cell to provide any energy for it to occur. Although those people might not have known it, they were talking about genetics. Within a few years of starting the symptoms, the person
loses complete control of his or her muscles and dies an early death. One leaf has more pigments than the other. The mouse is genetically and physiologically similar to humans, and its genome can be easily manipulated and analysed. Discuss the view of Karl Popper that, for science to progress, scientists must question and criticize the current state
of scientific knowledge. Sometimes we need to analyse how something has changed over time, or we need to see whether there is a difference between what we expected and what we got. Auxins are plant hormones that cause the positive phototropism of plant shoots and seedlings. (b) Explain the use of biotic indices and indicator species. This cow
has been bred to have a straight back for easier birthing and long legs for better milking by mechanical pumps. As exploitation (fishing) increases, there is a significant effect on the number of mature and larger size grouper. (d) Look over your entire structure, to make sure that all of the different atom types are showing the correct number of
covalent bonds for that type of element. For co-dominant traits, grey is used in pedigree charts rather than black or white. Note the thin duct leading to the lumen of the stomach; the presence of this duct qualifies each of these pits as an exocrine gland. Skill: Deducing the DNA base sequence for the mRNA strand. The axons form synapses that
compete for the ability to innervate a muscle fibre. • Multiple sequence alignment is used in the study of phylogenetics. One important function is physical and nutritional support of the neurone. Controlled experiments are the best way to investigate the relationship between two factors or variables. How does scientific knowledge progress? It is true
that the pituitary gland produces many different hormones, and some of those hormones influence the production and secretion of other hormones, but the pituitary itself is largely controlled by the action of the nearby hypothalamus (see Figure 15.18). For example, if an animal moves towards light, it exhibits a positive phototaxis. This leads to a
paralysis of the affected insect, and eventually death. Conversely, anabolic pathways result in the synthesis of more complex molecules from simpler ones. There are tree snails in Hawaii, for example, that are present on one side of a volcanic mountain but not the other. Chi-squared tests When doing experiments about genetic characteristics being
passed on from one generation to the next, it is expected, theoretically anyway, that certain ratios will be seen in the haemoglobin beta chain of each organism. They do not possess the same number of chromosomes, which is one of the
reasons why the hybrid offspring produced are usually infertile. He is not aware that she is doing this. This differentiation process is the result of the expression of certain specific genes but not 9 01 Cancer cells are examples of cells that undergo extremely rapid reproduction with very little or improper differentiation. What is the function of this
newly identified sequence? Let's return to the transfusion of blood and blood types. This is one way balance is maintained in the carbon cycle. It has been used to sequence whole genomes. (For more about this epic struggle, check out this post.) When botanists create new orders (so to speak), gardeners (conservatives of the botanical world) often
stubbornly hold on to the old ones. Hence, life on Earth is referred to as carbon-based life. In addition, an enzyme because the input of energy (activation energy) required will be lower with
the enzyme present. In the end, you should have four cells with two single chromosomes in each. Use caution when cutting the anther. Was that prediction correct? Inside each testis, spermatogenesis occurs within very small tubes known as seminiferous tubules. The problem may not be the accumulation of plaque but an accumulation of a protein
called C1q, which builds up on the synapse. • Sarcolemma ion channels open and sodium ions (N+) move through the membrane. Feeding the world's increasing population requires more and more phosphate. The two capital letters with superscripts represent alleles that are co-dominant: • IA = the allele for
producing proteins called type A antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens, giving type B blood • i = the recessive allele that produces neither A nor B antigens neither A no
bioinformatics Here is an example of pathway engineering. Table 2.6 shows the data provided by the Centers for Disease Control and Prevention (CDC). Men cannot be carriers for X-linked alleles. This is followed by an introduction, which gives the context of the topic and how it relates to your previous knowledge. 3 Individually, have each test
subject do one, and only one, of the exercise durations you predetermined. Each vehicle produces its own mass in carbon dioxide every year. Cells never stop cell respiration and thus are constantly lowering the concentration of glucose in the blood. Without this element, organisms would not be able to make DNA or proteins, and thus life would be
impossible. It can determine with some precision when regions of the brain become active and how long they remain active. Option D: Human physiology receptor-hormone complex receptor protein in cytoplasm nucleus steroid hormone 1 2 3 4 5 6 plasma membrane of target cell new polypeptide Peptide hormones Peptide hormones get their name
from the fact that they are composed of amino acids and thus are proteins. An impulse is always carried from the dendrite end of a neuron ealong the membrane of the neurone.) 544 GABA (gamma-aminobutyric acid) is an example of an inhibitory
neurotransmitter. According to the cohesion-tension theory, why are leaves essential to fluid transport in plants? There is very convincing fossil evidence showing that the angiosperms and insects coevolved; they appear to be instrumental in each other's development. 21 How does the example of Hatena and the alga represent an emergent
explanation of life? In Figure 5.5, species A, B, C, and D come from a common ancestor. sieve tube member lacks nucleus and cytoplasm companion cell has nucleus and dense cytoplasm sieve tube and accompanying companion cell. A developing neurone does the
same sort of thing, trying out all the possible connections to see which is the best fit. They vary greatly in form, but they generally consist of a flattened portion called the plade and a stalk called the petiole that attaches the blade and a stalk called the petiole that attaches the blade to the stem. Induced-fit model of enzyme action Enzyme-substrate specificity was discussed in Section 2.5. Enzyme
specificity is made possible by enzyme structure. In terms of the shapes of human red blood cells, we all carry two copies of the gene for the shape of our red blood cells, one copy that we inherited from our mother and the other that we inherited from our mother and the other that we inherited from our father. Material not consumed. Only mammalian cells are capable of making these complex
molecules. Is predicted athletic ability acceptable screening? It is as ingrained in an animal as much as the colour of its feathers or hair. Instead of ATP being formed by the movement of hydrogen ions, ATP is broken down to allow various mineral ions to move into the root cells. The significance of DNA replication is that it ensures that two identical
copies of DNA are produced from one original. Chlorophyll is a green pigment. It is important to recall that metabolism is the sum total of all the chemical reactions carried out by an organism. In addition, some people develop ulcers, a condition where the stomach or duodenum has become irritated by acid as a result of a combination of thinned
mucus and hydrochloric acid being in direct contact with the exposed tissue. Table 13.8 Examples of model organisms Model orga
Drosophila melanogaster Insect Caenorhabditis elegans Nematode Mus musculus Mammal The number of genes that we share with these species is very high. Polar molecules easily dissolve in water, because a polar solvent will dissolve polar solvent will dissolve in water, because a polar solvent will dissolve polar solvent.
separate, they become two identical chromosomes. Because it is their intellectual property, anyone who wants a genetic test for breast cancer or ovarian cancer must go to them. 4.1 Species, communities, and ecosystems Understandings: NATURE OF SCIENCE Looking for patterns, trends, and discrepancies: plants and algae are mostly autotrophic
but some are not. Figure 12.48 Serotonin neurones in the brain. Bacteria contain circular plasmids. • Reflex conditioning involves forming new associations. 92 100% 2 50% 50% 3 75% 25% 4 88% 12% Answer these questions from the results obtained. Figure 9.2 Vessel elements and tracheids.
form water to maintain the hydrogen gradient, resulting in the formation of water. every enzyme molecule is working as fast as possible rate of enzymecatalysed reaction. It
is a proposed explanation for 773 Who's right? It coordinates unconscious functions, such as movement and balance. A summary of the two reactions is shown in Figure 8.24. Thus the protein will not take on its 'normal' shape and will not function normally. The following are descriptions of each method. If oxygen is not present, anaerobic respiration
occurs in the cytoplasm. 1 (Sathiya Moorthi, P., Deecaraman, M. If the value of t is 2.25, is that a significant difference? 20 What happened to the receptor density over the 21 days following the last dose of MDMA? Lefthemisphere damage can result from a stroke (broken or blocked blood vessels in the brain). (c) Which carbon is always attached to
the nitrogenous base? This inactivated X chromosome can be seen to be heavily methylated. If higher temperatures are the result of global warming, what effect might global warming have on plant transpiration rates? One example of nutrient cycling is the nitrogen cycle. Yet both types of eye have evolved from a common ancestor, because they all
use one form or another of pigment cells and specialized nerve cells called photoreceptors that are light sensitive (see Chapter 12, Section A.3). • PKA enhances the release of the NT from the presynaptic neurone into the synapse. What will be described here are the events that occur before, during, and after fertilization in humans. Select the icon to the synapse.
watch a video Worksheets Soybeans are a very valuable crop. Animal physiology Anatomy of the kidney The function of kidneys is to filter waste products from the blood. • Click BLAST. The source and therefore the type of fat consumed is the key to good health. • Skill: Analysis of correlations between body size and brain size in different animals.
Antibiotics can often be used to cure ulcers instead of surgery. Reactions within body cells are collectively referred to as metabolism. When the guard cells lose water, they sag towards each other and close the stoma. The worked example below is an application of the 2 test on Mendel's results. Humans can consume the meat or milk from the cow to
benefit from the chemical energy the cow has obtained from the grass. 1 2 3 4 A B C D Figure 13.32 cDNA tagged with red and green dyes have attached to probes on the microarray plate. Once a gene has been methylated, it usually will stay that way even through many cell divisions. The letters X and Y refer to chromosomes and not to alleles, so
terms such as dominant and recessive do not apply. Wikis have been created for scientist to upload their latest laboratory findings. Figure 9.10 The structure of phloem, including the sieve tube member and accompanying companion cell. The purebred tall parent can only give T. Person 1 has a gene that expresses a normal protein. The SA node
action potential also reaches a group of cells known as the atrioventricular (AV) node. He even indirectly quantified the amount of growth substance in the agar blocks, by measuring actual curvatures of the stems. Allele frequency is a measure of the proportion of a specific variation of a gene in a population. In addition, the cells of adipose (fat) tissue
produce a hormone called leptin that sends a message to the hypothalamus to suppress appetite. You can see why the entire structure is sometimes called the 'bronchiole tree'. 425 10 Genetics and evolution NATURE OF SCIENCE Mendel's classic pea plant experiments clearly demonstrated that a monohybrid cross produces F2 offspring in a 3:1
ratio, meaning that for every offspring showing a recessive phenotype, there are three offspring showing the dominant phenotype (see Figure 10.11). 61 02 Molecular biology the oxygen side being somewhat negative and the hydrogen side being somewhat negative and the hydrogen side being somewhat positive. The word synapse is 113 years old. An enzyme then catalyses a condensation reaction reaction and the hydrogen side being somewhat positive.
between the two amino acids, and the resulting covalent bond between them is called a peptide bond. You should familiarize yourself with these examples to enrich your understanding of Biology. This causes vesicles containing neurotransmitters to fuse with the presynaptic membrane. Scientists from ICES also collect information on-board fishing
vessels. 

Guidance The structure of starch should include amylose and amylopectin. 
Application: Lack of vitamin D or calcium can affect bone mineralization and cause rickets or osteomalacia. Chromatin does not have nearly as many nucleosomes. There is no single blood pressure value that can be used to determine the norm, as a person's
very small intake of these elements to ensure good health. Ethylene glycol and methanol may be used in producing car antifreeze, de-icing solutions, solvents, and cleaners. 16 Suggest some reasons why pollinators are in trouble worldwide. An imbalance of just one can result in conditions such as schizophrenia or severe depression. Excessive
bilirubin levels are toxic to brain cells, which is why newborns with symptoms of jaundice must be treated promptly. As a result, the locus marked with a red bar on the X chromosome does not exist on the Y chromosome Because the Y chromosome is significantly smaller than the X chromosome, it has fewer loci and therefore fewer genes than the X
chromosome. However, in reality, acetyl CoA can be produced from most carbohydrates and fats. Electrical leads are placed in a variety of places on the skin in order to measure the small voltage given off by these two nodes of the heart. leaf debris T2 mayfly larva stonefly larva T1 algae T1 NATURE OF SCIENCE To learn more about biomass, go to
the hotlinks site, search for the title or ISBN, and click on Chapter 4: Section 4.2. Ever since Thomas Malthus predicted in the late 18th century that humans would eventually run out of food, scientists and researchers have wondered how big the human population can get before the amount of biomass available as food becomes insufficient to feed
everyone. receptor ATP G-protein cAMP PKA Cell nucleus transcribes a protein which modifies the synapse. Can you tell this is an animal cell? At the time of writing, the Earth's population is estimated to be about 7 billion people and still
growing. • Choose a species of plant that grows there that is easy to identify and that is widespread throughout the area, but not so numerous that counting the number of individuals growing in a square metre would take more than a minute or two. • How would a man feel if he found out he was not his child's father? • At the same time as generation
0 was obtained, some of the bacteria were placed in a 14N culture medium and allowed to grow for 20 minutes, which is the generation time for E. CHALLENGE YOURSELF 1 During blood transfusions, a person receiving blood cannot receive blood that has one or more of the three erythrocyte plasma proteins that they do not already have on the
plasma membrane surface of their own erythrocytes. However, this type of experiment is not always possible. Which of the processes of life is demonstrated by this action? • Activated adenyl cyclase facilitates the change of ATP molecules located in the cell to cAMP molecules. Our bodies have evolved a set of responses to create a clot that 'seals' the
damaged blood vessels, so preventing excessive blood loss and helping prevent pathogens from entering the body. Practice questions 1 When do chiasmata form in meiosis? bloodstream and some is binding with haemoglobin. coli was grown in the 15N medium for many generations, to ensure all the DNA present was 15N. Myoglobin stores oxygen
and only releases that oxygen when muscle tissue is very heavily used and the normal supply of oxygen from haemoglobin becomes limited. Fortunately, we have receptors for pain. This can result in the primary structure remaining intact (the sequence of amino acids connected by peptide bonds) but the hydrogen bonds often cannot stay in place
under the stress caused by the increased molecular motion. Each myoglobin can bind to only one oxygen molecule. • Elaborative encoding: relating new information to old knowledge already stored in the memory. The ultimate source of light is the Sun. In your opinion, is one more 'scientific' than the other? If they are produced by free ribosomes, the
proteins are primarily used within the cell. Mitochondrial DNA is particularly interesting to study because, unlike DNA found in the cell's nucleus, it is not shuffled and mixed during meiosis or fertilization: • In the cells where the gene is expressed (the protein is produced) the GFP is
also produced. Water moves into the root hairs from the soil because the root hairs have a higher solute concentration and a lower water concentration than the surrounding soil. Substances can do one of only two things when they are struck by a particular wavelength (colour) of light. When the kidney is cut in section, as shown in Figure 11.13, you
can see the layer of tissue surrounding the renal pelvis, which is called the renal medulla; the layer to the outside of that is the renal cortex. • Add another molecule, an enzyme-labelled antihuman IgG antibody (blue), to create colour. One way to spot non-scientific arguments is to look for whether or not the proponent's comments are motivated by
economic arguments, notably when they are motivated by their affiliation with industries that produce large quantities of carbon dioxide. Give two examples of heterotrophs in the human diet. Marijuana disrupts short-term memory in humans. After the antibiotic treatment is reduced, the persisters
repopulate the biofilm. Sarcomere actin Figure 11.9 The structure of a single relaxed sarcomere. Critics point out that the problem of hunger in the world is one of food distribution, not food production. • Spongiforma squarepantsii Desjardin, Peay & T.D. Bruns, 2011. (ii) Calculate the ratio of time spent foraging to the time spent patrolling on day 24.
The gene in this potato that produces the 20% amylose has been turned off. Application: Biopharming of antithrombin. Asample was then taken, processed, and centrifuged to produce generation 1. When both chambers are at rest The term used for a chamber of the heart that is not contracting is diastole. The ATPs are essential because they
provide the energy by which life is maintained. In such a scenario, it is impossible to guess which male's sperm cells will successfully fertilize her egg. Frequency (%) Protein-encoding genes (exons) 1-2 Introns 24 Highly repetitive sequences 45 Structural DNA 20 Inactive genes (pseudogenes) 2 Other 7-8 Short tandem repeats and DNA profiling
DNA profiling is the process of obtaining a specific DNA pattern from an organism, such as a human, from the body tissue of that organism. The members of the new population will be different enough from the pre-existing population that they will no longer be able to interbreed. Using pathway engineering, scientists attempt to
ion channel opening and sodium ions diffusing in through this channel. This opens the stoma. A DNA microarray is also called a gene chip. Biofilms can grow on implants such as hip replacements and catheters. Despite several visits by space probes, no conclusive evidence has been discovered on Mars that can lead scientists to declare that there is
life on its surface. 590 Agrobacterium tumefaciens + DNA + Ti plasmid gene for glyphosate resistance into soybeans, Glycine max. If R represents round and Y represents yellow, both the genotype RRYY and RrYy would give seeds that were round and
by the fact that, as oceans warm up, they release carbon dioxide, because gases dissolve less well in warm water than in cold water. Vacuoles are smaller than those found in plant cells. (b) Can scientists conclude that there is causality from this graph: that rising carbon dioxide levels cause global temperatures to go up? Be careful not to confuse
allele frequency with the number of people who show a particular trait. The ribbon-like structure in this model is a single polypeptide chain, direction of blood flow through the left side of the heart rate The majority of the tissue that makes up the heart is muscle. These cells are obtained from embryos, largely from laboratories and the heart rate are obtained from embryos, largely from laboratories are obtained from embryos.
carrying out in vitro fertilization (IVF). When a scientist is looking for a protein and has the DNA sequence, he or she can go to the National Center for Biotechnology Information (NCBI), a public site, and use the ORF finder to find the protein-coding region for the target DNA sequence. This process occurs in the 5 to 3 direction. By comparing the
genetic sequence used to produce this protein in various species, scientists were able to see how mutations accumulate over time. Waste water trickles over the filter media and the attached aerobic bacteria oxidize the organic matter in the waste. acetyl CoA Figure 8.11 Acetyl CoA combines with oxaloacetate to form citrate. Citric acid is a flavour
enhancer, maintains the pH of a food product, and can be used as a preservative. • Many become succulent by storing water, thus diluting the salt concentrations. Applications and skills: Applicati
mud such as sticks and stones. Many produce a shell reinforced with calcium. Myriad's justification for the cost of the tests was that biotech research requires very expensive laboratory equipment and highly trained professionals, so the money earned from the diagnostic tests helps the company invest in new developments to advance scientification for the cost of the tests was that biotech research requires very expensive laboratory equipment and highly trained professionals, so the money earned from the diagnostic tests helps the company invest in new developments to advance scientification for the cost of the tests was that biotech research requires very expensive laboratory equipment and highly trained professionals, so the money earned from the diagnostic tests helps the company invest in new developments to advance scientification for the cost of the tests was that biotech research requires very expensive laboratory equipment and highly trained professionals.
knowledge and continue putting new diagnostic tools in place. • For each test subject, calculate a percentage increase of ventilation rate, showing the increase after exercise compared with the baseline rate.
 glucose molecule during the link reaction. If you agree that a paradigm shift has occurred, what has caused it? • The stapes strikes the oval window, causing it to vibrate. Ca2+ DNA Calcium phosphate + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
of DNA. An artist's representation of villi in the small intestine. This means that the frequency of the recessive allele t is 10.5% in this population. Because of the triangular shape of a water molecule, the two ends of each molecule have opposite charges, with polar covalent bonds - O + H H + water - structural diagram - O + H H + water - electron
dot diagram Figure 2.10 The shared electrons between oxygen and hydrogen are not shared equally, thus they are polar covalent bonds. In 2005, stem cells were used successfully to help restore the lost insulation of nerve cells in rats, thus resulting in greater mobility in these animals. Guidance In diagrams of DNA structure, the helical shape does
not need to be shown, but the two strands should be shown antiparallel. Put very simply, the order of events is: • ingestion - a series of chemical reactions occurs, whereby the ingested food is converted into smaller and smaller molecular forms • absorption - small molecular forms are absorbed through the cells of your
digestive system and pass into nearby blood or lymphatic vessels • transport - your circulatory system delivers the small molecular nutrients to your body cells. electron transport chain photosynthesis Note that NADP+
and ATP move back and forth in the chloroplast from the thylakoids to the stroma in their reduced and oxidized forms. (b) Do the same for the upward fluctuations from October to May of the following year. Alveoli in the lungs are found as clusters at the ends of the smallest bronchioles. The elbow is also an example of a hinge joint, which provides an
opening-and-closing movement similar to the action of a door. Notice that the head occupies a large area but the hips and legs only occupy a small area. A single layer of these follicle cells surrounds each primary follicle. This causes negatively charged chloride ions (Cl-) to move across the
postsynaptic membrane into the postsynaptic neurone, or it can cause positively charged potassium ions (K+) to move out of the postsynaptic neurone. This occurs because the inhibitor binds to the enzyme present and is not released. This chapter is divided into two parts: Part 1 Mathematics and statistical analysis, and Part 2 Information and
communication technology (ICT) in biology. B and K produce white flowers and must be homozygous for white, CWCW, because any other combination would give pink or red. (b) Pairs of homologous chromosomes line up along the equator of the cell. Has it always grown? For example, a river, a mountain, or a clearing in a forest could separate
populations. Exercises 1 Draw the two strands of a DNA molecule representing their antiparallel relationship. It also helps regulate water uptake. Test subject numbers can be assigned instead of using names. The lack of activity in a brain-dead patient is called electrocerebral silence (see Figure 12.14). Even though no single blood pressure reading
can be considered to be the norm, the American Heart Association has released ranges of blood pressure values that can be used for advice on cardiovascular health (see Table 15.4). Neurones grow towards their target cells. Scheffel et al. 

Anaesthetics act by interfering with neural transmission between areas of sensory perception and the CNS.
You will recall that meiosis I produces haploid cells, but each cell has chromosomes existing as paired chromatids. It means you are aware of questions of validity. Fortunately, the investigator identified it as being a result of an error during the lab. In order to ensure that the links are up to date and that the links work we have made the links available
on our website at www.pearsonhotlinks.com. A second sample of the population is then captured. 69 02 Molecular biology Saturated fatty acids In Figure 2.15, the yellow zone on the left is the carboxyl group, the white zone in the middle is the hydrocarbon chain (shown much shorter than any fatty acid in the human body), and the green zone on the
right is where the methyl group is located. Insulin and glucagon help regulate glucose levels TEM of a cardiac muscle cell. This can be seen in Mendel's experiments with pea plants (see Figure 10.22). At the present time, as far as we can tell these dispersed regions of DNA do not have any coding functions. Heterozygous carriers can make A-
containing gametes or a-containing gametes. • To determine the sequence, a DNA polymerase enzyme attaches to one copy of the first fragment (let's call it fragment 1). After vaccination, most animals respond so quickly to the real pathogen that only very mild symptoms or perhaps no obvious symptoms at all are presented. Clones Cutting, copying,
and pasting genes Although the laboratory techniques are complex, the concepts are not difficult. 188 Worked example Using the following information, construct a pyramid of energy. These foods provide the brain with a supply of glucose that lasts for hours. Because they are so numerous, however, and they have been around for hundreds of
millions of years, their shells have accumulated in sediments, and when the sediments go through the process of lithification, they form limestone. Some electrical activity will be shown on an EEG if a patient is in a deep coma. Alligator females are very protective of their young. Hypothesis for question 1: the optimum pH environment for lactase will
be slightly acidic (pH 6.0-6.5). This is to allow verification, critique, and sharing of data, so that scientists with many different approaches can combine their findings and advance our understanding of the topics being studied. This process is called budding, and you may have observed this in electron micrographs of yeast cells. One difficulty of
supporting either claim is that the only evidence we can use is from fossils. 2 Replace the parafilm and invert the tube, shaking gently. (a) A kind of waterlogged soil found in wetlands and made of partially decomposed plant material. Derived traits (also called apomorphic traits) are also characteristics that have the same structure and function but
that have evolved more recently as modifications of a previous trait (e.g. flowers, which evolved more recently than leaves with vascular tissue, i.e. they are an adaption of vascular leaves). Each chromosome splits in two. If you look at the opposite strand of deoxyribose and phosphates, you will notice it is the opposite: the 3 carbon is at the top and
the 5 carbon is at the bottom. Chromosome number: a defining feature As you can see, the number 46 for humans is very different compared with the number for a worm. CHALLENGE YOURSELF Using the results shown in Figure 7.1, answer the following questions. In this case, statistical analysis of the data may indicate a correlation. In reality, the
genetics of albinism is more complex, notably because there are multiple types of albinism. Did you come close to 200? Those birds who possess the genes for bills long enough to drink nectar at the bottom of long, thin flowers have a better chance of survival than those who do not. CNS: • brain • spinal cord. The right hemisphere has little language
ability. Consider the problem faced by people with haemophilia. Likewise, a body mass that is too great would make childbirth difficult and could also reduce the baby's chances of survival. In addition, burning forests to make way for farmland and burning wood for cooking and heating has contributed to this increase. The result is an unstable 6-
carbon compound. In other words, it would be very unlikely that they are independent of each other. The last ice age ended about 10 000 years ago, and we are now in an interglacial period associated with warmer temperatures. (Total 9 marks) 8 Explain why carriers of sex-linked (X-linked) genes must be heterozygous. When this virus infects a cell,
it takes over the metabolism of the cell, resulting in multiple viruses of its kind being formed. 1987), p. Other than conceding that we all have a common ancestor, it would be difficult to explain how else this is true. We are facing that situation now. In order to do this, Calvin used improvements in apparatus design and recent developments in
radioactive tracers and autoradiography. Slowly, over time, the tree trunk decomposes as the molecules inside the wood are liberated and reused. Nester et al. Even though the first accurate model of DNA was produced by James Watson (American) and Francis Crick (British) in 1953, many other scientists from around the world contributed pieces of
information that were instrumental in developing the final model. For example, a doctor might wonder why a child did not grow as fast between the ages of 9 and 12 months compared with the rest of the graph. Placing organisms on a slow-spinning turntable may also disrupt the normal pull of gravity. Whereas respiration is, in general, a catabolic
process, photosynthesis is, in general, an anabolic process. This is particularly true of fatty acids because of their non-polarity and relatively large number of hydrogen ions (H+) can bond with the negative charges of the enzyme or substrate, and prevent proper charge
matching between the two. The oncogenes may start to change or go through mutation because they are triggered by an outside agent referred to as a mutagen. 250 Cnidaria Cnidarians are a diverse group, including corals, sea anemones, jellyfish (sea jellies), hydra, and floating colonies such as the Portuguese man-of-war. • Impulses caused by
sound perception are transmitted to the brain by the auditory nerve. open flask One obvious missing component of cell theory is how the first cell arose. Other gases including methane and nitrogen oxides have less impact. 6.4 Gas exchange Understandings: NATURE OF SCIENCE Obtain evidence for theories: epidemiological studies have
contributed to our understanding of the causes of lung cancer. You may wonder why transgenic (cloned) animals are so often goats. One of the characteristics that distinguishes meiosis from mitosis (see Section 1.6) is that, during the first step, called prophase I, there is an exchange of genetic material between non-sister chromatids in a process
called crossing over (see Figure 3.16). This is then called reciprocal altruism. Karyograms and karyotypes A karyogram is a representation of the chromosomes found in a cell arranged according to a standard format, as in the example in the photo opposite. The quantum rod travels through the blood stream to seek out and bind to cancer cells.
Because of this, the amount of water absorbed from the soil by the root through the process of osmosis is increased. MIL is a molecule used to label active serotonin receptors. When two extreme phenotypes are favoured by natural selection, rather than one intermediate phenotype are favoured by natural selection.
sequences refers to the bases present. Cormorants When using a mathematical correlation coefficient, r, is a measure of the degree of linear relationship or linear dependence between two variables. In his writing, he points out the difficulty of applying the term species to organisms that lived in the past. The mean is
6.3 cm. The tissue that makes up our lungs is passive and not muscular, therefore the lungs themselves are incapable of purposeful movement. On this page there is a lot of information valuable to researchers. • Different scientists and different regions of the world use different versions of the scientific method to obtain valid
results and conclusions. A molecule, such as glucose, is acted on by a series of enzymes. Threats to coral reefs are very sensitive to the following: water temperature, water acidity, and the depth of the water. Annotate means to write the function of each labelled part. 2 Make cDNA by reverse transcription, using
fluorescently labelled nucleotides, blue in this example of learning that could take place at the dentist. 398 Apical meristems are often differentiated based on their location within the plant. Cells are often
divided into particular groups based on major characteristics. How does this work? The function of these enzymes is to catalyse a sequential series of reactions in which the covalent bonds are broken (oxidized) one at a time. The study was immediately criticized by some members of the scientific community, who claimed that the quantities of
transgenic pollen placed on the caterpillar's food was of a concentration that would not be possible in nature, and that more realistic experiments would need to be carried out in the field, 1 2 3 For humans, the total theoretical number of possible combinations during random orientation is 223 because there are 23 chromosomes in each gamete. For
example, a large, dense population will exhibit a greater increase in mortality with the spread of a contagious disease than a small population that is not so densely crowded. If the determination is 'not-self', the macrophage engulfs the cell by phagocytosis. Figure 6.28 Events occurring during a 28-day menstrual cycle. Natural selection tends to
eliminate from a population individuals that show low fitness, whereas the fittest individuals in a population have a higher likelihood of surviving. Each country has its own laws concerning how food is labelled for consumers. Passive mechanisms: no ATP used • Simple diffusion: direct movement through the cell membrane following a concentration
gradient. 486 Many of the events associated with fertilization depend on the species of animal concerned and factors such as whether the fertilization is external or internal. This mechanism explains the surprisingly low number of genes found in the Human Genome Project. Interesting work has been done with cheap antioxidants such as ascorbic
acid (vitamin C). • The receptors detect a stimulus and generate a nerve impulse in the sensory neurones (see Figure 12.34). A niche is a position or role within a community of an ecosystem. It is important to include the units. This area is generally free of proteins, so binding of mRNA and tRNA is carried out by the rRNA. The producers take simple
inorganic compounds, such as carbon dioxide (CO2), from their environment and convert them into energyrich sugars, such as glucose (C6H12O6). 476 Osmoconformers are animals that have internal tissues that have 
acids and some amino acids are essential. Could the many alleles all work together to contribute to the trait, in the way each instrument in an orchestra contributes to a symphony? Photosynthesis occurs in organisms referred to as autotrophs. Such an experiment helps us to learn how we might set up a base on the Moon or perhaps Mars but, more
importantly, it helped the people living inside appreciate what a delicate balance there is between air, water, and life: a balance that is complex and can be disrupted by actions with unintended consequences. Let's explore more about this interesting and important topic. Albino animals lack pigmentation, so this penguin does not have the black
markings characteristic of most penguins. This has allowed the pollution-sensitive lichen population to return and allowed the bark on tree trunks and branches to return to their non-blackened colour. each tRNA carries a specific amino acid G C G A triplet anticodons A A A A C G C U G A U U C U A A C G C C triplet codons ribosome mRNA
Polymerase chain reaction and Taq DNA polymerase Polymerase Polymerase Polymerase Polymerase Chain reactions are referred to as redox reactions. Transparency of water and maximum density at 4°C do not need to be included. Notice that, as in all
condensation reactions, a water molecule is created from each of the three reactions. Can part of the answer be that the learning was propagated socially in the flock? Cytoplasm contains dissolved substances, enzymes, and the cell organiles. When it carries out phosphorylation, one phosphate is lost resulting in a twophosphate compound called
ADP. It uses no oxygen and occurs in the cytosol of the cell. The graphs show the time profiles when different lipids emerged from the gas chromatography column. These molecules are typically found in animal products such as butter, bacon, and the fat in red meat. superior vena cava The left side of the heart sends blood along a route that is called
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the systemic circulation. In what ways is this useful to scientists wanting to publish their results? A typical person might be able to survive about 3 weeks without food. Exercises 7 Contrast geographical isolation and temporal isolation. Table 6.3 A comparison of arteries, capillaries, and veins Artery Capillary Vein Thick walled Wall is 1 cell thick Thin

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walled No exchanges All exchanges occur No exchanges occur No exchanges No internal valves Internal valves present Internal pressure high Internal pressure low The heart, a double pump The human heart is designed as a pair of side-by-side pumps. How do geneticists work out the complete genome? Currently, it is the most
sensitive test for the flu virus. Each of the three domains is subdivided into these seven taxa: 244 • kingdom • phylum • class • order • family • genus • species. This foetal blood exchanges materials with the maternal bloodstream, and the third foetal blood exchanges materials with the maternal bloodstream, and the third foetal blood exchanges materials with the maternal bloodstream.
as water of metabolism. They have undergone many evolutionary adaptations to help them survive in a marine environment, but have not lost their integral mammalian characteristics such as hair, mammary glands, and endothermy (being 'warm blooded'). CAMs form a physical but reversible glue-like bond between the tentative projection of one
cell's axon and the receiving structure on a neighbouring cell. • This results in the elongation of the cells on the side away from the light. 'Hetero' means other. 11 Explain the final products of the two photosystems involved in the light. 'Hetero' means other. 12 Explain the final products of the two photosystems involved in the light.'
improve that skill with more practice and schooling. Many individual bones and segments of exoskeletons also act as levers, to maximize efficiency for a variety of movements. Legend: 1=presence of ferns in quadrat, 0=absence of ferns in quadrat Apply the chi-squared test to these data to decide whether the shade had an influence or not on the
distribution of the fern. Hyperion/DIR/VIP/Glossary/ Illustration/Images/microarray scan This is a gene chip of all the genes of a frog. Choose one that is most suited to your circumstances. Exercises 16 Briefly outline how a
spermatozoon is well adapted for its function. Galen taught his students that there were two types of blood: 'nutritive blood' that was made by the liver, and 'vital spirits'. Will questions about souls always remain beyond the capabilities of science to investigate or
verify? It is interesting to see if an organism has a positive thigmotaxic response. Chemistry teachers will tell you that the list of products such as benzene, which were commonly used in laboratories in the past, are now restricted or
forbidden because of their cancer-causing or mutagenic properties. This seems to be because their job needs their brain to store large amounts of information and to have good spatial understanding. (This would be the result of a change occurring in the DNA molecule that transcribed this mRNA.) 97 02 NATURE OF SCIENCE Assessing the ethics of
scientific research: the use of invertebrates in respirometer experiments has ethical implications. When you look at the function (s) of each part of a cell, it is less than the overall function of the complete cell. These have been previously marked with fluorescent markers to identify them. When using the 2 test to determine whether there is a difference
between the expected and the observed values, the degrees of freedom is determined by taking the number of categories into which the data fall and subtracting 1 from that number. Gametes (sperm cells and egg cells) cannot contain 46 chromosomes for the simple reason that, if they did, when they fused together during fertilization, the baby that
would be formed would have a total of 92 chromosomes, and each new generation would double its chromosome number, making an impossibly large amount of DNA to deal with. 1. Thus the question becomes: how do the actin filaments of a sarcomere all move toward the centre and collectively make the muscle contract? 2 Outline the differentiation
and migration of immature neurones. The very large circle is the entire nerve, and each small circle within it is one of the axons of a neurone contained within that nerve. 81 02 Molecular biology Factors affecting enzyme-catalysed reactions, you must
first remember that all chemical reactions are fundamentally molecules colliding. R R Another way of showing the same idea is shown in Figure 10.17. Thus a muscle pulls on a tendon that is connected to a bone (or exoskeleton) and a movement of the skeleton (or exoskeleton) are fundamentally molecules colliding. R R Another way of showing the same idea is shown in Figure 10.17.
normal skin differ from the skin cancer cells. Further protein-digesting enzymes then hydrolyse the smaller polypeptides into amino acids This illustration shows the cells that are demanding oxygen. Phillips 482
embryonic development. What are antibodies and how do they help destroy pathogens? 11 Describe what would happen in the liver if a person was to go for an extended period of time without eating or exercised heavily for a long period of time. The body needs to keep a great deal of the water, many of the salt ions, and all of the glucose that is in the
filtrate. • Where is knowledge? Most molluscs are aquatic, and include snails, clams, and octopuses. The technique involves catching some of the male which contrasts with the otherwise greyish plumage. Speciation due to divergence of isolated
populations Among evolutionary biologists there is some discussion as to the rate at which species evolve. The stage of bacterial growth when penicillin is produced is called the stationary phase. Those groupings are carbohydrates, lipids, proteins, and nucleic acids. Science may be described as the art of systematic oversimplification. In this instance
the ions must pass through a transport protein in the membrane. Observe and record the diameter in millimetres in the above table. The liver contains two kinds of cells that are used in these processes. Plant biology a promising source of biofuel because they do not compete with food crops for resources. List as many locations as you can that this
single glucose molecule will visit from the time that it is in your mouth to the time it enters a muscle cell of your body. When sunlight strikes the white areas of the shirt, all the wavelengths of light are reflected and our eyes and brain interpret the mixture as white. 27 01 Cells The current agreed model for the cellular membrane is the fluid mosaic
model. Oxygen dissociation curve of adult haemoglobin and myoglobin and myoglobin and myoglobin saturation Look at Figure 15.23. If the peppered moth did not have been completely wiped out when their camouflage no longer worked 229 05
Evolution and biodiversity against a dark background. Successful pathways The French company Sanofi has begun brewing baker's yeast to make malaria drugs on an industrial scale. One is a thought-provoking experiment is a thought-provoking exper
repeatable. An absence of a superscript means that no allele for that trait exists on that chromosome. Each of these lenses has a number on it followed by an ×. 13 One way to stop undesirable plants growing at a specific location is to apply a solution of water with a high concentration of sodium chloride (table salt). Improvements could be made if we
are willing to change agricultural practices and including composting and recycling of human and animals waste. Inside, pyruvate is decarboxylated, a reaction involving the loss of a carbon in the form of carbon dioxide, to form the 2-carbon acetyl group. You may have heard news reports about patients who are living on life support systems but their
brain shows no electrical activity. A free nucleotide locates on one opened strand at one end, and then a second nucleotide can join the first. Exercises 1 What is the importance of memory cells to an animal's immunity? Light energy is converted to chemical energy in carbon compounds by photosynthesis. Here are a few examples. 

Some axons
extend beyond the neural tube to reach other parts of the body. Compared with Paramecium, Chlorella has a completely different approach to nutrition. The standard deviation of the bean plants grown in
shade is 47.02 cm. The drugs could be attached to the transferrin molecule and delivered to the cells as transferrin attaches to the cell membrane. Thus, following a vaccination, if you do encounter the actual pathogen, the memory cells will initiate a very quick secondary immune response. Archaeans are single-celled organisms that are distinct from
bacteria and are very ancient. This is one of the reasons why, when looking at cells under a microscope, it is not usually possible to see chromosomes all coiled up. They have different causes and different effects on the environment. NATURE OF SCIENCE Alexander Fleming made the initial discovery of penicillin in 1928. CHALLENGE YOURSELF 7
Use the amino acid structures in Figure 2.20 and draw the following short peptide consisting of five amino acids. Investigating the factors that affect the rooting of stem cuttings. Mitochondria have their own DNA, a circular chromosome similar to that in bacterial cells
allowing them some independence within a cell. Computer image of an insulin molecule. It is a cancer that is prone to spreading, a process called metastasizing. As exercise begins and carbon dioxide. Insulin does this by interacting
with protein channels in body cell plasma membranes, thereby opening those channels to glucose. A During prophase I. Gel electrophoresis puts the fragments in order from Macmillan Publishers Ltd. (3) (Total Total 6 marks) marks 5 Describe the process of
erythrocyte and haemoglobin breakdown in the liver. 3 How does specialization in muscle and nerve cells affect their ability to reproduce? At the synapse, THC acts on cannabinoid receptors. Hydrogen bonding and dipolarity explain the cohesive, adhesive, thermal, and solvent properties of water. The vast majority of trans fatty acids are the result of
chemical transformations in food-processing factories. 766 766 On the other hand, it is a bit intimidating to think that there are some things that no one will ever know the answer to. Chemical energy, thanks to the chemical bonds that exist
between the carbon atoms and other atoms. Let's look at what a nerve impulse actually is. 

Behaviour that increases the chances of survival and reproduction will become more prevalent in a population. 8 Data processing • Produce a table to record the processed data involving the percentage change in mass and core volume. Are questions of world
hunger simply questions of technology and biomass production? They are close in size to a bacterial cell. The exception is in the 23rd pair of chromosomes, which are considerably larger than the chromosomes, which are considerably larger than the chromosomes, which are considerably larger than the 22rd pair of chromosomes, which are considerably larger than the 22rd pair of chromosomes, which are considerably larger than the 22rd pair of chromosomes, which are considerably larger than the 22rd pair of chromosomes, which are considerably larger than the 22rd pair of chromosomes, which are considerably larger than the 22rd pair of chromosomes, which are considerably larger than the 22rd pair of chromosomes in the 23rd pair of chromosomes, which are considerably larger than the 22rd pair of chromosomes in the 23rd pair of chromosomes in the 23rd pair of chromosomes, which are considerably larger than the 23rd pair of chromosomes in the 23rd pair o
composed of aggregates of small cells that have the same function as stem cells in animals. (Hypertonic and hypotonic were discussed in Section 1.4.) According to the cohesion-tension theory, how might these remarkable plants be able to survive in this very difficult environment? Another enzyme then hydrolyses maltose into glucose Trypsin (an
endopeptidase) Proteins (polypeptides) An endopeptidase hydrolyses long polypeptides into smaller polypeptides. Nesting turtles are particularly vulnerable. The resilience of a species is highly dependent variable of mass
percentage change on the y-axis. Meselson and Stahl made predictions based on a number of possible models. In 1838, the botanist Matthias Schleiden stated that plants are made of 'independent, separate beings' called cells. 

Application: The use in IVF of drugs to suspend the normal secretion of hormones, followed by the use of artificial doses of a stable models.
hormones to induce superovulation and establish a pregnancy. Gregoire Courtine, who works at the Brain Mind Institute in Switzerland, has decided to switch the paradigm for those who have spinal cord damage and paraplegia. Humans and chimpanzees have identical cytochrome c amino acid sequences, whereas the yeast Candida krusei has 51
amino acid differences compared with humans. Very soon after each subject has finished, take a 20-second count of his or her exercise. This photo shows small delicate blood vessels, including capillaries. Exercises 1 How is the excretion
of metabolic wastes from cells related to the concept of the surface area to volume ratio? C Both children are unrelated to either of the parents. The only way that a male and a female can naturally have the same offspring twice is by producing identical twins, but, in this case, it is two children from the same egg cell and the same sperm cell. 8 In the
human elbow, state what provides the following functions. Since 1967 the digital hearing aid has been the main type of hearing device. DNA structure P Figure 7.2 A DNA nucleotide is composed of a molecule of deoxyribose with a phosphate group attached to the 5 (five-prime) carbon and a nitrogenous base attached to the 1 (one-prime) carbon. B C
D A (Total 1 mark) 2 In the mitochondrial electron transport chain, what is the last electron acceptor? It has been modified during the years since it was first proposed in the 1800s. What process is occurring when water moves through the tube membranes into the dialysate? Today we understand that the brain can create new neurones and new
pathways. Homologous chromosomes, also called homologues, are attracted to each other and pair up: one is from the individual's father, the other from the mother covalent bonds are created rather than broken. As a result, the human
number of 46 is preserved by the sexual life cycle. This process involves photosynthesis. In short, two populations of a species have diverged (separated), and a new species have diverged (separated), and a new species have diverged (separated).
a condensation reaction. What benefit does this serve? On the same figure place an arrow and the letter O at the five locations where oxidation of a cyclic intermediate compound occurs. human-physiology/structureof-the-respiratory-system.html CHALLENGE YOURSELF RBC IS EN Capillary endothelium Air space in alveolus Air space in alveolus 3
Using the artwork of a small area of lung tissue shown on the left, answer the following questions. You learned to read a book, how to ride a bike, how to ride a bike
been determined in cm2, convert this value to m2 using the following formula: leaf surface cm2/10 000 cm2 m-2 This information allows you to fill in the last row of the table. But if the population of bacteria continues to acquire mutations, new strains could show resistance to all the antibiotics available. Glyphosate
resistance in soybean plants Using less pesticide and herbicide is a goal. The nucleosomes are further wrapped into a solenoid. The receptors are like gates that let ions enter or leave when the neurotransmitter binds to them. Now imagine 3 billion of those letters: what would that look like? All organisms are classified into three domains. So, what
happens as a result of the XX or XY combinations? Add some water, but be sure to leave about 5 cm of air at the top of the bottle. The entire base sequence of human genes was sequence of human genes was sequenced in the Human Genome Project. 2 Early research indicated that fluid could move in plants even when roots were removed. When the seal's eating habits are
investigated and the herring's diet is considered, new organisms can be added to the chain: copepods (a common form of zooplankton) are eaten by the herring, and great white sharks eat seals. • The results are a grid of coloured spots (Figure 13.32) that can be interpreted. Table 4.3 The table of Shade (woodland) expected values Sun (prairie)
Grand total Fern absent 9.5 9.5 19 Fern present 10.5 21 Grand total 20 20 40 See page 797 of the Mathematics, and information and communication chapter for help with this calculation. An understanding of the properties of biofilms has allowed scientists to see their benefit in water clean-up efforts. The function of HCG is to enter the mother's
bloodstream and 'maintain' the corpus luteum of her ovary for a longer period of time compared with a typical menstrual cycle. 3 60 Briefly describe the two aspects of metabolism. The homeostatic mechanisms at work are regulated by the production of the hormones insulin and glucagon from the pancreas. Figure 12.40 The marine snail Aplysia
exhibits a gillwithdrawal reflex when its siphon is stimulated. Neither group knows whether it is taking an active pill or a placebo. 224 NATURE OF SCIENCE There is a species of plant that grows in coastal saltwater marshes called saltmarsh cordgrass, Spartina alterniflora. products of second replication Semi-conservative replication The process of
DNA replication involving bacteria was developed as a result of Meselson and Stahl's experiment. These enzymes result in a chemical change in the zona pellucida, making it impermeable to any more spermatozoa. • In turn, this activates PKA. jaundice. As 501 12 Option A: Neurobiology and behaviour we have seen with other descriptions of neurone
activity, pruning seems to follow the 'use it or lose it' principle. • Learned behaviour can spread through a population or be lost from it more rapidly than innate behaviour. 594 Physical methods as a direct means of inserting genes into plants In order to produce GM plants, methods had to be developed to deliver the transgene without damaging the
plant cell. AMP thought that it was unfair that clinical A patent is an authorization for a person or a company to make, use, or sell it. A a Carrier - An individual who has a recessive allele of a gene that does not have an effect on the phenotype. • Absorption of light by
photosystems generates excited electrons. Even though adults cannot develop rickets, they can develop a similar condition called osteomalacia (pronounced os'te-o-mah-la'shah), which means soft bones. However, there is a slight delay in the synthesis of the lagging strand. The two hemispheres do not have exactly the same functions. Notice that the
muscles are attached to the outside of the skeleton. They are the anal pore and the contractile vacuole. These cells produce and secrete a solution that acts as a surfactant. It has been shown that long-term alcohol abuse results in three primary effects on the liver. Circulating in the blood plasma are a variety of molecules called plasma proteins. This
splitting actually involves many steps but we can explain it effectively in three stages. As a result, they are treated separately, and virologists have their own classification system. Skin and mucous membranes form a primary defence The best way to stay healthy is to prevent pathogens from having the chance to cause disease. You can see how new
memories are created by education and experience. Leptin's target cells are in the hypothalamus of the brainstem. Table 2.7 shows a selection of organisms and their approximate gene count. (3) (6) (Total 9 marks) 3 (a) Draw a labelled diagram of the nitrogen cycle. coli found that one strand of DNA was involved in a discontinuous process in which
fragments were produced and linked later. The software toolbox is implemented on a web server and a user-friendly interface has been developed to facilitate image submission, storage, and sharing. 3' 1 of 20 amino acids bonded here (serine) 5' Figure 2.41 Structure of a tRNA 3 molecule. Instead of working with pea plants the way Mendel did,
Morgan worked with the tiny fruit fly of the genus Drosophila. To the lower left of that are the villi, which are used for absorption. • Natural selection • Concentration gradient • Artificial intelligence. Key 6.0-6.1 Hovering Patrolling Mating male head width/mm 5.8-5.9 5.6-5.7 5.4-5.5 5.2-5.3 5.0-5.1 4.8-4.9 4.6-4.7 0 10 20 30 40 50 proportion of
bees caught/% Chapman and Reiss 1999 571 12 Option A: Neurobiology and behaviour (a) Identify the largest head width range found in the sample of hovering bees. Also, companies often test a product alone but not necessarily in conjunction with other products. Today, a lot of the discoveries that took months or years to make are just a few clicks
away, because they are available for everyone to consult. 3.6, p. The code is carried from the nucleus by the second type of nucleic acid (RNA). However, there is still much work to be done in order to solve all the mysteries of the cell.
pair sequence of telomeres and the number of repeats of this sequence varies with each species. Decolorize with alcohol. Unlike insects, humans and other vertebrate animals use a closed circulatory system. Carry out the following activity. • Reintroduce the genetically altered cells back to the patient. This sea snail was named after the cartoonist
who created 'The Simpsons': Matt Groening. Farmers today can choose the genetic makeup of their cows from a catalogue, and order gametes to be delivered in liquid nitrogen for the purpose of artificial insemination by a veterinarian. For example: • red flowers are conspicuous to birds • yellow and orange flowers are noticed by bees • heavily
scented flowers can be located at night. (Total 4 marks) 9 Suggest two reasons for using cladograms for the classification of organisms. Mammals produce and excrete urea. It was recognized in the 1950s that herbicides and pesticides harm many other organisms in an ecosystem as well as the targets. Under these circumstances, (alpha) cells of the
pancreas begin to produce and secrete the hormone glucagon. Also, be certain to note which organelles occur in only one of the two types. Between the DNA samples from species A and species C there are 83 differences. Students are encouraged to used trend lines and r2-values in their data
processing, in order to analyse the data they have collected better. Think of a group of birds that arrive early in the springtime and start nesting before the others arrive, the early birds' genes will be isolated from the birds that arrive early in the springtime and start nesting before the others arrive, the early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds that arrive early birds' genes will be isolated from the birds' genes will be isolated f
good choices concerning their own health. However, some of the effects of a venom/toxin may be neutralized by immersing the cleaned wound in fresh, hot water. A group of researchers tried such an experiment here on Earth by building a sealed living space called Biosphere II in the desert of Arizona, complete with a rainforest, a miniature ocean,
land for growing food, and livestock to provide eggs and milk. This type of change would take place over many generations. Normally, potatoes produce 20% amylose and 80% amylopectin. • Auxin moves by efflux pump action into the nuclei of cells on the side of the stem opposite the light. Migration is an innate behaviour and is therefore an
expression of genetic information. This pressure helps support the plant vertically. Alleles that interact on both of the X chromosomes of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos then result in relatively high oestrogen and progesterone production, resulting in the prenatal development of female embryos the resulting in the prenatal development of female embryos the resulting in the prenatal development of female embryos the resulting in the prenatal development of female embryos the resulting in the prenatal development of female embryos the resulting in the prenatal development of female embryos the resulting in the prenatal development of female embryos the resulting in the res
Flowering and light Examples Long-day plants Flower when days are shorter Poinsettias, chrysanthemums, and asters Day-neutral plants Flower without regard to day length Roses, dandelions, and
tomatoes Euphorbia pulcherrima, commonly known as poinsettia, requires at least 14 hours of darkness, uninterrupted by light, in order to produce the red-coloured displays they are famous for. Exercises NATURE OF SCIENCE Assessing risks and benefits associated with scientific research: scientists need to evaluate the potential of herbicide
resistance genes escaping into the wild population. NATURE OF SCIENCE You might wonder why desert animals like the kangaroo rat don't solve their water loss problems by producing and excreting uric acid. In addition, they 446 argue that, because we do not see rapid evolution happening today in nature, we can conclude that the process
happens gradually. Such definitions have been phrased carefully so that all the important details are included. All rights reserved. Eating organic material provides newly dividing cells in the giraffe's body with a fresh supply of carbon-based energy-rich molecules with which the cells can carry out work. The phosphorous cycle Spreading fertilizer
This specific area in the left hemisphere is now called Broca's area and was the first area of the brain to be associated with a specific function. As described in the previous section, your metabolism is the sum total of all the enzymes will increase their reaction rate as their reaction rate as their reaction rate as their reaction rate as their reactions.
temperature (and thus molecular motion) increases. As mentioned above, one of the design features of an alveolus is that it is composed of a single layer of cells, to facilitate oxygen and carbon dioxide diffusion. It should be evident from this explanation that facilitated diffusion is very specific depending on the carrier protein. This is a 361 08
Metabolism, cell respiration, and photosynthesis characteristic of all cyclical pathways in metabolism. 15 If a microscopic field of 1000 normal cells in interphase when 1000 cells in interphase when 1000 cells in interphase when 1000 normal cells in interphase when 100
together in all possible combinations creates six genotypes that give rise to the four phenotypes listed earlier: • IAIA or IAi gives type A blood • IBIB or IBi give
even though the air may be very cold, the body of water is relatively stable in temperature. Figure 12.52 This map shows the two different blackcap migration routes. You may remember that is functioning properly, all the glucose that is in
a ventral view (from the front): so the left side of the body is on the right, and the right is on the left. Solution To use this statistical test, it is important to record carefully all the observed results (C) and the expected results (E). • Scroll down and look at all of the organisms that have beta haemoglobin. These organisms make their own food. Show
identity of the specific pathogen has not been determined, just the fact that it is something that is 'not-self' and therefore should be removed. This is because carbon dioxide must enter the mesophyll region of the leaf so that photosynthesis can occur. Application: Insectivorous plants as an adaptation for low nitrogen availability in waterlogged soils
The structure of the chloroplast allows the light-independent reactions to proceed efficiently. • Orientation of pairs of homologous chromosomes prior to separation is random. cortex An adult rye plant was found to have a root system with 14 million branches totalling 630 kilometres (380 miles) in length. All the bonds mentioned
above are involved when this structure is present Fibrous and globular proteins Fibrous proteins are composed of many polypeptide chains in a long, narrow shape. The consequence of changing one base could mean that a different amino acid is placed in the growing polypeptide chain. They are membrane-bound and have many possible functions.
Iboga is a root bark that is chewed by the Bwiti people of West Central Africa during rituals. The bottom right cell of the table is what we want: it shows the sum of the last row's values and this is the 2 value we are interested in. 

Application: Use of dialysis tubing to model absorption of digested food in the intestine. Many animals prevent
polyspermy by reversing an electrical (ion) charge upon first fertilization. The rate of movement of the animal depends on the intensity of the stimulus, not its direction. Earth's surface has an average temperature of about 14°C; fluctuations only very rarely go lower than +50°C (in Antarctica) or higher than +50°C (in North Africa). This structure
means that membranes have two distinct areas when it comes to polarity and water solubility. It receives a flood of messages from the senses, and responds by controlling balance, muscle coordination, and most voluntary movement. The molarities to be used are 0.0 M, 0.2 M, 0.4 M, 0.6 M, 0.8 M, and 1.0 M. The Bohr shift Haemoglobin's affinity for
oxygen is reduced in an environment where carbon dioxide partial pressure is high. Sequencing DNA In order to find out which gene does what, a list must be made showing the order of all the nucleotides in the DNA 121 03 Genetics code. For most people, the glucose levels in blood are lowest in the morning and highest soon after a meal. When
someone first arrives at a high altitude, physical activity can lead to almost immediate fatigue. Listening to high-frequency sound for too long can damage the hair cells in the cochlea, and cochlear hair cells do not grow back.
also increased, and thus 'adult-onset diabetes' is now an inappropriate name. B II and III only. If you do a comprehensive search in the published literature of organisms that have already been identified and do not find a name for the organisms, it is possible that you have discovered a new species. Joining the initiation complex are proteins called
initiation factors that require energy from guanosine triphosphate (GTP) for attachment. Moving on to the exceptions to the current cell theory, these include: • the multinucleated cells of striated muscle cells, fungal hyphae, and several types of giant algae • very large cells with continuous cytoplasm that are not compartmentalized into separate
smaller cells • viruses • the problem of explaining the 'first' cells without spontaneous generation. It is through these steps that populations evolve. The generations are named according to the reproductive cells they produce. From studies using aphid stylets, it is obvious that phloem sieve tubes are hollow, allowing phloem sap to move within the
plant. Adaption and survival Evolution is not just based on chance. GM plants have been given new genes so that new proteins are made. 2 Obtain 20 ml of the yeast culture from your teacher in another 100-ml beaker. Most bacteria and yeast are either photoheterotrophs or chemoheterotrophs. It may be used to produce simple sugars such as
glucose, disaccharides such as sucrose, or polysaccharides such as cellulose or starch. The author, Michael Foster, derived the word from the Greek words 'syn' and 'haptein', which mean together and clasp, respectively. This means that steroids easily pass through cell membranes because both steroids and phospholipid molecules are relatively non
polar. In Figure 2.35, notice that one strand is replicating in the same direction as helicase is moving and the other strand is replicating in the opposite direction. Figure 8.19 NATURE OF SCIENCE Developments in scientific research follow improvements in apparatus: sources of 14 C and autoradiography enabled Calvin to elucidate the pathways of
carbon fixation. There is a limit to this, however, because enzymes have a maximum rate at which they can work. The information from the visual cortex and vice versa. The hovering bees fly higher than the patrolling bees, or fly around the trees. Predict what the percentage of
first day of menstruation is designated as the first day of the menstrual cycle simply because this is an event that can be easily discerned (see Figure 6.28). Cohesion and adhesion to the inside of the wascular tubes, which are partially
composed of cellulose. This will bring about gene expression. Summarize the function of each. What are the roles of Ca2+, tropomyosin and ATP in contraction? Trying to breed a 'superior race' where everyone has the same characteristics is contraction? Trying to breed a 'superior race' where everyone has the same characteristics is contraction? Trying to breed a 'superior race' where everyone has the same characteristics is contraction? Trying to breed a 'superior race' where everyone has the same characteristics is contracted by the contraction?
at the beginning of this route is the aorta. GM soybeans growing in a field. Thus cardiac muscle is very oxygen-demanding. The degree of freedom is determined by taking the number of classes into which is therefore one of the
deadliest animals on Earth. Indicate an example of a locus. The word neurogenesis comes from 'neuro' meaning beginning follicle cells (from inner ring of Graffian follicle) zona pellucida haploid nucleus with spindle formation for second meiotic division numerous cortical granules cytoplasm containing yolk, and all
organelles typical of body cells (e.g. mitochondria, ribosomes) plasma membrane 484 Comparing and contrasting spermatogenesis and oogenesis and oogenesis and oogenesis and contrasting spermatogenesis and oogenesis and oogenesi
Spermatogenesis Oogenesis Mitosis replaces germinal cells daily Mitosis replaces germinal cells only early in a female's development Some cell growth occurs before meiosis I begins A great deal of cell growth occurs before meiosis I begins A great deal of cell growth occurs before meiosis I begins The two divisions of meiosis result in one ovur
and three possible polar bodies Spermatids must remain in seminiferous tubules until differentiation of the occurs partly in the ovary and continues after ovulation The resulting gamete is extremely small with very little cytoplasm and limited organelles The resulting gamete is extremely small with very little cytoplasm and limited organelles The resulting gamete is extremely small with very little cytoplasm and limited organelles The resulting gamete is extremely small with very little cytoplasm and limited organelles The resulting gamete is extremely small with very little cytoplasm and limited organelles The resulting gamete is extremely small with very little cytoplasm and limited organelles The resulting gamete is extremely small with very little cytoplasm and limited organelles The resulting gamete is extremely small with very little cytoplasm and limited organelles.
large with a great deal of cytoplasm, nutrients, and numerous organelles Millions of spermatozoa produced every day throughout life (starting at puberty) Ovulation of one of a total of thousands of oocytes occurs with each menstrual cycle, then stops at menopause Fertilization in animals can be external or internal If a female animal lays eggs to
allow the male of the species to fertilize the eggs outside the female's body, the fertilization is said to be external. It responds by making penicillin to defend itself against other organisms that all have their DNA contained in a nucleus
Proteins of various types are embedded in the fluid matrix of the phospholipid bilayer. At the centre is the nucleus, containing a single nucleolus. Have you ever had a story in your family that was told time and time again for years, and then one day you found out that the event in question never actually happened? 

Metabolic pathways can be
controlled by end-product inhibition. The heart valves serve to prevent a backflow of blood. Even a change in a single amino acid in the overall sequence of a polypeptide can have drastic effects on its function. Individual cardiac muscle cells grown in a Petri dish contract in an independent rhythm. As you learned earlier, the walls of the ventricles are
much thicker muscle than the walls of the atria. Look at Figure 12.30 The courtship behaviour of the three-spined stickleback. Bryophyte spores are transported by rainwater and ground humidity, which is one of the reasons why they
are found most abundantly in damp habitats such as a forest floor. As most microorganisms cannot live in high salt concentrations, bioremediation of the by-products of benzene can only be accomplished by a salt-tolerant species (a halophile, meaning salt-loving). 4 List four reasons why pathway engineering of bacteria and yeast has been very
successful. The heights for nine of the plants are shown below in cm. 1 6 Pseudomonas also cleans up mercury pollution Mercury from substances such as discarded paint and fluorescent bulbs pollutes our environment. This anticodon is unique to each type of tRNA. If an organism has feathers, is it automatically a bird? Discuss this idea: what kinds
of arguments support it and what arguments refute it? metaphase chromosome Figure 1.29 An anaphase chromosome is a single molecule of DNA and has a centromere. There is a correlation between smoking and the incidence of cancer. The seed is the means by which an embryo can be dispersed to distant locations. The agricultural
techniques he developed were used to feed the Soviet population and the Red Army. 492 Practice questions 1 Explain the role of antibody production with regard to vaccinations. 5 Place the other Petri dish in complete darkness. Brightly florescent quantum dots (QDs) are becoming important tools for tracking molecules in living systems. It is a very
sensitive test. damaged blood vessel prothrombin chemicals released Figure 6.11 Flowchart of the blood-clotting sequence. This mechanism is one-way and fundamental to all forms of life. The databases are modern cyber-safe museums or reference collections, where knowledge is carefully classified and saved. Omega end 18 15 12 9 1 COOH Alpha-
linolenic acid (omega-3) 12 18 Omega end 9 1 COOH Linoleic acid (omega-6) Cholesterol is a lipid substance needed in the body for a variety of reasons. 3 weeks 7 weeks 6 months 8 months newborn From the study of neurogenesis in Section A.1, you should now be familiar with the neural tube and how it is
formed. Thus antibiotics are chemicals with the ability to damage or kill prokaryotic cells, but not damage eukaryotic cells or their metabolism; because a virus has no metabolism of its own, antibiotics are not prescribed for any disease of viral origin. QD drug delivery Using the QD tracking strategy, researchers have a better understanding of how
nanoparticles could deliver drugs specifically to tumours. This can be done without interfering with the normal bacterial growth and reproduction. Some amino acids are relatively polar and some are non-polar. For example, you often hear that our internal body temperature is 37°C (98.6°F). Helper T cells turn the immune response from non-specific
(not-self) to antigen-specific, because the identity of the antigen has now been determined. These numbers are always placed in this way for both ribose and deoxyribose. The timing of the menstrual cycle, including capillary beds) at this point in time
The rate of mitotic division will increase with subsequent divisions. Notice how the genotype IAIB clearly shows co-dominance. Let's examine the pressure and volume changes that occur on the left side of the heart. • Sensory hairs of the cochlea detect sounds of specific wavelengths. In the upper half of the graph, haemoglobin is already bound to
some oxygen and has increased its affinity for oxygen (because of the protein shape change), and the graph is very steep in that area until nearly all of the haemoglobin is saturated. Some proteins with a quaternary level structure include prosthetic or non-polypeptide groups. Few people fully realize how dependent the biosphere is on energy from
the Sun for food production. Consequences associated with being overweight The perception of being underweight, normal, or overweight is highly biased by cultural and personal feelings about body shapes and expectations. !2 !3 double bond Curved polyunsaturated unsaturated fatty acids cis omega! 6 monounsaturated Figure 2.18 Summary of
fatty Straight/Straighter saturated omega!3 animal fats trans partially hydrogenated acid types. Blood type system in humans has four possible phenotypes: A, B, AB and O. The 3 end of tRNA is free and has the base sequence CCA. Non-photosynthetic and non-chemosynthetic organisms are referred
to as heterotrophs. Sequencing then begins. light form dark form In places near industrial centres, the carbonaria moths accounted for 95-100% of all the peppered moths observed. Sequence alignment software allows comparisons of sequences from different organisms. Lactic acid fermentation allows glycolysis to continue with a small gain of
ATP in addition to the ATP that is generated through the aerobic pathway. This has been shown consistently in many independent studies. The herbivorous fish were parrotfish and surgeonfish. Osteomalacia is also the result of a deficiency in vitamin D or calcium. • Slow-acting NTs can regulate the efficiency of neurotransmitter release from the
presynaptic neurone (the sender). 557 12 The term 'endorphin' means the morphine within. Skill: Interpretation of electron micrographs to identify organelles and deduce the function of specialized cells. If the plasmid has been transferred, then the agrobacter will grow in the presence of the antibiotic. The newly released antibodies circulate in the
bloodstream and eventually find their antigen match (e.g. the proteins of the virus capsid). The loss of reproductive ability is often paired with increased specialization to carry out a certain function. 312 urinary bladder seminal vesicle erectile tissue of penis prostate gland Figure 6.24 Male reproductive system (plus bladder). NATURE OF SCIENCE
Plant exudate is any fluid that moves out of the normal transport system of plants. 47 01 Cells Exercises 23 A chemical called colchicine disrupts the formation of microtubules. The nitrogenous bases can be one of the purines (adenine and guanine), or one of the pyrimidines (thymine and cytosine). Typically a single muscle does not completely
'disappear' when it is being used as a source of energy: the muscle just gets thinner and is therefore far less useful. They work in concert with the plant roots, which also absorb nitrogen and phosphates. The population that originated from the south (Georgia) grew the most robustly. 2 ATP 2 ADP P P fructose-1, 6-bisphosphate 2 The less stable 6-
carbon phosphorylated fructose is split into two 3-carbon sugars called glyceraldehyde-3-phosphate (G3P). This makes four haploid cells. Therefore steroids have the chemical and solubility properties of a lipid. Louis Pasteur Theory of knowledge Doctor, which drug treatment is best for me? It is this universal aspect of the code that allows the
exchange of genes from one species to another with the use of genetic engineering. Test the solution for the presence of glucose after each 1-minute time period until the test is positive for glucose. Why do these areas create this colour? Either one of these two may be used as an antidote for ethylene glycol or methanol poisoning. The difference is
that, unlike fossil fuels, the carbon dioxide from biofuels was removed from the atmosphere by plants just a few months or years before the biofuel was used. This includes production of a hormone called secretin that enters the blood and results in lowered gastric pit activity. An alternative to using glucose test strips is to use Benedict's reagent,
following standard protocols. In this case, 4.4 is repeated three times, and no other value is repeated, so the measure of the spread of data. Having extra sets of chromosomes has the consequence of making errors in replication more common. This condensation is accomplished via a process called supercoiling
This feature is called aestivation, and botanists look for whether the flower petals overlap with each other or whether they are arranged in a spiral or not. The combination of several receptors is registered by the brain as a certain smell. After several hours the bats return to their roost, feed their young, and interact with nest mates. When combined,
molecules of calcium carbonate (CaCO3) are formed. Some eggs were collected from parent birds who had been in the matrix of the mitochondrion and is referred to as a cycle because it begins and ends with the same
                                                                                                                       . Yet to get into our bloodstream, molecules must pass through the cell membranes of our intestines and then through the cell membrane of a capillary vessel. The design presented in the book is one of the easiest to set up and get measurements with. A single
ring nitrogenous base always pairs with a double-ring nitrogenous base. This diagram is like a time-lapse photograph of the ovarian events during a single menstrual cycle, as not all of these stages would be occurring at the same time. (2) (Total 6 marks) 7 (a) Label the diagram of the human eye shown below. Plastids are a group of closely related
organelles that occur in photosynthetic eukaryotic cells. If any one of the three major coronary arteries, or one or more of their branches, is somehow blocked, some portion of the heart muscle is likely to be deprived of its oxygen supply. State the possible genotypes of the girls and boys. For example, some people cannot smell digested asparagus but
others can. A variety of nuclei (blue) can be seen. The rate of ventilation is controlled by the respiratory control centre in the medulla oblongata. C The same species but of a different genus. Plant tissues and meristems Most plants have three basic types of tissues: dermal tissue, which is an outer covering that protects against physical agents
and pathogenic organisms, prevents water loss, and may have specialized structures for various purposes • ground tissue, which consists mostly of thin-walled cells that function in storage, photosynthesis, support, and secretion • vascular tissue, made up of xylem and phloem that carry out long-distance conduction of water, minerals, and nutrients
within the plant, and provide support. 5 family B 2 6 3 7 8 4 9 10 12 Key males with PKU carrier unaffected females with PKU carrier unaff
are always the same concerning shared derived characteristics and parsimony. The termination phase completes the process of translation. If blood attempts to flow backwards in any vein, the passive flap valves use the force of the blood hitting the valve to close down and prevent blood from flowing in that direction. Active transport is used to load
organic compounds into phloem sieve tubes at the source. However, in transcription, helicase is not involved. 3 Using an appropriately sized graduated cylinder approximately one-half filled with water, determine the volume of each core using fluid displacement. • Cooperative aggregates of microorganisms can form biofilms. CACCAGTAACCC. This is a compound of the cooperative aggregates of microorganisms can form biofilms.
karyogram was prepared using false colour imagery. The cell maintains these conditions by pumping potassium ions into the cell and pumping sodium ions out of it. Exercises 5 Explain when a seed would be a sink and when it would be a sink and pumping sodium ions out of it.
release of histamine molecules causing allergy symptoms, you can better appreciate why allergy sufferers often take antihistamines to alleviate symptoms. The expansion of the human brain has come from the growth of the cerebral cortex. Be very cautious with sharp instruments. • Gene therapy • Vaccine tests • Experimentation on human
volunteers, notably prisoners • Research involving human embryos. He describes his idea by imagining an injured patient as a car with all the parts (muscle, bone, etc.) present but the engine turned off. 65 02 Molecular biology An artist's drawing of a cell membrane with proteins. These include birds, water, and animals other than insects.
Applications and skills: Application and there is a high probability that any deviation from the expected values can be
attributed to chance'. In the nucleus of cells are two types of molecules that are particularly important for the process of DNA replication, which are nucleotides that are not yet bonded and are found
floating freely in the nucleoplasm, some contain adenine, some thymine, some cytosine, and some guanine. 553 12 Option A: Neurobiology and behaviour acetylcholine. These animals only need to produce a small number of ova because the reproductive success for these animals is quite high. The filtrate that enters a collecting duct can be thought of
as urine, but urine in a dilute form. You have just learned that 'not-self' proteins trigger an immune response. However, there is an inevitable fluctuation around this exact temperature, depending on what a person has been doing, for example exercising or being out in very cold weather. These are the molecules from which all living things are
composed, thus the element carbon can be considered to be the keystone element for life on Earth. Each bipolar neurone synapses with a ganglion cell. • Scientific theories undergo modifications over time. a Now you can fill in the empty squares with a ganglion cell. • Scientific theories undergo modifications over time.
who are obese are known to have a greater level of leptin circulating in their bloodstream. These include: • copying DNA in a laboratory - the polymerase chain reaction (PCR) • using DNA to reveal its owner's identity - DNA profiling • mapping DNA to reveal its owner's identit
cutting and pasting genes to make new organisms - gene transfer • cloning cells and animals. The gene of interest is also in the middle. If a family member cannot donate a kidney, the patient will go on a waiting list for a kidney from a deceased donor.
Figure 12.8 The split-brain experiment with a spoon. Transcription activators cause looping of DNA, which results in a shorter distance between the activator and the promoter region of the gene. During his rehabilitation, his good arm and hand are immobilized by the physical therapist, so that he can't use them. ADP myosin actin 4 Myosin binds to
ATP and this allows detachment of the myosin heads from the actin attachment sites. To understand the greenhouse effect, you need to know how a greenhouse works. (Total 9 marks) 4 Explain why antibiotics are effective against bacteria but not viruses. Quorum sensing is an emergent property. This was not the case in the bar chart that we looked
at in Figure 6. Palaeontologists have been collecting and classifying fossils in an organized fashion for almost two centuries. Low-voltage electricity can be applied for several minutes. For example, if a tenth plant was added to the sample and it was the tallest at 9.7 cm, then the two values in the centre would be 6.2 and 7.3. The mean of those two is
6.75, so the median would be 6.75 cm. 10 Are living cell present with the open tubes of phloem? CHALLENGE YOURSELF Review the example above. Auxins and phototropism Tropisms are generally defined as growth or movement to directional external stimuli. One of the most striking examples of this is the five-fingered limb found in animals as
 diverse as humans, whales, and bats. Notice the iron atom at the centre of the molecule. Adding to the appeal is the low cost of mice and their ability to multiply quickly. He wanted to find out whether he would get all tall plants, some tall and some short, or all short. In the first reaction, the phosphates from the ATPs are added to glucose to form
fructose-1,6-biphosphate, a process called phosphorylation. Plants are able to detect the presence of light, its direction, wavelength, and even intensity. Explain why. It is more difficult for a female to hunt and patrol if the cubs are at different ages and some are too young to be left alone. This is only possible if there is more than one form of the allele.
Case study 3 Spirit/soul In 1907, Dr Duncan MacDougall conducted experiments to determine whether or not people lost mass after death. low blood glucose level Blood glucose level Blood glucose level Blood glucose level rises; less glucagon is released. When graphs of their effects are produced, certain characteristics can be seen. Does a reductionist's view of science negate the concept
of emergent properties? Learning can be explained as a change in performance that is stored in the nervous system as memory. • Examples of sedatives are benzodiazepines, alcohol, or tetrahydrocannabinol (THC). As you can see, this process uses cAMP, which is a second messenger. The anatomy and physiology of the human body is so complex
that researchers will be investigating it for many decades to come. The gametophyte generation produces the plant gametes by mitosis, whereas the sporophyte generation produces spores by meiosis. Urea, as a component of urine, can be stored temporarily in the urinary bladder. During this phase the cell's DNA is in the form of chromatin. 136
Random orientation Figure 3.17 shows that, during metaphase I, the homologous pairs of chromosomes line up along the centre of the cell. Graticules must be calibrated. Monosaccharides can be classified according to how many carbon atoms they contain.
was a physicist: you probably identified the bias he had from his quote! 767 What is knowledge? Skill: Setting up sealed mesocosms to try to establish sustainability. Increased carbon dioxide concentrations in the air lead to increased dissolved carbon dioxide in the oceans, which lowers the pH of seawater. When abiotic measurements are taken of
an environment, they can include temperature, pH, light levels, and the relative humidity of the air. The process of associating food with the lever may take a long time, but eventually the animal learns to manipulate its environment. They provide the base sequences essential to produce proteins at the cell ribosomes. The forests were drier than usual
that year. Directional selection Before After 443 10 Genetics and evolution CHALLENGE YOURSELF A blackcap 5 Determine whether each of these examples is of directional, stabilizing, or disruptive selection. The result was large-scale international cooperation.
aggregates of microorganisms. Its early stage of life, referred to as its juvenile stage, characteristically involves movement and it derives its nutrition by ingesting nutrients from its surroundings. Lysosomes are sacs bounded by a single membrane that contain as many as 40 different enzymes. Exocytosis is essentially the reverse of endocytosis, so the
fluidity of the plasma membrane and the hydrophobic and hydrop
legal quardians. Rheotaxis is a response to water current. The two sides of the ladder are made up of the phosphate and deoxyribose sugars. When a fluid environment such as cytoplasm, blood plasma, etc., is flooded with either H+ ions (an acid) or -OH ions (a base), the extra charges can prevent normal hydrogen bonding. The gene, as well as the
name, comes from a soil bacterium, Bacillus thuringiensis, which has the ability to produce a protein that is fatal to the larvae of certain crop-eating pests. high blood glucose level Stimulus: blood glucose level rising after eating carbohydrate-rich foods. Do you have to have a hypothesis, controlled variables, a laboratory? Now, scientists are working
on deciphering which sequences represent genes and which genes do what. Releasing raw sewage into water systems was common until, in the 1850s, it was shown that cholera was transmitted by water contaminated with faeces. This pump represents a form of chemiosmosis, as talked about in respiration and photosynthesis (Chapter 8). One G is on
the maternal homologue, and the other G is on the paternal homologue. As the virus is scratched on to the leaves of the tobacco plant, the plant becomes infected with the gene-carrying virus. All IB drawings involving nucleotides should use these symbols. Absorption of light is the first step in the process of photosynthesis. The buildup of this material
begins early in life and typically takes many, many years to become a serious problem. The gene that determines this is on chromosome 16 and has two alleles: the G variant codes for wet cerumen, the A variant codes for wet cerumen, the A variant codes for wet cerumen. Below is a drawing of a prokaryotic cell. • Albunea groeningi Boyko, 2002. Or if one population of mammals is still
hibernating or has not returned from a migration when another population of the same species is ready to mate, this would also be a temporal barrier between the two gene pools. Movement of the substance occurs from an area of higher concentration, As RNA polymerase moves along the strand of DNA acting as the
template, RNA nucleotides float into place by complementary base pairing. Currently the particular stem cells being used for this treatment in humans are human embryonic stem cells. The investigation must also limit the time and the resources available. 20 What are the three major parts of all nucleotides? This results in a definite three-dimensional
conformation. • The microphone in the external processor picks up the sound signal. (Total 3 marks) (3 What is the mechanism of natural selection? • Cuts in the external processor picks up the sound signal. (Total 3 marks) (3 What is the mechanism of natural selection? • Cuts in the external processor picks up the sound signal.
doctors from taking action immediately and stopping the use of X-rays on pregnant women in the 1950s? The dates and locations of the 19th-22nd congresses are: • 2004 Beijing, China (XXI) • 2016 Japan (XXII). anaphase I Metaphase I 1 2 The homologous chromosomes line up across the cell's
equator by random orientation. Karl Popper Popper 1992a Case study 5 Choosing a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether to have a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether to have a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether to have a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether to have a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether to have a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether to have a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether to have a boy or a girl A clinic claims that it has developed a new technique for filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filtering sperm cells in such a way that future parents can choose whether the filte
Comparison of the number of genes in humans and other species Scientific name Virus (bacteriophage) phiX174 * Bacterium Escherichia coli (type K-12) Nematode (roundworm) Caenorhabditis elegans Human Homo sapiens Asian rice Oryza sativa Baker's yeast Saccharomyces cerevisiae Mouse-ear cress Number of bases Number of genes 5 400 11 4
639 000 4 377 100 292 000 20 000 3 000 000 000 000 21 000 430 000 000 000 up to 56 000 12 495 000 5 770 Arabidopsis thaliana 135 000 000 25 000 Fruit fly Drosophila melanogaster 122 654 000 27 407 Japanese canopy plant Paris japonica** 150 000 000 Unknown *First genome ever sequenced (in 1977). The increase in fluid between the two
follicle cell layers creates a bulge on the surface of the ovary and eventually leads to ovulation. The higher order functions performed by the cerebral cortex are shown in Table 12.5. Table 12.5. Functional areas of the cerebral cortex are shown in Table 12.5. Table 12
Coordinates movement Primary motor cortex Plans and executes movements Primary somatosensory cortex Processes information Visual association area Processes visual information Visual cortex Recognizes visual stimuli
Wernicke's area Understands written and spoken language Auditory association area Processes auditory information Auditory cortex, Broca's area, and nucleus accumbens Figure 12.17 Nucleus accumbens is associated with the rewards
circuit in the brain. There are published studies of how pain is perceived, and how endorphins act as painkillers. Two organisms can be used to demonstrate the functions of life: Paramecium and Chlorella.) When something is considered to be statistically significant, it means that there is a strong probability that it is not caused by chance alone. CO2
! H2O carbonic anhydrase HCO3" H2CO3 H! The hydrogen carbonate ions formed from this reaction exit the cytoplasm of the erythrocyte membrane. 15th-century illustration of common bloodletting sites. In most cases the use of microscopes 7 01 Cells with a high magnification and resolution
are needed to observe cells and especially their subunits. The result is stomatal closure. D.3 The chemical composition of the blood is regulated by the liver. Speciation due to divergence of isolated populations can be gradual. Human reproduction Despite all of the cultural 'trappings' that societies incorporate into the process of human
reproduction, it is basically a male gamete (sperm) fertilizing a female gamete (sperm) female gamete (s
Construct a diagram of the carbon cycle. Peter L. Exercises To find out more about bioinformatics, go to the hotlinks site, search for the title or ISBN, and click on Chapter 13: Section B.5. 13 Compare and contrast BLASTn and BLASTn and BLASTn and BLASTn and BLASTn and BLASTn and Click on Chapter 13: Section B.5. 13 Compare and contrast BLASTn and Click on Chapter 13: Section B.5. 13 Compare and contrast BLASTn and BLASTn an
incorporate carbon dioxide during the night. B Nutrients are lost from the ecosystem when organisms die. Notice that the carbons of the pentose are numbered. If you have ever made a fire on a beach or at a campsite, you know that organisms die. Notice that the carbons of the pentose are numbered. If you have ever made a fire on a beach or at a campsite, you know that organisms die.
2 3 Replication begins at the origin, which appears as a bubble because of the separation of the two strands. Who has the right to have access to the information gained from such tests? Homologies of the forelimb in six vertebrates 1 2 human 2 4 bird
(chicken) 5 1 (a) Look at Figure 5.3 and complete Table 5.1. Table 5.1 Characteristic Bat Number of digits (fingers) 2 43 3 Type of locomotion that the limb is best adapted for (b) There are two animals in Table 5.1 that have reduced their number of digits over the course of evolution. To calibrate a graticule, a plastic millimetre ruler or a graduated
slide can be used. Figure 1.11 Compare the drawing of a chloroplast with this TEM of a chloroplast. However, in a living system, diffusion often involves a membrane. 

Guidance 

Names of the tRNA binding sites are expected, as well as their roles. Anaesthetics can achieve this is by altering the ion channel. MDMA is structurally related to
amphetamine. Failure to ingest enough vitamin C over an extended period of time results in a serious deficiency disease known as scurvy. As you can see from the jacricular to the general. Results measuring the luminescence of the quantum rods showed that only target
cells took up the rods, and only target cells accumulated the rods. Two to four trees are needed to produce enough drug to treat one patient. She leaves the nest and the male enters. Organelles are noncellular structures that carry out specific functions (a bit like organs in multicellular organisms); different types of cell often have different organelles.
302 Many neurones of an organism with an advanced nervous system have axons with a myelin sheath; they are said to be myelinated. • Codons of three bases on mRNA correspond to one amino acid in a polypeptide. When we go up in an airplane, for example, the cabin needs to be pressurized so that we can keep breathing, and so that we do not
freeze to death 10 000 m above the ground. The darker the colour, the more cDNA has attached to a probe. Certain combinations of base pairs coding for similar proteins can be found in diverse organisms. You should also count the number of each type of atom and check that against the known formula of C6H12O6. These new groupings involve
analysis of DNA. If you fast, your level of leptin significantly decreases. There are more people with lactose intolerance than there are people who do not have the condition. In theory, yes, but it would not be likely. In this system, the concept of common descent is crucial to deciding into which groups to classify organisms. The bee stings its victim
with its barbed stinger, then flies away, leaving the stinger in the victim. This sequence carries the genetic code that is essential for the life of the organism. This equation is useful for determining how fast a population is changing, or predicting the outcomes of matings or crosses. Blood clotting minimizes the chances of infection and blood loss When
small blood vessels like capillaries, arterioles, and venules are broken, blood escapes from the closed circulatory system. You should. Also, in a real experiment, it is unlikely that exactly 25% of the offspring would be short plants. The risk is that they will drive the ecologically conscious companies out of business because they do not use any of their
capital on ecological measures. Knockout technology can help determine gene function We have seen that gene function a model organism. Where do autotrophs get their nutrients? (Total 1 mark) 3 The seguence of nucleotides in a section of RNA is: GCCAUACGAUCG What is the base seguence of the DNA sense strand? In this
case, the single recessive allele in males determines the phenotype. • GenBank checks the sequence of the gene against other sequences to see if there is a match. Be sure to do some research to find a plant species that forms roots easily in either water or a solid medium. • To learn more about enzymes, go to the hotlinks site, search for the title or
ISBN, and click on Chapter 2.5 NATURE OF SCIENCE Using models as representations of the real world: Crick and Watson used model making to discover the structure of DNA. The human body is composed of cells organized into organs, and organs organized into organs, and organs organized into organs organized into organs.
these people. • Application: Ethics of the therapeutic use of stem cells from specially created embryos, from the umbilical cord blood of a newborn baby and from an adult's own tissues. height Polygenic characteristics Returning to the idea of a questionnaire about phenotypes, when there are many intermediate possibilities, then the trait shows
continuous variation. If this is done on a massive scale, companies would provide eco-friendly products and services to attract customers, and those companies by consumers and be driven out of business. Some of the cloned antibody-producing plasma cells remain in the bloodstream and provide
immunity against a second infection by the same pathogen. It plays a critical role in the way the brain controls movement, memory, and decision making. DNA polymerase I also participates in the process. The anterior end of the neural tube (forebrain) expands dramatically into the cerebral hemispheres. The transcription process The process of
transcription begins when an area of DNA of one gene becomes unzipped (see Figure 2.40). Identifying a blood vessel as being an artery or a vein has nothing to do with whether the blood is oxygenated. Many of the carbon atoms found in the food that you eat (such as carbohydrates) will be eliminated from your body in the
molecules of carbon dioxide that you breathe out. 132 If a trait or gene is described as autosomes, not on the sex chromosomes. Recent increases in atmospheric carbon dioxide are largely due to increases in the combustion of fossilized organic matter. The gases produced by human activity that retain
the most heat are among the ones we have already identified as greenhouse gases: carbon dioxide, methane, and oxides of nitrogen. In cells, condensation reactions occur to re-form the larger, biochemically important, molecules. Cells 1.2 The ultrastructure of cells Understandings: Prokaryotes have a simple cell structure without
compartmentalization. The numerous 'worm-like' tubes are Malpighian tubules, and the larger central area is the part of the intestine that the tubules empty nitrogenous wastes and excess water into. The light-independent reaction occurs within the stroma or cytosol-like region of the chloroplast. Figure 12.23
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Structure of the to optic nerve retina. The structure of individual R-groups does not need to be memorized. A Glycerate 3-phosphate is carboxylated using carbon dioxide. • Facilitated diffusion: movement through a cell membrane following a concentration gradient, but the molecule must travel through a protein channel because of its size and
polarity. Also, in order for these to be evidence of causality, there must be a mechanism to explain why one phenomenon might cause the other. Option B: Biotechnology and bioinformatics Understandings: Databases allow scientists easy access to information. haem group Hepatocytes produce and secrete bile and plasma proteins
One of the better-known functions of the liver is the production of bile. Thus, some learning takes place. • Applications and skills: Applications and skills: Application of the target cell. With genetic engineering we
have accomplished mass production of penicillin, a key antibiotic; mass production of citric acid, one of the most widely used food-flavouring agents; and the production of biogas, which could be a main energy source of the future. (See Nature of Science box on the next page for more about proxies.) Proxy data show that, in the northern hemisphere
15 000 years ago, it was very cold, and Earth was undergoing a glaciation, or ice age. Benzodiazepine increases the binding of GABA to the receptor and causes the postsynaptic neurone to become even more hyperpolarized (Figure 12.44). This is because of the larger concentration of substrate out-competing the inhibitor for the active site of the
enzyme. Cardiac muscle spontaneously contracts and relaxes without any control by the nervous system. liver stomach gall bladder pancreas small intestine showing the relative locations of the circular and longitudinal muscles. Use a timer
and count the number of breaths for a 20-second time period for each test subject. This phase involves tRNAs bringing amino acids to the mRNA-ribosomal complex in the order specified by the codons of the mRNA. The time period during which an area of a neurone is ready to send an action potential, but is not actually sending one, is called the
resting potential, and this area of the neurone is said to be polarized. Campers and hikers can use a dichotomous key in a field guide to be sure that any mushrooms or plants they find are edible and not poisonous. The next time you encounter either of these two terms, you are more likely to understand their context. 468 Fish use ammonia as their
primary nitrogenous waste. 237 05 Evolution and biodiversity NATURE OF SCIENCE A Staphylococcus bacterium discovered in a hospital is suspected of being resistant to a certain number of antibiotics. These tubes are surrounded with a solution that is referred to as the dialysate. A field of wild flowers in Texas, USA. Why would helping a fellow
individual survive be beneficial to your own survival? This pressure difference keeps the left semilunar valve closed and prevents backflow into the ventricle. Most of the world's farms do not have enough phosphate. Biosphere = where all living things are found. As a result, parents send out dozens, hundreds or thousands of potential offspring into
the world. With this treatment, the nutrients in the milk are not affected but the disaccharide lactose has been pre-digested, so a lactose-intolerant person is able to absorb the monosaccharide sugars. Look at Figure 40 15.25. (4) The receptor- hormone complex binds to a specific gene of DNA and, in this example, promotes transcription for this
gene. • The final radioactive products were identified using autoradiography. The carboxyl group gives the fatty acid slight polarity at that end, but the majority of the molecule is non-polar and thus hydrophobic. Undamaged and large males are much more likely to mate with available females than others.
Autosomes and sex chromosomes As you saw in Section 3.2, in humans the sex chromosomes, and they are the ones that determine whether a person is male or female. • Viral disease: 20 plant species are resistant to 30 viral diseases, preventing huge crop losses; for example, papaya has been given a gene that helps it
resist the ring spot virus. These brain imaging and mapping techniques help clinicians and researchers design better strategies to enhance recovery. The problem we are now facing is that the world bee population seems to be in decline. You might remember that we need one type of cholesterol in our cell membranes to provide flexibility. These
charged ions include calcium (Ca2+), and iron (Fe2+), mentioned above, as well as sodium (Na+), magnesium (Mg2+), and chloride(Cl-). Text Quote on page 773 from Empirical model building and response surfaces, John Wiley & Sons, New York (Box, G. These primary wall areas also include pits or pores that allow water to move laterally. This new
population is reproductively isolated from the original population of mice. An example of a potometer is shown in Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the progress of an air bubble along the pipette is measured at regular intervals Figure 9.7. the pipette is measured at regular intervals Figure 9.7. The
helps to answer the question 'How far do my data stray from the average?' Data distributed on a normal distributed on a normal distributed on a normal distribution (minimal variation). It is becoming routine
for AEDs to be located in many areas where large numbers of people are routinely found, such as shopping centres, sports stadiums, gymnasiums, etc. Some types of bacteria go through binary fission every 20 minutes when conditions are ideal. If they catch a fish that is missing the adipose fin, they place the head in a special box provided by the
MDNR. Table 15.5 will remind you of their functions. In the present case, our calculated value is 0.264, which is less than 3.841, so we can accept the null hypothesis. Many of the minerals required in our diet are known as electrolytes because they are easily dissolved in a fluid medium (e.g. blood, cytoplasm, and intercellular fluid) as charged ions.
An ORF is a length of DNA that has a start code of ATG and does not exhibit any of the stop codes (TAA, TAG, TGA). The following have been reproduced from IB documents and past examination papers: Understandings, Applications, and corresponding mark schemes
provided on the eBook. Can it be modified over time? The cells that are affected by any one hormone are referred to as target cells of that hormone. As you will recall, polypeptides are composed of amino acids covalently bonded together in a specific sequence. They described the effects of light on the movement of canary grass (Phalaris canariensis)
Three enzymes were isolated and taken from the sweet wormwood plant and introduced into a pathway in baker's yeast. To build such a chart, symbols are used to represent people. Early childhood is the best time to learn language skills, when the excess synapses provide the raw material for the language experience to act on. 13 What % of smells
leptin into GenBank. Some of those genes are 74 almost universal, such as the genes that code for proteins involved in common cell functions. • Vaccines contain antigens that trigger immunity but do not cause the disease. Biopharming using plants Will you get your next vaccine from a potato rather than from an injection? • Multicellular organisms
have properties that emerge from the interaction of their cellular components. 405 09 Plant biology, the relationship of structure to function is a universal theme. The hope is that the cement will be thick
enough to stop the radiation from continuing to escape into the environment. Wear eye protection and protect skin and clothing.* For this investigation, first place a drop of acetocarmine stain on an empty microscope slide. (6) (c) Explain the process of transcription leading to the formation of mRNA. 14 Compare top-down and bottom-up limiting
factors that can affect population growth. increasing CO2 concentration (all other variables constant) CHALLENGE YOURSELF 13 Many scientists have been involved in the development of the concept of limiting factors. This film raises questions about how far technology will lead us and whether or not we want to go in that direction. The final
messenger molecule at the end of the cascade of reactions will typically accomplish one of two possible before the peptide hormone began this sequence, or 2 the final messenger molecule activates an enzyme in the cytoplasm, and thus a reaction proceeds that was not possible before the peptide hormone began this sequence, or 2 the final messenger molecule activates an enzyme in the cytoplasm, and thus a reaction proceeds that was not possible before the peptide hormone began this sequence, or 2 the final messenger molecule activates an enzyme in the cytoplasm, and thus a reaction proceeds that was not possible before the peptide hormone began this sequence, or 2 the final messenger molecule activates an enzyme in the cytoplasm.
nucleus and either promotes or inhibits the transcription phase of protein synthesis. The bottom portion of the leaf is composed of the spongy mesophyll. • Quaternary structure may involve the binding of a prosthetic group to form a conjugated protein. How was evidence of causation collected? The clear area at the centre is the lumen where many
nearly completed spermatozoa with flagella are located. To profile polymorphisms, we often look at a group of 13 very specific loci (locations on a chromosome) referred to as short tandem repeats (STRs). Any concentration below or above this normal range creates problems in the body. If mould, (fungal) growth becomes visible, discard the setup
according to your teacher's instructions. Hotlink boxes can be found at the end of each chapter, indicating that there are weblinks available for further study. Plant biology As mentioned in Section 2.9, leaves are the main plant organs involved in photosynthesis. This angiogram shows the network of blood vessels within a kidney. The vessel elements
are attached end to end to form continuous columns, like the tracheids. Determine which domain each of the following organisms belongs to. 

Guidance Carbon dioxide, methane, and water vapour should be included in discussions. If this phenomenon continuous columns, like the tracheids. Determine which domain each of the following organisms belongs to.
a point at which the differences between two separated populations are so great that they no longer belong to the same species. 8 An advanced activity can be carried out. You will need an empty, clean transparent plastic drinks bottle that will hold 2 or 3 litres, mud (nice, slimy, stinky, mud works the best), shredded newspaper, crushed egg shells
and raw egg yolk. Wings used for flying are an example: eagles, mosquitoes, bats, and extinct reptiles such as the pterosaurs all use (or used) wings to fly. Note that RNA polymerase is the enzyme that breaks the hydrogen bonds to produce the two separate strands of DNA. Germination is the development of the seed into a functional plant. 48–56
(Lewis, Kim 2007), Copyright © 2007, reprinted by permission from Macmillan Publishers Ltd.; Figure 13.26 from Potential microbial bioinvasions via ships' ballast water, sediment, and biofilm, Marine Pollution Bulletin, 55, fig. 592 The potato is called the Amflora potato, and it is a breakthrough in production of amylopectin, a type of starch made by
potatoes. Fresh fruit and salads are also good sources of fibre. Energy capture, energy conversion and storage, and carbon fixation using modified and synthetic biological processes, were all addressed. When variation is not continuous, it is referred to as discontinuous variation. However, the E. Figure 13.24 The process of trickle filtering. You do not
have to memorize the pressure numbers given in this example, your focus should be on understanding how the given blood and the opening and closing of the heart valves. Because of this, a theory is an extremely valuable endpoint of science that represents understandings that have developed from
extensive observation, experimentation, and logical inferences. Such an engineered pathway was first achieved at UCLA at the Henry Samueli School of Engineering and Applied Science. Neurones pump sodium and potassium ions across their membranes to generate a resting potential. 1000 kJ m-2 yr-1 of energy is passed on to the herbivores.
Like stems and roots, the leaves have vascular tissue that includes xylem and phloem. Peat is a kind of waterlogged soil found in certain types of wetlands, some eastern European countries, northern Canada, northern China, the Amazon River
basin, Argentina, northern USA (notably Alaska) and parts of Southeast Asia. The atmosphere We live at the bottom of an ocean of air we call the atmosphere. = 0% to 25% = 25% to 75% = 75% to 100% The concentration of chlorophyll gives an indication of the concentration of phytoplankton. Plover chicks are also speckled for camouflage.
microtiter well known antigen attached to well One type of biomarker is a tumour marker. This also means that no DNA molecule is ever completely new. This daunting task has been made easier by computers, but it consists of lining up any overlapping segments until they all match. Search for this title or ISBN 9781447959007. If the plant is to
absorb these minerals, active transport is needed. 436 Exercises 4 Define the term linkage group. (a) Thinking about the structure of a nucleosome, will the DNA that is wrapped around the histones be involved in the transcription process? alpha chain alpha chain beta chain haem group beta chain Some proteins are more than one polypeptide
Frequently, the terms polypeptide and protein are used interchangeably. pylori) for many years (20-30 years, for example) are much more prone to stomach cancer than the general population. This frees the polypeptide, releasing it from the ribosome. 2 Concerning species on Earth, describe two overall trends that can be seen in the fossil record
These plasma proteins determine your blood type. For some diseases, like a cold, we simply wait for the exposure, experience the symptoms, and then develop the immunity. Some ethologists have dismissed psychology as irrelevant because it is based on animal behaviour in an unnatural setting. Once you are familiar with the structure of a
chromosome, you can understand the four phases of mitosis. With tolerance, exposure to the drug causes less response than it previously caused. Try out your data analysis skills and yours TOK critical thinking skills on this graph. BASF Plant Science has developed a genetically modified potato, Solanum tuberosum, plant that is not to be consumed as
a food product but to be used by industry. Graphs are instrumental in analysing data, and if you know how to make accurate and appropriate graphs your conclusion and evaluation will be greatly enhanced. In long-day plants the remaining Pfr at the end of a short night stimulates the plant to flower. • Receptors are overexpressed (for some reason
the cells are making lots of receptors) on cancer cells. A protein's function is directly dependent on its shape; in most instances, as long as the covalent bonds (like peptide bonds) remain intact, the protein will return to its normal shape and function if it is returned to its normal temperature. This is especially true for organisms that reproduce by
sexual reproduction. Vessel element Tip of tracheid secondary walls are lignified to add strength end walls have pores to allow rapid water transport pits and modified pits allow water to move between cells hollow cell with no cytoplasm or nucleus Ancient flowering plants only have vessel
elements. This accounts for all six of the carbon atoms that were present in the initial glucose molecule. The left visual field is giving information to the right side of the primary visual cortex (note the blue lines). Inbreeding is the practice of having closely related organisms mate with each other. Innate behaviour is encoded in DNA and can only be
changed by genetic change. Important advances in genetic technology have given us the tools to knock out mice genes, which means replacing normal genes with alternative versions. Food chains By feeding on producers, consumers can utilize the chemical energy to grow and stay healthy. Any plants touching the bottom or left side of the quadrat
should be considered 'out' and not counted. A (single) cardiac cycle is what most people think of as a 'heart beat'. Water passes from one tracheid to another through thin regions called pits. In reality, everyone has two blood types, one that is called the ABO blood types and one that is called the rhesus (Rh) blood type. It is thought that, if two species
are in close contact for an extended period of time, long enough for many viral mutations to occur, one of those viral mutations to enter a new type of host. This, in effect, puts the second tRNA in the ribosome position that the first originally occupied, and creates room for a third tRNA to float in, bringing with it a third specific amino
acid. This social learning occurs with all types of drug use. (2) II I Jones and Jones 1997 (b) State one effect of the parasympathetic nervous system. • Life is based on carbon compounds, including carbohydrates, lipids, proteins, and nucleic acids. Why do vampire bats share blood with each other, and why do baby ducks follow their mothers around?
In addition, light energy is used to accomplish a reaction that is called photolysis of water. Knowing the properties of osmosis and turgidity in plant cells would explain the causality associated with the correlation, thus giving it great scientific plausability. Here, the portal vein branches into a second capillary bed that allows the releasing hormones to
leave the bloodstream for their target cells, the cells of the anterior pituitary. • Primary protein structure: the sequence determines the three-dimensional shape, as shown below. Gel electrophoresis is used to compare the collected DNA with that of suspects. The man was able to understand spoken
language and could move his mouth and tongue, so he did not have motor impairment. From the multinational Human Genome Project, we have learned that less than 2% of human DNA actually codes for proteins or other materials required for protein synthesis in the cell. The sinoatrial node acts as a pacemaker. The incidence of PKU ranges
between 1 in 2600 births in Turkey and 1 in 125 000 births in Japan. Skill: Analysis of dissociation curves for haemoglobin and myoglobin. Diagram of human eye should include the sclera, cornea, conjunctiva, eyelid, choroid, aqueous humour, pupil, lens, iris, vitreous humour, retina, fovea, optic nerve, and blind spot. DVT is often treated with
anticoagulant medications. Out of the window, they see a solitary black sheep. From an evolutionary perspective, this was the big step that separated reptiles and birds from the aquatic environment of their immediate ancestors, the amphibians. Take breaks. This entire series of events, beginning with potassium ions diffusing out of the localized area
of the membrane, is called repolarization. This shows that the data are very close to the mean and not spread out. Transfection means to 'infect with a new DNA molecule'. Specific examples of important grain crops include wheat, rice, and maize. Each letter represents one of the four bases in the DNA code. An action potential is formed as the
membrane depolarization is raised above the threshold. Notice what is happening in this process: light energy (food). Of course, that is not the end of the analysis. A part of this philosophy even suggested that the organic molecules that are characteristic of living organisms could only be produced
within living organisms. In his Biographical Encyclopedia of Science and Technology, Isaac Asimov points out how fortuitous it was that Mendel happened to choose traits of pea plants that were nonlinked genes. • Calculate the mean percentage increase for each group. You have allowed me to be more than I ever could have been without you.
aerobic pathway Aerobic cell respiration is the most efficient pathway Cells that have mitochondria usually use an aerobic pathway for cell respiration. This enzyme uses the energy of an ion gradient to allow the phosphorylation of DNA is semi-conservative
and depends on complementary base pairing. The plants showed growth, response, excretion, homeostasis, and depends on complementary base pairing. The plants showed growth, response, excretion, homeostasis, and
reproduction. 15 Why is it possible to purchase a chrysanthemum in full bloom at any time of the year when it is a short-day plant? Such a situation can arise when cell division does not completely separate the copies of chromosomes into distinct nuclei, and they end up in the same cell. Lysosomes are also involved in the breakdown of materials that
may be brought into a cell by phagocytosis. This neuroadaptive change is probably critical for producing addiction. The fragments of the lagging strand are called Okazaki fragments, after the Japanese scientists who discovered them. Continuous-batch fermentation of citric acid Aspergillus is a common species of mould found all over the world in
many different climates. NATURE OF SCIENCE Consider ethical implications of research: Jenner tested his vaccine for smallpox on a child. Although this keeps mammals warm, once the heat leaves an organism's body, it cannot be used again as a biological energy resource. 150µm (c) An organism has an actual length of 0.05 mm. The target tissue of
GnRH is the nearby pituitary gland, and it results in the anterior pituitary producing and secreting two hormones into the bloodstream. A new shuffling of the alleles has created a new combination that does not match either of the parent's genotypes. High acidity contributes to the fact that non-decomposed material accumulates. (c) The formation of
chiasmata occurs. The r2-value is then calculated to see how closely the linear regression model matches the data. Time / min 60.5 Chamber with desiccant (dry) Chamber with wet towels (humid) 0 10 10 5 9 11 10 9 11 15 9 11 20 8 12 25 7 13 30 6 14 35 5 15 40 5 15 45 5 15 Table 12.8 Effect of humidity on the movement of isopods: trial 1 533 12
Option A: Neurobiology and behaviour Time / min 60.5 Chamber with desiccant (dry) Chamber empty 0 10 10 5 9 11 10 8 12 15 8 12 20 7 13 25 6 14 30 5 15 35 5 15 40 5 15 10 10 40 10 10 45 10 10 40 10 10 45 10 10 on the movement
of isopods: trial 2 Table 12.10 Effect of humidity on the movement of isopods: control trial 1 Figure 12.33 Graph of the mean values from two trials with isopods in humid and dry conditions. 37 What do the numbers measure? This single cell has the ability to reproduce at a very rapid rate, and the resulting cells then go through a differentiation
process to produce all the required cell types that are necessary for the well-being of the organism. Sometimes a whole mountain range is coloured red because of the red stain of biofilms. 24 Outline an example of behaviour that will become more prevalent in a population since it increases the chances of survival and reproduction. D Five glycerate 3-
phosphates are converted to three ribulose 5-phosphates. When the biphospholipid layer of the membrane. Other plants are biennials and take two years to complete their life
cycle before dying. 275 06 NATURE OF SCIENCE Theories are regarded as uncertain: William Harvey overturned theories developed by the ancient Greek philosopher Galen on movement of blood in the body. Within the lungs are a multitude of small spherical air sacs called alveoli. DilemmaRead the following short quotation from a botanist then
answer the questions which follow. and Splitters have come into the garden, wreaking as much havoc as deer. The same can be said for the shaded area in the woods. However, recent developments in biotechnology have given the term a new meaning. This means that chlorophyll reflects green light and therefore must absorb the other wavelengths are much havoc as deer. The same can be said for the shaded area in the woods.
of the visible light spectrum. Correlation does not necessarily mean causality. 53 02 Molecular biology Table 2.1 Types of molecules Molecular biology Table 2.1 Types of molecules Molecular biology Table 2.1 Types of molecular biolog
model of the amino acid alanine. Until 1960, researchers believed that only the brain of an infant or child could change, and that by adulthood the brain was unchangeable. Figure 2.37 Meselson and Stahl's experiment. Heritable change, and that by adulthood the brain was unchangeable.
environment, adapts accordingly, or dies out. Some people experience a sense of panic and paranoia. Religious background influence his or her acceptance of certain scientific theories? Although this is evidence that evolution is happening as a result of an accumulation of small
changes over time, the driving force is, of course, human choice active transport A variety of mechanisms are used for nutrient molecules to cross the epithelial layer of the villi mucosa. In addition to carbon dioxide and water vapour, methane and nitrogen oxides also contribute to Earth's greenhouse effect, but to a lesser extent. The tube of the
alimentary canal has two layers of smooth muscle, called circular and longitudinal. 8 885 millions of deaths (2005) 7 total deaths 5395 466 6 5 885 466 154 1253 3 2 141 141 952 952 1 tobacco use trachea, bronchus, lung cancers tuberculosis diarrhoeal diseases HIV/AIDS chronic obstructive pulmonary disease cerebrovascular disease
lower respiratory infections 1544 ischaemic heart disease 0 This is an appropriate time to discuss the unethical actions of the tobacco industry in the suppression of results linking smoking with cancer. In the days when there were fewer rules, some scientists named unsightly or offensively smelling organisms after people they considered to be their
show colour. False-colour SEM showing a macrophage (the large yellow cell) engulfing Escherichia coli bacteria (the small pink rods). The antivenom is made by injecting a horse, goat, or sheep with a small amount of the snake's venom, in order to stimulate antibody production. 

Plasma cells secrete antibodies. Others are better adapted for living
in lush rainforests, while some can survive in the desert. • • 51 02 Molecular biology Applications and skills: Applicati
brain. The marker gene will give antibiotic resistance that will be necessary in a later step. Dirckx Electron micrograph of the microroganisms on your teeth forming a biofilm (plaque). The spindle fibres pull individual chromatids to opposite ends of the cell. You will recall that all organisms use glycolysis to begin the cell respiration sequence.
Thyroxin is secreted by the thyroid gland to regulate the metabolic rate and help control body temperature. 91 02 Molecular biology CHALLENGE YOURSELF 11 The experiment in biology'. Calcium binds with DNA for easy transfer into
sure there are no air bubbles in the mud. hypothalamus The hypothalamus is found at the base of the brain as part of the brain as portugated a few generations ago, thanks to the accumulation of small changes in the genetic characteristics of livestock chosen by breeders. It
shows a primary transmitter (neurotransmitter) that moves across the synapse and finds a primary receptor on the postsynaptic neurone. Deaf people who have had lefthemisphere damage may no longer be able to use sign language to communicate. A group of genes inherited together because they are found on the same chromosome are considered
to be members of a linkage group. Although the term 'immunity' is sometimes interchangeable with the term 'resistance', that is not the case here. After a certain number of half-lives, there are so few 14C atoms left that it is difficult to determine the age of the fossil with any accuracy. oceans detritus 650 sedimentary rocks Uplift of marine
sedimentary rocks can return phosphorus to terrestrial ecosystems. The energy being referred to is called the activation (1 SD) in either direction from the mean. You used the following processes needed for memory: encoding
storage and accessing. Local anaesthetics produce drug-induced insensitivity to localized pain. 120 Because valine has a different shape and different shape and different shape and different properties compared with glutamic acid, the shape of the resulting polypeptide chain is modified. Phloem then transports dissolved sugars from the leaves to the stems, roots, and flowers of a plant
Plover eggs show adaptations that have been acquired by natural selection. Measurements may then be taken. CH4Hg methyl mercury 2H+ hydrogen ions Biofilms Very few countries have sufficient resources for combating oil spills and other
pollution incidents on their own. New research by Ben Barnes, published in the Journal of Neuroscience in 2013, is counter to the prevailing theory about Alzheimer's disease. The subject correctly picks up the spoon. Name these in the order the blood passes through them, starting with the right atrium. 

It is there a central dogma of molecular picks up the spoon. Name these in the order the blood passes through them, starting with the right atrium.
biology? mouse 0.04623 Figure 13.39 Cladogram showing the amount of evolutionary divergence of eight organisms using the same information as we used for the cladogram in Figure 13.38. Figure 13.38. Figure 13.38. Figure 13.38. Figure 13.38.
the cell. Some of the more common solutes in blood plasma are: • glucose (blood sugar) • amino acids • fibrinogen (a protein involved in blood clotting) • hydrogen carbonate ions (as a means of transporting carbon dioxide).
of geographically isolated populations. • Secondary protein structure: repetitive shapes of either a helix (a spiral staircase shape) or a pleated sheet (a sheet with corrugated folds), e.g. spider silk. . The cancerous growth in the lungs takes over areas of healthy tissue areas that once provided a combination of bronchioles and alveoli. Such systems rely
on sunlight, and they will be the main focus of this section. When methane changes from a liquid to a gas at -162°C there are no hydrogen bonds attracting the molecules to each other. The resting potential requires active transport (the Na/K pump) to set up a concentration gradient of both sodium and potassium ions. 2007, Fig. ddG 4. The new are no hydrogen bonds attracting the molecules to each other.
classification is a better reflection of which ones are more closely related to each other. Remember that, despite the fact that bacteria are all around us, we were not able to see them until the microscope was invented in the 1600s. When the guard cells swell with water, the stoma appears between the cells, and water evaporates through the stoma
Stem cells There are populations of cells within organisms that retain their ability to divide and differentiate into various cell types. This is why we can be sure that any modifications in mitochondrial DNA are due solely to mutations. These primary follicles remain relatively unchanged until the girl reaches puberty. If it is zero, record the result as
such. Serendipity is a good concept to understand in science. Deficiencies Weak muscle development in children because of poor nutrition. There are several factors to consider when setting up potometers. The gene pool in this population of 16 people is made up of 32 genes. α-helix H N O C O H C C H H C N H O C C O H N H N H O O H Figure 7.18
Protein secondary β-pleated sheet H O hydrogen bonds H O C H C C H H C N H O C C O H N structure. Lastly, oxides of nitrogen (NOx) are produced by human activities such as: • burning fossil fuels (e.g. gasoline in cars) and using catalytic converters in exhaust systems • using organic and commercial fertilizers to help crops grow better •
industrial processes (e.g. the production of nitric acid). Mitosis does not happen by itself. Although there may be other factors, the amount of sunlight reaching the fields will influence the biomass, so that sunnier parts of the world can produce more wheat. It is difficult for people growing up and learning in today's world to truly appreciate the
scientific ideas of the past. Natural selection and the frequency of characteristics Pesticide resistance in rats and multiple antibiotic resistance in bacteria are both carefully studied modern examples of natural selection. It has six chromosomes, meaning its diploid number, 2n, is 6, and therefore its haploid number, n, is 3. An action potential is either
propagated (sent) or it is not. The AV node then sends out its own action potentials that 742 spread out to both ventricles. Speciation can occur abruptly. Thus a cell under the influence of thyroxin will have a greater need for oxygen and other indicators of an increased metabolic rate. Copyright © 1987 by John Wiley & Sons, Inc. The specific plant
auxin that causes this described action is indoleacetic acid (IAA). 1 8 6 4 2 0 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 temperature difference (°C) Biofilms may be good to use for crude oil degradation. The end-product inhibits enzyme 1 in the pathway. Science knows no country, because knowledge belongs to humanity, and is the torch which
illuminates the world. Attachment of the bicep to the radius and scapula. B Two glycerate 3-phosphates are linked together to form one hexose phosphate. Here we can see that the mouse, Mus musculus, gene is 86% identical to the human gene for leptin. Table 1 Data from a bean plant experiment Height of 10 bean plants grown in sunlight, in
centimetres ±1 cm Height of 10 bean plants grown in shade, in centimetres ±1 cm 125 131 121 60 154 160 99 212 124 117 143 65 157 155 129 160 140 145 118 95 Total 1310 Total 1300 First, we determine the mean for each sample. The cytoplasm within the axon is electrically conductive, which allows the electrical potential to skip from one node
of Ranvier to the next. • To learn more about essential fatty acids and the Linus Pauling Institute, and about essential amino acids, go to the hotlinks site, search for the title or ISBN, and click on Chapter 15: Section D.1. NATURE OF SCIENCE Serendipity and scientific discoveries: the role of gastric acid in digestion was established by William
Beaumont while observing the process of digestion in an open wound caused by gunshot. viviparum, is a hybrid between two Allium species: A. Figure 12.36 A crude template of birdsong is inherited, but the development of a mature adult song is learned. 16 From the following DNA sequence, determine the sequence of amino acids that would be
assembled. 8 List some pollutants metabolized by microorganisms. Where does the heat go? The cell then divides (cytokinesis). When playing a board game with family or friends, cheating is frowned upon. The left cerebral hemisphere receives sensory information from the right side of the body, and vice versa The cerebral cortex is the thin layer on
the surface of the left and right cerebral hemispheres and is responsible for all higher order functions. As an afterthought: should we tell her she's wrong? The points where the cyclin-activated CDKs function are called checkpoints in the cell cycle. These three alleles can produce six different genotypes. Can you identify which side is the cis side and
which is the trans side? 80 60 40 Figure 13.10 The percentage of soybean and cotton crop adoption over 10 years. Na! Extracellular Figure 1.21 Stage 3: The carrier opens to the exterior of the cell and the sodium ions are released. Nearly frictionless movement at the elbow joint. Over time a substance called plaque can build up in one or more theseased.
coronary arteries to the point where a substantial narrowing of the lumen (inside) the artery occurs. By using PCR, forensics experts or research technicians can obtain millions of copies of the DNA in just a few hours. Gravitaxis is the response to gravity. The dependent variable in each investigation will be the time necessary to achieve a positive
glucose test. You may remember this protein from studying about the human body. All of the pathways start with glycolysis. You may have studied paradigms in your Theory of Knowledge class. Nitrogen-fixing bacteria convert atmospheric nitrogen to ammonia. New meiotic spindle fibres are produced. Plant I. If any one spermatogonium undergoes
mitosis, two half-size cells result, each capable of growing again for a later cell division. For example, with the increase in popularity of mechanized milking machines to pump milk from cows instead of milking by hand, there has been an increased selection of cows with longer legs. polypeptide chain folded into a three-dimensional shape Figure 7.19
This is called a sausage model. If you do not have access to prepared slides, you can use images from the internet sections of a gene act as introns at different times. The plants express the gene by making a protein that is the desired product. Another challenge is that, just because a group of taxonomists decides
to make a change, it does not mean that everyone will agree with that change. In theory, yes. 599 13 If the cells have been transformed by the new plasmid, they will grow on the antibiotic media. This false-colour SEM shows that small platelets (shown in pale green) have triggered the formation of insoluble fibrin protein fibres. Let's try it. 6 6
CH2OH H 4 HO 5 OH H 3 2 H OH glucose 6 CH2OH H H O H Figure 2.14 A condensation reaction showing the formation of the disaccharide maltose. • An external processor is worn behind the ear or attached to the hair. Here are the eight organisms: • domestic duck • Canada goose • alligator • Nile crocodile • human • rhesus monkey • rat
mouse. What do the sarcastic fringehead fish and the bald eagle have in common? This would mean that one-quarter of the loci for that gene are occupied by that allele, and the other three-quarters do not possess it. Dietary minerals: essential chemical elements In many countries the food industries indicate the percentage of daily vitamins and
minerals contained within a 'serving' of their products. Whenever auxin affects cell growth, it does so by changing the pattern of gene expression. A classic example of an innate sequence of behaviours is seen in the mating behaviours of the three-spined stickleback fish (see Figure 12.30). 3.2 Chromosomes Understandings: Prokaryotes have one
chromosome consisting of a circular DNA molecule. Some genes do, in fact, go hand-in-hand, so that when one is placed in a gamete during meiosis the other follows. 60-day average 20 trend 10 0 !10 !20 TOPEX/Posidon 1994 1996 How do scientists collect data to see climate change? An increase in exercise predictably results in a greater use of
oxygen and release of carbon dioxide to/from muscle tissue associated with the exercise. This is as much a reflex as the pain reflex. At the top of your nasal passage is a patch of specialized neurones that contain the olfactory receptors. Acetyl CoA can be synthesized into a lipid for storage purposes. The formation of a covalent bond between two
adjoining nucleotides is catalysed by one of the DNA polymerase enzymes that are important in this process. • Energy released from carbon compounds by respiration is used in living organisms and converted to heat. The three root zones indicate regions of cell development.
affected children. Photosynthesis is the production of carbon compounds in cells using light energy. The only transport mechanism that can explain the totality of this movement is active transport mechanism that can explain the totality of this movement is active transport. To continue with this emergent concept, a whole multicellular organism is capable of carrying out more functions than the sum of the function(s) each cell
is specialized in. Below is the chemical equation for making calcium carbonate: Ca2+ + 2 HCO3- Figure 4.14 Biogas production and use. This idea is referred to as a hypothesis. This is similar to the technique they used to peel the top off a milk bottle. 58 CHALLENGE YOURSELF 2 Drawing molecular diagrams of common biochemical substances is
easier than you might think, especially with a little practice. Once you have calibrated the graticule, it can be used to take accurate measurements of the object being viewed. (1) (b) Explain, using a named example, how polygenic inheritance gives rise to continuous variation. start kinase trigger DNA replication Interphase is a very active period in a
cell's life. An excellent example is the American alligator. Autonomic is similar to 'automatic', so you can remember that these functions are not voluntary. When we say 'the ability to see in colour is a genetic trait' we mean one of two things is happening with someone's DNA: either that person has the DNA code for making colour vision possible or
going to implant itself through the cell layers shown in colour. It is a good idea to take a photo at the beginning of the experiment, and then one every week or so. As it turns out, the statistics do not support this knowledge claim. For example, a ? Each hormone is transported by the bloodstream from the gland where it is produced to the specific cell
types in the body that are influenced by that particular hormone. One example of such an organism is Biston betularia, the peppered moth, which lives in temperate climates. During each menstrual cycle, a few primary follicles finish meiosis I. However, that changed in 1966 when a team of Japanese scientists studying DNA replication in E. The
organic molecules of the phloem sap include: • sugars (sucrose is the most common, and sugars account for most of the phloem) • amino acids • plant hormones • small RNA molecules (this is a recent finding and may explain how cells that are far apart in a plant can communicate). The portions of the phloem of t
are composed of relatively non-polar amino acids, whereas those outside the bilayer are composed of many polar amino acids, whereas those outside the bilayer are composed of many polar amino acids, whereas those outside the bilayer are composed of many polar amino acids, whereas those outside the bilayer are composed of many polar amino acids, whereas those outside the bilayer are composed of many polar amino acids, whereas those outside the bilayer are composed of many polar amino acids, whereas those outside the bilayer are composed of many polar amino acids, whereas those outside the bilayer are composed of many polar amino acids. (b) Sketch a single carbon atom, add a carboxyl group, fill in with hydrogens. The help provided by fungal hyphae to plants is unique: there is a symbiotic relationship between some roots and fungi. Figure
2.25 The effect of increasing temperature on the rate of an enzyme-catalysed reaction. Ecology experts studying the area around Chernobyl. Make sure you have permission to take the samples. The cochlea has more than 32 000 hair cells. Oxygen cannot be carried as efficiently by the irregularly shaped red blood cells. Endoplasmic reticulum The
endoplasmic reticulum (ER) is an extensive network of tubules or channels that extends most everywhere in the cell, from the nucleus to the plasma membrane. When such gases are present, they keep the atmosphere near Earth's surface warm by absorbing heat from the warmed surface and re-radiating it in all directions, including back down
towards the surface. Using lactose in the medium of the batch fermenter will begin to starve the Penicillium. This prevents the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will begin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the production of folic acid resulting in the death of the batch fermenter will be gin to starve the death of the batch fermenter will be gin to starve the production of the batch ferm
and heterotrophs. Autopsy Autopsy can also be used to determine what brain parts are involved in certain functions. 791 Mathematics, and information and communication technology skills Scatter plots A scatter plot is used when two variables are involved, and they are plotted as y against x using Cartesian coordinates. NATURE OF SCIENCE
Gregor Mendel used artificial pollination in a series of experiments in which he carefully chose the pollen of various plants to fertilize other individuals of the same species. To test whether a chemical meets the criteria for an addictive substance, a controlled self-administration experiment is designed and the response of the animal is recorded to see
whether it fits the above model for addiction (see Figure 12.9). and Peck, L. Reactions are dependent on molecular collisions and, as a general rule, the faster molecules are moving, the more often they collide, and with greater energy. However, the mass of plants is considered to be an indirect reflection of photosynthetic rate, as an increase or
decrease in biomass may be caused by a whole variety of factors as well as the photosynthetic rate. Most people refer to the pituitary gland as a singular gland, but it is actually two glands that exist as different 'lobes'. With increased numbers of transmitted signals, the strength of the synaptic connection also increases. Figure 11.16 Sectioned view
of the proximal convoluted tubule of a nephron. That single chemical reaction would be one of the millions of reactions that cell's metabolism. The medulla oblongata controls breathing by monitoring the level of carbon dioxide in the blood. It means the relative contribution that the organism will make to the
gene pool of the next generation. Label any visible cell structures. C to G as well as I and J are pink and must be heterozygous, CRCW, because they have one of each allele from each parent plant. Human physiology this forms a glandular structure known as the corpus luteum. What about the technique of in vitro fertilization? How is this
 'antiscientific'? The two neurones always align with each other so that the axon's synaptic 304 terminals of one neurone adjoin the dendrites of another neurone. In species where there is variation, a change in the environment will eliminate some but not all members of the population. The factor being tested is referred to as the independent variable
In other words, the differences in mean size is very unlikely to be a product of pure chance. Imagine that you want to retrieve the DNA sequence of a target gene, for example the actual size of structures and ultrastructures
shown in drawings or micrographs. This specially designed apparatus was actually a flattened flask that was used to house algal cells carrying out photosynthesis. The changes being observed now are alarming scientists because
plants that are filicinophytes. Remember that the reason there are two of each chromosome is that one came from the mother. It is usually used for seeing whether an unborn baby has any chromosome is that one came from the mother. It is usually used for seeing whether an unborn baby has any chromosome is that one came from the mother. It is usually used for seeing whether an unborn baby has any chromosome is that one came from the mother. It is usually used for seeing whether an unborn baby has any chromosome is that one came from the mother. It is usually used for seeing whether and the other from the mother is flaky and crumbly an unborn baby has any chromosome is that one came from the mother is flaky and crumbly an unborn baby has any chromosome is that one came from the mother is flaky and crumbly an unborn baby has any chromosome is that one came from the mother is flaky and crumbly an unborn baby has any chromosome is that one came from the mother is flaky and crumbly an unborn baby has any chromosome is that one came from the mother is flaky and crumbly an unborn baby has any chromosome is that one came from the mother is flaky and crumbly an unborn baby has any chromosome is that one came from the mother is flaky and crumbly an unborn baby has any chromosome in the mother is flaky and crumbly an unborn baby has any chromosome in the mother is flaky and crumbly an unborn baby has an unborn
with a grey colour, while others produce earwax that is more fluid and has an amber colour. Carbon dioxide is carried in solution and bound to haemoglobin in the blood. • Gene expression is regulated by proteins that bind to specific base sequences in DNA. This potometer uses an air bubble for readings. Sheep are still born with long tails, despite
being removed by farmers for countless generations. This method can produce a new image every second. This tool has allowed specialists called genetic counsellors to advise parents about their future baby. 620 GFP is a powerful tool that has been used for studying gene expression since its discovery in the 1960s, when the gene for making it was
extracted from jellyfish. This also illustrates that if there is no variety in a population, there is a very limited number of outcomes: the whole population either survives or dies. Hopefully this section will make you to feel more comfortable with data and give you strategies for understanding graphs and statistical tests that will improve both your
internal assessment (IA) work and your exam results. ddG? Genetics In principle, DNA is not supposed to be modified during the lifetime of an individual. Trustom results in diploid zygotes with two alleles of each gene that may be the same allele or different alleles. In order to read the tag, a hand-held detector is used. A nucleosome
occurs in situations where there are areas of different concentrations of a particular substance. The oxaloacetate may then begin the cycle again. Also, the onion heads that you see in the photo can touch the ground when the stalk bends, and this will generate a new plant a few centimetres away from the original plant. Naturally curved fatty acids are
called cis fatty acids, and the hydrogenated, straightened ones are called trans fatty acids. The disease is not sex-linked, thus the male being shown with PKU was coincidental. If you sing a song over and over again, repeating the signals between the neurones makes a better memory of it. Or compound each other? This two-step process is more time
the postsynaptic membrane. Sensory receptors and diversity of stimuli We link certain tastes to emotion and memory. At 22°C the rate of respiration is faster than at 12°C. The ecosystems on the mountain were destroyed. (2) (Total 3 marks) 5 Albinism, a lack of pigmentation in skin and hair, is caused by a recessive allele. The rules about writing
binomial nomenclature names are that: Homo sapiens • the genus name is capitalized but the species name is not Genus Species • both are written in italics when typed, or underlined when handwritten • in addition, after these two names, often the last name of the person who first published the name in a scientific journal is given (but not
italicized), and the date when it was published, for example Equus zebra Linnaeus, 1758. A different tool called a positron emission tomography (PET) scanner is slower but has the advantage of being able to identify the areas of the brain activated by neurotransmitters and drugs. Such things are often measured using electronic probes and data
logging techniques. Skill: Labelling a diagram of the structure of the human ear. Because of the biofilm's increased medical costs. Smooth ER does not have any of the organelles called ribosomes on its exterior surface. The promoter
region for a particular gene determines which DNA strand is the antisense strand. One of the many complications for research on memory and learning is the sheer complexity of the human brain. pylori survives when introduced into the stomach, probably by burrowing beneath the mucus layer and infecting stomach lining cells. Smallpox was a
deadly global disease prior to 1967. When they cause the eardrum (tympanic membrane) to move back and forth slightly. The leaves of plants grown inside will often show movement in the direction of the light they receive. Sunlight penetrates through the 203 04 Ecology glass and warms up the plants inside. To
overcome or validate this scepticism, evidence obtained by observation or experimentation is essential. It requires energy to create those covalent bonds, and the source of that energy can ultimately be traced back to the Sun. 0 90 % 80 % remaining 14C 70 % 60 % 50 % 5.73 40 % 30 % 11.46 20 % 17.19 10 % Figure 5.2 The proportions of
radioisotopes and stable daughter isotopes in a onceliving organism indicate the passage of time since the organism died. Computer model showing the molecular structure of the tobacco mosaic virus (TMV). Digitalis (it is the product of a more recent speciation). In other words, the genes make more sticky glue to adhere the bacteria even more
strongly to the substrate. This doesn't mean the information on those sites is incorrect, but it does mean you need to consider the possible bias behind the information. (2) (a) State four functions of proteins, giving a named example of each. The area in which centrioles are found is called the centrosome. Fields can be sprayed with glyphosate and the
weeds are killed but the soybeans are not affected. If those letters are in your name, just skip them. In a typical plant more than 90% of the water taken in by the roots is lost by transpiration. Sickle cell disease In humans, a mutation is sometimes found in the gene that codes for haemoglobin in red blood cells. Some say they feel lightheaded and
hazy. Cloning using a differentiated animal cell In 1996, a sheep by the name of Dolly was born. • The size should be appropriate for the complexity of the drawing. 15 01 Central vacuole has storage and hydrolytic functions Cells Endoplasmic reticulum (ER) is a network of tubes and flattened sacs. Scientists caught 100 hovering bees, 250 patrolling
bees and 150 mating bees and measured the width of the head of each bee. 1 Observe the organism of choice. CO2 CO2 HCO3- H+ CO2 CO2 CO2 HCO3- H+ CO2 CO2 CO2 HCO3- H+ Figure 4.8 The forms of Cycling of carbon dioxide carbon dioxide is absorbed by photosynthetic autotrophs such as photosynthetic bacteria,
phytoplankton, plants, and trees. 87, fig. As a result, the equation becomes (p + q)2 = 1. Because HCG is a hormone shows up in small amounts in the bloodstream and urine. The hepatocytes act on the chemicals within the blood many times as the blood makes a
continuous circuit through the liver. Food such as sugar snacks and drinks provide glucose quickly, but the supply does not last as long and can result in low brain activity. It appears that the process of mitosis occurs in discrete stages. This gene defect is most common in European populations; it is much less common in Asians, Latinos, and Africans.
He noticed the formation of a crystalline substance that looked familiar to him. Despite his success, the lack of ethical perspective and blatant lack of safety measures would not be considered acceptable practice today. Start with a single cell that has two pairs of chromosomes, each having two sister chromatids. 

Leaching of mineral nutrients from
agricultural land into rivers causes eutrophication and leads to increased biochemical oxygen demand. Starch is insoluble and exerts no osmotic effect. The amino acid sequence of polypeptides is coded for by genes. As the ventricle finishes its contraction, the pressure inside it once again drops below the pressure in the aorta, and the semilunar
valve closes (this causes the 'dub' sound that can be heard with a stethoscope). Cells Another organism, Elysia chlorotica, demonstrates a similar situation. The majority of humans are born with the ability to digest lactose, one of the most common sugars found in milk. There are many different types of compound light microscope. • If the regression
model fits the data well, it can be used to predict values that were not measured. Annelida (b) Makes a shell reinforced with calcium ...
                                                                                                                                                                                                  . The greenhouse effect on a planet is not caused by glass windows, but by its atmosphere's ability to retain heat in a similar way to that of the glass of a greenhouse or car. The darkened skies
meant that producers could not get enough sunlight to continue making enough food to feed the consumers. The cortical reaction takes place within a few seconds of the first spermatozoon actually fertilizes the ovum. The problem is that if you do not think carefully about the information going
into the Punnett grid, you could put in the wrong information. Genetic modification has created soybeans that are resistant to herbicides. The pH of water decreases as the amount of carbon dioxide increases. The sediments eventually form sediments eventually form sediments eventually form sediments eventually form sediments.
process is exactly the same for each student. Embedded in the membranes are the enzymes and other compounds necessary for the processes of the electron transport chain and chemiosmosis to occur. Disruptive selection 2. Active mechanisms: ATP expended • Membrane pumps: molecules moved against their concentration gradient by certain
proteins using ATP to 'pump' the molecule across the membrane. Natural selection favours isopods that show this response. Gene therapy is the process of taking a beneficial gene from a person who does not have it, but who needs it to stay healthy. Think of the standard deviation as a way of showing how
close your values are to the mean. Exactly how general anaesthetics work is not known, but recent studies indicate that they act on the CNS: • by modifying the function of the gated ion channels in some fashion • or by binding directly to the ion channels in some fashion • or 
act together to produce a viable living unit. Recall that water moves from a hypotonic region to a hypertonic region following the pathway of the sinusoids of the liver, and the glomerulus capillary bed connecting the peritubular capillary bed of a
nephron. This phenomenon is cancelling out some of the predicted warming. Computer artwork showing MRSA bacteria (small blue spheres). In the pancreas there are cells known as (beta) cells that produce the hormone insulin. All the experiments supported the view that the bottle opening was a combination of innovation by some blue tits and
learning spread by social communication. If the differences caused by disruptive selection are extreme and the two populations occupy different niches, it is possible for speciation to occur. Reflexes take place so quickly because they do not have to travel up to your brain to be processed. 33 Which genes could be preventing cancer? 3 01 NATURE OF
SCIENCE Looking for trends and discrepancies: although most organisms conform to cell theory, there are exceptions. LPG 25 C cold fractionating tower for camping gas petrol paraffin Figure 4.13 The many uses of petroleum products in our everyday lives. Fertilization in flowering plants is actually a double fertilization. For example, mice have
inadvertently crossed oceans after going on board ships looking for food, and found themselves hundreds if not thousands of kilometres away from where their parent population lived, perhaps on an island far from any mainland. There have been huge fluctuations in climate in the past, and the current changes that we are seeing in recent decades are
natural. Triglycerides vary greatly from each other, including their relative healthiness in our diet. What does this show about the nature of science? CO2 Transport in blood plasma at rest and during exercise Form of transport Dissolved CO2 Bicarbonate ion CO2 bound to protein Total CO2 in plasma pH of blood Rest Exercise Arterial Venous Veno
mmol l-1 blood mmol l-1 blood mmol l-1 blood mmol l-1 blood 0.68 0.78 1.32 13.52 14.51 14.66 0.3 0.3 0.24 14.50 15.59 16.22 7.4 7.37 7.14 Adapted from Geers and Gros 2000. Tab. As well as DNA and ribosomes, the interior of a chloroplast includes the grana (singular granum), the thylakoids, and the stroma, which are labelled in Figure 1.11. Spermatogonia
undergo meiosis to produce spermatozoa. en er light energy loss. To answer this question, we must first understand the ordinary cell cycle. 431bl, blickwinkel 565 b, Charles Krebs 26, Custom Medical Stock Photo 755t, Enigma 770b, Ester Van Dam 231, GreenStockCreative 768br, imageBROKER 413, Janusz Gniadek 236, Megapress 718,
Robert Morris 776, Tom Uhlman 172, Tony Mills 562l, Universal Images Group 240, Univer
Frederick Fischer 260t, Marty Snyderman 250, Paul Souders 638, Ronald Thompson / Frank Lane Pictures 210t, Wilfried Krecichwost 768tc; Department of Biological Sciences: www.bio.mtu.edu / campbell / prokaryo.htm 48b, 49; DK Images: 475, Colin Keates 775, Craig Knowles 183, 445b, Craig
Robertson 446b, Frank Greenaway 283 t, Gerard Brown 173b, Gill Tomblin 177b, Ian O'Leary 194, John Woodcock 128, Linden Artists 196b, M.I. Walker 181, 164 b, Mick Posen 200, Mike Saunders 197, Nigel Hicks 173t, Peter Anderson 786bl, Peter Bull 303t, 774, Peter Gardner 164t, Rajeev Doshi, Medi-Mation 459, Roy Flooks 206,
Stephen Oliver 196t, Zygote Media Group 272b, 315t, 740; Floating Island International, Inc. 609; Fotolia.com: 4designersart 322, Alejandro Dans 579t, alekswolff 662l, catolla 581t, chesterF 380, Christian Musat 789, claffra 209b, DragonImages 204b, frogger 414, gabe 9000c 647b, gavran 333 623tr, Leysan 255tr, Mark Balyshev 576, Mykhailo
Koytoniuk 112, Olhaafanasieva 577b, Patrick J. Bean plants being grown for an experiment. The structure and bonding of an ethanol molecule. After doing hundreds of soundings, the scientists reading the data can even tell what species of fish has been located. Figure 8.21 shows the overall light-dependent reaction of photosynthesis involving non-
cyclic photophosphorylation (non-cyclic electron flow). You may also remember that sickle cell anaemia is caused by one amino acid that has only one mutation in each of the two beta chains. Humans belong to the phylum Chordata (chordates) and are in the subphylum Vertebrata (vertebrates). Each of us has many different types of antibody-
producing plasma cells and, as a general rule, each type of antibody. • Cerebral hemispheres act as the integrating centre for higher complex functions such as learning, memory, and emotions. There is
no doubt about nine of the 20: these nine are definitely essential, for everyone throughout their lives. In addition, 159 03 • How do you think a child would feel if she were to find out from DNA profiling that her father was not her biological father? 20 Prolactin is a hormone that is produced throughout most of a woman's pregnancy. 

Glycolysis gives
a small net gain of ATP without the use of oxygen. These repetitive sequences are usually composed of 5-300 base pairs per repetitive sequence. Present research indicates that auxin itself also has an effect on the protein pump of the stem cell membranes as indicated in Figure 9.19. Bacteria show genetic variation just like all other living organisms
on Earth. The inner portion of each of the tubule cells has microvilli in order to increase the surface area for reabsorption. Be accurate. A false-colour TEM of HIV (small round objects) infecting a leucocyte. Also, keep in mind the importance of the steps in terms of shuffling genetic information in order to promote variety in the offspring. Technology
has been developed that can often break these stones into small pieces by ultrasound. Multiple alleles So far, only two possibilities have been catalogued and given a scientific name, the biggest number being insects. In addition, it is
possible for an HIV+ mother to infect her child during pregnancy, labour, delivery, or breastfeeding. Is there a statistically significant difference between these two sets of data? • An effector is an organ that performs the response. Conversely, if a sperm cell containing a Y chromosome fertilizes an ovum, a male is produced. Figure 10.4 How an allele
B from a maternal chromosome (in red) can be switched with an allele b on a paternal chromosome (in blue). However, behavioural output is not always easily seen, which is a negative control? When both exchanged and unexchanged vessels have the same temperature difference, they are
stacked. The genomes of many bacteria, plants, fruit flies, worms, etc., have been sequenced. 445 10 Genetics and evolution 16 chromosomes (two sets): 24 chromosomes (two sets): 32 chromosomes (two sets): 32 chromosomes (two sets): 32 chromosomes (two sets): 45 chromosomes (two sets): 45 chromosomes (two sets): 52 chromosomes (two sets): 64 chromosomes (two sets): 65 ch
triploid cells (3x) have 24, and tetraploid (4x) have 32 chromosomes. Heart valves keep blood moving in a single direction. Most victims are children. Nutrients must pass through these cells in order to get to the capillaries and lacteal. If one person believes that something is true, does that make it true or does there have to be a certain
number of believers before the idea can be considered true? coli was being unzipped for replication. A Hydrogen bonds between water molecules. CHALLENGE YOURSELF 3 Using the information given at the beginning of Section 10.2, about Mendel's experiment on the traits in peas of seed colour and seed shape, calculate the chi-squared value and
determine whether or not there is a significant difference between the observed and expected values, shark bullfrog human physiology Essential ideas 6.1 The structure of the small intestine allows it to move, digest, and absorb food. This
develops in childhood and can be caused by vitamin D deficiency, or both. If this volume of water was to leave an individual would need an extremely high water intake to make up for this high water loss (not to mention many, many trips to a toilet). Red-green defects are inherited as a
sex-linked trait: sons can inherit the defect from their mother. However, you need to know more detail about the production of ATP. More properly, one cardiac cycle is all the heart events that occur from the beginning of one heart beat. Sweet wormwood comes from the forests of China. Here is an example of a
good research question: 'What is the effect of humidity on the distribution of the isopod Porcellio scaber?' 2 Describe a method for the collection of relevant data. Reclassifying thousands of organisms by creating a new category of taxon would be a good example, and that is precisely what Carl Woese did in 1977. As you will recall, metabolism
consists of all the chemical activities performed by a cell. The Schwann cells are spaced evenly along any one axon, with small gaps between them; these gaps are called nodes of Ranvier. The solution with DNA from both cultures was then centrifuged at high speed. The taxa that are higher up this list contain the most numbers of organisms, and the
taxa at the bottom of the list contain the least number. The answers to these questions are beyond the scope of this book and the IB programme. A rat in a Skinner box. For simplicity, no crossing over is shown. The study of this development, from a fertilized egg to a fully formed organism, is called embryogenesis. Remember that both parents could
be heterozygous individuals (carriers) who do not have PKU but do have a 25% chance of causing each of their children to have PKU. tQSFTZOBQUJD _ Cl entry and K+ outward leakage inhibition Conduction block: tBYPOBM/B+ entry failure of action local anaesthetic potential
propagation Figure 12.47 shows what is thought to be the mode of action of a general anaesthetic. There is often a fifth type of histone attached to the limking string of DNA near each nucleosome. The surface of each villus cell that faces into the lumen (cavity) of the small intestine has many microscopic finger-like projections known as microvilli.
When glyphosate is sprayed onto weeds, the transgenic soybean is not harmed because it is resistant to 589 13 Option B: Biotechnology and bioinformatics it. The new DNA will be integrated into the chloroplast DNA (plastid genome). 711 14 Option C: Ecology and conservation Phosphate rock grinding mill at a phosphate mine. Mitochondria: • are
about the size of most bacterial cells • divide by fission, as do most bacterial cells • divide independently of the host cell • have their own proteins • have the have t
which is consistent with an engulfing process. Re-formation of nuclear membranes II. • • Students should be aware that the 64 codons in the genetic code have the same meanings in nearly all organisms, but that there are some minor variations that are likely to have accrued since the common origin of life on Earth. Solutions 1 2 3 4 Because the
mutation for melanism is very rare, it would be expected that the percentage of dark-coloured moths would be very low, certainly less than 10% and probably closer to 1%. The effect of population size, age, and reproductive status on sustainable fishing practices Commercial fishing is not the only fishing pressure exerted on fish populations. It used
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fragments of DNA copied through a process called polymerase chain reaction (PCR). The catalytic ability of an enzyme can be optimized in certain pH and temperature environments, as well as by increasing the substrate concentration available to the enzyme. For example, there are amino acids that are only essential for very young people, or for
people who are suffering from a particular disease. In the case of amino acids, a lack of one or more of the essential amino acids would mean that certain proteins could not be synthesized. Are there religious writers who fear scientific criticism if they publish their ideas? 15 Why is there a delay between the signal from the SA node and the signal from
the AV node within one cardiac cycle? If you have difficulty doing this, you should review Section 2.6. NATURE OF SCIENCE Francis Crick and James Watson used information from many sources to produce their model of the structure of DNA. The up and down pattern is caused by seasonal fluctuations in activities such as photosynthesis. What is the
correct sequence of stages? As with many rules, there are exceptions. Eukaryote is the domain in which we find all other life besides Archaea and bacteria, from the microscopic single-celled yeast that helps bread to rise, to enormous organisms such as sequoia trees and blue whales. • Gorilla gorilla • Paramecium caudatum (caudate means having a
tail). Sertoli cell Figure 11.23 A section view through a seminiferous tubule. This results in lower bacterial counts in our food and less chance of infection/food poisoning. These are called morally responsible for the applications of their
discoveries? The MSY is the highest proportion of fish that can be removed from the total population without jeopardizing the maximum yield in the future. Brain injuries have been studied to show what occurs when parts of the brain are damaged. Is this always the case? Skinner was a scientist who worked in the 1930s. Suppose such flies are
accidentally put in the wrong jar in a laboratory along with another population of flies that look the same but that are all homozygous for both traits. This technology allows scientists to see the expression of genes by looking at the messenger (m)RNA that is transcribed by the gene. Water is not as accessible to mammals as it is to fish, so mammals
have a system that needs less water for dilution and elimination compared with ammonia. STRs are short, repeating sequences of DNA, normally composed of 2-5 base pairs. In 1995, a team of biologists in China found some seeds in a dried-up lakebed. Follow your teacher's directions carefully concerning the use and disposal of the fungicide. Again
using the magnifying instrument make observations of the movement and final location of the paramecia. You would have no reason to challenge her: she is the expert. 11 Considering only the usual 20 naturally occurring amino acids, how many combinations of amino acids would be possible if four amino acids were to bond together in a random
order? Petroleum, from which products such as gasoline, kerosene, and plastics are made, is rich in carbon because it originated from partially decomposed organisms that died millions of years ago. Let's follow the steps of meiosis using human cells as an example. (b) Monkeys have tails whereas apes do not. Endocytosis and exocytosis Endocytosis
and exocytosis are processes that allow larger molecules to move across the plasma membrane. • Melatonin is secreted by the pineal gland to control circadian rhythms. One phrase that often comes up when looking for ways in which we can help our planet is 'act locally, think globally'. The most common chemical energy produced from
photosynthesis is the molecule glucose. Other enzymes (such as lipase) help the snake digest the triglyceride fats within the adipose tissue of the rodent. Scale bars and magnification will be addressed in more detail in a later practical activity. As the centuries went by, and as the study of biology became more systematic, tens of thousands of new
species were discovered in forests, deserts, and oceans, some of which showed characteristics of both plants and animals. Spain is the major European producer of maize genetically modified with a pesticide gene that kills insects that attack it. This epidermal layer is constantly being replaced
as the underlying dermal cells die and are moved upwards. • Oestrogen and progesterone are secreted by the placenta once it has formed. What other ways can you think of in which we use technology to know the biological world? Homology is observed in DNA sequences as well. Cell adhesion is provided by proteins that can they hook together in
various ways to provide permanent or temporary connections. Acetyl CoA may then enter the Krebs cycle to continue the aerobic respiration process. Refer frequently to Figures 11.8, 11.9 and 11.10 when following these steps of a muscle contraction. Use the hotlinks at the end of this section to watch a movie called GMO/OMG that premiered in New
York City in September 2013. Molecular biology Nucleotides are the building blocks of nucleic acids As you learned earlier in this chapter, nucleic acids are one of the major carbon-based groups. B II would decrease. It consists of sugars joined to polypeptides, and acts like a giant molecular network protecting the cell. The loop of Henle creates a
hypertonic environment in the medulla of the kidney Much of the water in the original filtrate remains after the filtrate has left the proximal convoluted tubule. It is important to note the functions of tissues in relation to their position in the leaf. As a result, the colour of the reef goes from being richly multi-coloured to being as white as bone.
 Eventually, the neural tube develops into the entire central nervous system: the brain and the spinal cord. The leading and lagging strands are assembled concurrently. Many enzymes, carriers, and other molecules are involved in the process. • A thickened, waxy cuticle reduces water loss by acting as an impenetrable barrier to water. Instead, a mule process.
is called an interspecific hybrid. **Largest plant genome sequenced so far. Unlike nitrogen, which can be fixed by bacteria and added back to the soil, phosphorous is not recycled easily. The primary somatosensory cortex is the main area for receiving the sense of touch. The pumping actions of the carriers result in a high concentration of hydrogen
ions in the intermembrane space. Note that the values are squared in order to be sure that the negative sign does not pose a problem. The cristae provide a large surface area for the electron transport chain to function on. • Production of antibodies by lymphocytes in response to particular antigens gives specific immunity. 681-715, tab. The two
major groups are the chlorophylls and the carotenoids. A radioactive counter is then placed over the head for about 30 minutes. Right-side circulation pattern. • Add standard deviation error bars to each mean point plotted on your graph, and add a note to your graph that the error
bars indicate standard deviation. As mentioned previously, passive transport does not require energy (in the form of ATP), but active transport does. • If the organism did not have that gene in the first place, could there be a good reason for its absence? Some of the products offered are revelations about ancient family origins and risk factors for some
health problems, such as the chances of developing certain types of cancer or heart disease. Myogenic control of heart rate Artificial heart valves. Will plants be the new pharmaceutical producers? • Click on: nucleotide blast. washington.edu/chudler/ functional.html motor association
cortex primary somatosensory cortex sensory association cortex visual association cortex visual cortex visual cortex prefrontal cortex prefrontal cortex visual association cortex prefrontal cortex visual association cortex prefrontal cortex prefrontal cortex prefrontal cortex visual association cortex visual association cortex prefrontal cortex visual association cortex prefrontal cortex visual association cortex prefrontal cortex prefrontal cortex visual association cortex visual association cortex visual association cortex prefrontal cortex visual association cortex visual associat
marker that can be used to assess whether a treatment is working for a patient or if the breast cancer is recurring. In addition to producing two important hormones (insulin and glucagon) involved in digestion: lipase, amylase, and a protein-digesting enzyme known as an
endopeptidase. Insulin is then secreted into the bloodstream and, because all body cells communicate chemically with blood, all cells are exposed to insulin. Foxgloves are now classified in a way that shows that they are more closely related to plantains; they are no longer considered to be figure.
inspiration versus an expiration. To learn more about blood types go to the hotlinks site, search for the title or ISBN, and click on Chapter 11: Section 11.1. First identify whether each of the following situations represents passive or active immunity and then 'verbalize' your justification for each decision for each situation.
Methylation patterns are now being used in the diagnosis and treatment of some cancers. When cross-fertilization occurs, pollen is carried from the anther of one plant to the stigma of a different plant of the same species. This student is measuring oxygen produced by an aquatic plant. Another species of tomato was modified by a bioengineering
company to make it more tolerant to higher levels of salt in the soil. The scarcity of water means that they have many behavioural and physiological adaptations for water conservation. Each carbon in the chain would have an appropriate number of hydrogens to make four bonds around each. The loop of Henle maintains hypertonic conditions in the
medulla. Fruits are mature ovaries (carpels) that contain seeds. What are QDs? To learn more about memory, go to the hotlinks site, search for the pain withdrawal reflex. Finding blood cells in urine can be a sign of kidney malfunction or perhaps
infection and bleeding somewhere in the renal tubes. • Ritalin is used for the treatment of attention deficit hyperactivity disorder (ADHD). number of glyphosateresistant weed species 5 4 3 2 1 0 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 year The word 'compare' in a question means you need to write down the similarities and contrast
the differences between two or more things. Be careful not to confuse pyramids of numbers: pyramids of numbers show the population sizes of each trophic level, not the energy at the start can sustain several trophic
levels. In the case of the midwife, on a busy night she might look out the window, see a full moon, and cry out to her colleagues, 'See? Figure 9.24 Interconversion of the phytochrome molecule between its two possible forms. • Wash off the plate to remove anything that has not attached. Thanks to such a graph, what advice can doctors give women
who wish to avoid this syndrome in their children? It is also important to note that the characteristics that change and evolve over time must be heritable (passed on by genes). The dependent factor is measured or described using quantitative or qualitative data. Many palaeontologists shy away from terms like 'missing link': what features of this use
of language make the term unscientific? There are usually two major types of proteins. When urine is nearly colourless, this means that your body has abundant water and is eliminating excess water as dilute urine. The melanic form of the peppered moth, called carbonaria, was increasing in number. Again, refer back to the worked example to see
this mutation. The secondary structure does not involve the side chains, the R-groups. So, what keeps food moving, and moving in the one direction? Transgenic goats now produce this protein. In a mouse, for example, the surface of the cerebral cortex is smooth, while in a dog it is very convoluted. A yellow tube sponge, one of the members of the
phylum Porifera. Right: Micrograph showing the telophase stage of mitosis in the root tip cell of maize. The second general location is the interior (lumen) of some part of the alimentary canal (gut). Rod cells in our eyes respond to dim light, resulting in black and white vision; cone cells respond to bright light, giving us colour vision. A male blue bird
of paradise, Paradisaea rudolphi, hangs upside down on a branch and spreads out his blue feathers. Some people think that both are fine, and some are in favour of one but not the other. Natural scientists often use experimentation in laboratories to test out their hypotheses. Consider the following example. The
pain reflex makes us pull away, for example, from a hot object. A concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of water that allows the movement to occur is the result of a difference between solute concentration gradient of the properties of the propertie
group, one 5-carbon monosaccharide, and a single nitrogenous base. The function of myoglobin is to store oxygen within muscles begin to enter an anaerobic situation when exercising heavily. Figure 8.20 This false-colour TEM and drawing show the structure of a chloroplast. Is that enough? 11 Compare and contrast rods and
cones. In 1928, Alexander Flemming, a Scottish biologist, noticed that Penicillium notatum, a mould, had killed staphylococcus bacteria in a culture dish. Cells that are aerobic normally take the two pyruvate molecules and metabolize them further in an aerobic series of reactions. Curve C shows the action of a non-competitive inhibitor because it
results in a lower maximum reaction rate. A huge problem that had to be solved with this step is that ammonia cannot be stored within the self-contained egg. Such a splitting is called a reduction division. A person with more body fat produces more of this hormone, so that the brain knows there are adequate energy stores. They vary in size from the
most minute mites, just over 100 µm long, to the Japanese giant spider crab, which is 4 m in length. 3, p. Without iodine these hormones cannot be synthesized. In 1917 an American food chemist discovered that A. However, if, for some reason, the Sun stops shining, because it is blocked from Earth by clouds or particles in the sky (as happens after
large volcanic eruptions), then the food chain is affected. • Variation can be discrete or continuous. It is used in the case of orchids, which have very small seeds, to grow plants more reliably in sterile cultures. Be cautious in the use of the fungicide. There are many other elements found within the molecules of living organisms. (1) (b) Calculate the
number of mating bees with head width from 5.8 to 5.9 mm. One of the components of pancreatic juice is amylase. In the past 10 000 years, however, many human populations have adopted an agricultural based lifestyle, raising animals for milk and consuming dairy products on a daily 119 03 Genetics basis. Measure the humidity in each chamber
with a Vernier probe. That project has sequenced the whole human genome using information technology and computers. In addition, near the plasma membrane surface, pinocytotic vesicles are often visible. Nucleic acids On one end (the 5 end) of the final mRNA transcript (mature mRNA), there is a cap made of a modified guanine nucleotide with
three phosphates. 481 11 Animal physiology Events occurring before birth Although many of the events described below are quite similar for other mammals, the details given here are specific to human oogenesis. In response, farmers, manufacturers, and transport providers, among others, wonder why they should invest money in new techniques
that reduce greenhouse gases if scientists are not 100% sure how an enhanced greenhouse effect is going to be harmful to the environment. 706 C.6 Nitrogen and phosphorus cycles Understandings: NATURE OF SCIENCE Assessing risks and benefits of scientific research: agricultural practices can disrupt the phosphorus cycle. 575 13 Option B:
Biotechnology and bioinformatics NATURE OF SCIENCE Serendipity has led to scientific discoveries: the discovery of penicillin by Alexander Fleming could be viewed as a chance occurrence. The colour of the precipitate indicates a
high sugar concentration. Table 9.7 summarizes three categories of plant in relation to light and flowering. 1 2 Bacterial colonies growing on nutrient agar in a Petri dish. • The iron atom is removed from each haem group. • To carry out a negative control test (one that is designed to purposely give negative results), test the lactose solution using
either a glucose test strip or Benedict's reagent (to show the absence of glucose). 7 Ground-nesting birds such as grouse lay their eggs in a nest made on the ground. Nitrobacter lives in welloxygenated soils and changes nitrites into nitrates, which are useable by plants. The large white cells are called goblet cells and they secrete mucus. By simply
limiting the intake of this one amino acid, the toxic levels characteristic of a 'normal' protein diet do not develop. • Membrane proteins are diverse in terms of structure, position in the membrane, and function. • Thus only the cells expressing GFP will fluoresce and can be found using fluorescent microscopy. Liver cells use active transport to
 accumulate glucose molecules from blood plasma even though the liver has a higher glucose concentration. In 1912, someone did just that, and called follicle cells repeatedly undergo mitosis. • Many desert plants shed their leaves and/or
become dormant in the driest months. It is easier to lose excess weight with a diet that includes fruits and vegetables, in part because there are 20 amino acids, there are 20 enzymes. In a test question referring to oxytocin and/or antidiuretic hormone
(ADH), specifically look for the words 'produced' versus 'secreted' before answering a question concerning the origin of these two hormones. Skill: Drawing of the ultrastructure of prokaryotic cells based on electron micrographs. The Punnett grid in Figure 3.28 explains her reasoning. The ability to accomplish a secondary immune response for a
particular antigen is actually what we call being 'immune' to a disease. tPut the marked kernels back into the bag and shake the bag. • Colour blindness is the inability to distinguish between certain colours, often green and red. The repeating sarcomeres are the reason why striated muscle has a banded pattern. Capillaries and alveoli are extremely
thin and delicate tissues consisting of single cell layers. When bile is added into the duodenum, the resulting emulsification does not chemically change the lipids, but it does break up the coalesced clumps and increases the surface area for lipase to catalyse the digestion. Figure 9 shows a scatter plot for the numbers of pairs of grey partridges (a types area for lipase to catalyse the digestion.
of bird) plotted against the number of sightings of birds of prey per square kilometre (km-2). There are three kinds of muscle, cardiac muscle, and skeletal (striated) muscle issue: smooth muscle, cardiac muscle, cardiac muscle, cardiac muscle, and skeletal (striated) muscle.
the skeletal muscle is achieved by the sliding of actin and myosin filaments. Because the carbons are carrying as many hydrogen atoms as possible, saturated fatty acids have no double bonds between the carbons are carrying as many hydrogen atoms as possible, saturated fatty acids have no double bonds between the carbon atoms. Elysia is a slug found in salt and tidal marshes and creeks. The method is described below. 345 07 Nucleic acids 2 3 4 Hydrogen
bonds between polar side chains. This Costa Rican ground beetle was named after Arnold Schwarzenegger because of the insect's large biceps. edu/Media/life-scienceslearning-center/documents/ DNA Microarrays and Cancer. The reason why there are so many different species of lemur with different specialties is because of
adaptive radiation. As with line graphs, scatter plots are useful for trying to see a correlation. To learn more about DNA structure, go to the hotlinks site, search for the title or ISBN, and click on Chapter 2: Section 2.6. NATURE OF SCIENCE Obtaining evidence for the semi-conservative
replication of DNA. Thus, our eyes see red. Researchers make movies of what is going on in the brain as a subject performs tasks or is exposed to various stimuli. What have you learned in Theory of Knowledge to help you to make your decision? and Li, Feng 1999, Copyright ©1999, reprinted by permission from Macmillan Publishers Ltd.; Figure on
page 792 from The relative effects of raptor predation and shooting on overwinter mortality of grey partridges in the United Kingdom, Journal of Applied Ecology, 44 (5), pp. A blood pressure reading is actually two values, one called the systolic pressure and the other called the diastolic pressure. PCR allows large numbers of copies to be made of a
DNA fragment. If there are many extremes, the standard deviation will be large; with few extremes the standard deviation will be small. • NATURE OF SCIENCE Assessing risks and benefits with scientific research: the risks to human male fertility were not adequately assessed before steroids related to progesterone and oestrogen were released into
the environment as a result of the use of the female contraceptive pill. Assume you are an oncologist (a doctor who treats cancer) and your patient has skin cancer. In addition, the amount of time people devote to procuring and preparing their own food has dramatically decreased. et al., eds. Stem cells are being utilized in a number of ways by
scientists around the world. Spermatogonia undergo mitosis in order to replenish their numbers. If a motor area of the brain is affected, then paralysis will be seen in the right arm and right leg. Notice that the Z lines form the ends of this and all sarcomeres. This means that 40-50% of the haemoglobin that
has recently been to the lungs gives up (dissociates) one or more oxygen molecules when the haemoglobin reaches the body tissues. Discuss how both approaches have allowed the accumulation of the body of knowledge we now possess in biology. Originally, as for all mammals, the only age at which we drank milk was when we were infants. 972-982
(Watson, M. • The serum to be tested is added to the wells. Thanks to new technology, Woese and his colleagues noticed a large difference in the ribosomal (r)RNA of a group previously considered to be prokaryotes. The contracting units of myofibrils are sarcomeres A myofibril is composed of many side-by-side contracting units called sarcomeres.
Angelman's syndrome is a genetically inherited disorder, which primarily affects the nervous system. The body cavities of insects have small tubes called bridges because they are strong bonds. • The optic nerve connects with the pretectal nucleus of the
brainstem (the rectangle in Figure 12.13). Proteins synthesized in this manner have several different destinations. The world saw the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of radiation poisoning on people when the city of Hiroshima was the terrifying effects of the first two people when the city of t
in a repetitive way for many nucleotides. These fatty acids are called polyunsaturated because two or more carbons are double bonded to each other). In some instances, the scientists have been pleasantly surprised to find that nature
seems to be doing fine despite the dangerously high 155 03 Genetics radiation levels. • Oxygen is produced in photosynthesis from the DNA counterpart, because RNA nucleotides contain the sugar ribose not deoxyribose. • Because they
survive to adulthood, the successful organisms have a better chance of reproducing and passing on their successful genetic characteristics to the next generation. In order to avoid these unpleasant symptoms, people who are lactose intolerant can eat milk and milk products that have been treated with lactase before consumption. Because the tubule
is a small tube, there is a cavity or lumen at the centre. Scientists supported by the National Institutes of Health in the USA have been studying pruning using the mouse as a model organism. Table 15.1 Important digestive secretions Exocrine secretion 726 Exocrine gland Ducts lead to Function of secretion Salivary glands Mouth Moistens
food; contains the enzyme amylase Gastric juice Three cell types found in pits in the stomach wall Interior of the stomach; hydrochloric acid (HCl) denatures protects the stomach; hydrochloric acid (HCl) denatures protects the stomach amylase are all enzymes; a bicarbonate solution helps neutralize
 partially digested food entering from the stomach Bile Liver Gall bladder and duodenum Emulsification of lipids Gastric secretions and their control oesophagus sphincter valve three layers of smooth muscle duodenum Figure 15.3 The term 'gastric' specifically refers to the stomach. Hypertension There are many factors that can contribute to
 hypertension. When the physical exertion ceases, or at least decreases, the 760 chemoreceptors detect the decrease in ventilation rate. For example, lipase is an enzyme specific for lipid molecules, and amylase is specific for
 amylose (otherwise known as starch). The electrons are supplied one by one to the chlorophyll a molecules of the reaction centre. Commercially available lactase is also quite temperature tolerant and will not completely denature until boiled for about 30 minutes. However, unlike the Krebs cycle, which occurred in the matrix, the electron transport
chain occurs on the inner mitochondrial membrane and on the membranes of the cristae. The 2 value will help us determine whether the null hypothesis can be accepted or rejected. What do you interpret this dark shape to be? The calorie count based on lipid content is important for many people in order to maintain a healthy weight, but the type of
lipids found in foods that gives those calories should be important to everyone. • • • Cut off 2 mm of the tips, and place these segments on a microscope slide. The DNA opens and a transcription bubble forms. Seeing rats again, the farmer puts out more of the original poison; this time fewer rats die. Dichromats see the world differently depending
on the variation they have inherited. Auxins are found in the embryo of seeds, the meristems of apical buds (shoot apex), and young leaves. 5 Before birth, a human foetus has a hole between the right atrium. If you apply your critical thinking to this, some knowledge questions should pop into your mind. As we have seen, a 2-3-year-old
and the presence of water. This is a reduction reaction. The mutated red blood cell, with a characteristic curved shape, made its discoverers think of a sickle (a curved knife used to cut tall plants). (1) link reaction (ii) Indicate two places where decarboxylation occurs on the diagram. Each chromosome still exists as a pair of chromatids, so there is
 another cell division called meiosis II. In this case, it is likely that the authors of the report in which this graph appeared wanted to show the correlation between the sightings of birds of prey and the number of couples of partridges. It would save huge amounts of money if oil pipelines, dental drills, and medical catheters, to mention just a few items,
had improved surfaces. A coenzyme is a molecule that aids an enzyme in its action. follicles corpus luteum wall of uterus endometrium (inner lining of uterus) cervix vagina The typical location for fertilization is within one of the Fallopian tubes. Glucose, a typical product of photosynthesis, is an organic molecule. Thus when water 62 molecules
are attracted to cellulose molecules by hydrogen bonding, the attraction is an example of adhesion because the hydrogen bonding is between two different kinds of molecules. This lab reinforces the concepts associated with changes in homeostatic mechanisms in the human body. The riffle contains abundant food. The methyl mercury builds up in the
 organisms in the ecosystem. Gould. Yes, the two categories are related to each other. These compounds are necessary to make useful things such as cell membranes and proteins such as enzymes. 447 10 In science, theories are like pairs of glasses. (1) (1) 569 12 Option A: Neurobiology and behaviour (b) Identify the two most common activities of the
bee over the 24 days. Biochemistry is the branch of organic chemistry that attempts to explain the chemistry characteristics of living organisms. • • Applications and skills: Applications are skills: Applications and skills: Applications are skil
carboxylase (rubisco) is the most ubiquitous protein on Earth. 409 09 Plant biology Many of the seeds will not produce a functional plant because of these dangers. The generalised features of flowers which have been used to identify members of
the figwort family for a long time. Activity 2 - Using DNA similarities to build a cladogramA new method is beginning to provide a lot of new evidence about how groups of living things are related. 8.2 Cell respiration Understandings: NATURE OF SCIENCE Paradigm shift: the chemiosmotic theory led to a paradigm shift in the field of bioenergetics. It
is called cyclic photophosphorylation. (b) Some ideas for producing your own wet-mount slides include: the inside epidermal layer from the bulb of an onion; Elodea leaf cells; Anabaena (an aquatic cyanobacterium); cheek cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells; Anabaena (an aquatic cyanobacterium); cheek cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells; Anabaena (an aquatic cyanobacterium); cheek cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells; Anabaena (an aquatic cyanobacterium); cheek cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells; Anabaena (an aquatic cyanobacterium); cheek cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells; Anabaena (an aquatic cyanobacterium); cheek cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells; Anabaena (an aquatic cyanobacterium); cheek cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells from inside epidermal layer from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells from the bulb of an onion; Elodea leaf cells fr
blood vessel is significantly smaller than it was at an earlier time in this person's life. In animals, it is common for one specialized gland or cell to produce a hormone. Grassland ecosystem: diatoms copepods herring seals great
 white shark The definition of a food chain is a sequence showing the feeding relationships and energy flow between species. How do we know that this chunk of rock is really from Mars? The chain-stopping unique dideoxynucleotides are now labelled with fluorescent markers for easy recognition and quicker sequencing. As each parent can have
different alleles for each of the genes along the chromatids, the two homologous chromosomes are by no means identical. Explain in detail. Application: Studies showing age of parents influences chances of non-disjunction. One estimate suggests that using vitamin B12 as a supplement can prevent 50% of neural tube defects. Fertilization usually account of the genes along the chromatids, the two homologous chromosomes are by no means identical. Explain in detail.
occurs within the Fallopian tube. To test yourself another way, try to explain the retina to someone else using the picture. This allows the formation of a specific protein. His results suggested that the curvature of stems was directly proportional to the amount of growth
phenylketonuria (PKU) • sickle cell disease and sickle cell trait • Tay Sachs disease • thalassemia. The doctors at the clinic claim they have a 95% success rate, which is considerably higher than current sperm separation
techniques. 242 Examples of binomial nomenclature Sometimes scientific names for organisms are relatively easy to decipher because they contain their common names: • Amoeba amazonas • Equus zebra • Gekko gecko (this lizard gets its name from the sounds it makes). In fact, based on the biochemistry of proteins, the two terms do have a
slightly different meaning. You can try it at home with popcorn kernels. 1 2 3 4 5 6 7 8 9 Action potential results in calcium ions (Ca2+) diffusing into the terminal buttons. It contains an amazing 100 billion neurones, with thousands of synapses making the amount of connectivity literally mind-boggling. This hormone results in milk production and
secretion. One of the ways to pre-digest milk products on a large industrial scale is to use the method described above. The codons are specific for certain amino acids or punctuation signals. The side of this 'pancake' that is further into the uterine wall is made of connective tissue and blood vessels formed by the mother. If a response is needed, some
portion of the brain or spinal cord initiates a response that is called a motor response. The second stage of photosynthesis is a series of reactions. Oxygen in the alveoli typically diffuses into the bloodstream typically diffuses into the blood
diffuses into the alveoli. Who determines whether it is safe? Option A: Neurobiology and behaviour on the left side of the body, and vice versa. It appears to stop the activity of the enzyme that breaks down dopamine in the synaptic cleft. This diffusion of sodium ions is the 'impulse' or action potential, and results in the inside of the axon becoming
temporarily positive in relation to the outside. Diseases caused by sex-linked genes or co-dominant alleles Genes carried on the sex chromosome, there are fewer loci. More specifically, it is cardiac muscle. Worked example Here is an example of a key for identifying the animal
taxa listed in this chapter. However, one feature that unites cnidarians is that they all have stinging cells called nematocysts. Often they are grouped so that a sequence of metabolic reactions, called a metabolic pathway, can occur. The job of the neurone is to find the best fit. He found that by giving a puff of serotonin, a slow-acting neurotransmitter
to Aplysia the following would occur. 3 What is the effect of altering the concentration of substrate (lactose) on the activity of the enzyme lactase? Is this food safe? The phosphorous that is way into ocean sediments. We are acquiring new skills and
knowledge daily. In other words, the hybridoma cells are virtually immortal as long as they are kept in a suitable environment. Thus in the synapse high concentrations of dopamine cause euphoria, and high concentrations of noradrenaline may be responsible for the alertness and high energy effect of amphetamines. • Diets high in complex
carbohydrates, fruits, and vegetables decrease the risk of CHD. In this experiment, DCPIP or DPIP (2,6-dichlorophenolindophenol) will be used to replace NADP in the light-dependent reaction. 10 Explain why humans do not need excessive amounts of iron in their diet in order to make the millions of new erythrocytes that are formed each and every
minute in the bone marrow. If a student writes on an IB exam that he or she refuses to answer the questions about evolution by natural selection because of his or her religious beliefs, should he or she get any marks? These two terms perfectly describe spermatogonia. Figure 3.13 How the chromosome number is halved. The most common pathogens to answer the questions about evolution by natural selection because of his or her religious beliefs, should he or she get any marks? These two terms perfectly describes about evolution by natural selection because of his or her religious beliefs, should he or she get any marks? These two terms perfectly describes about evolution by natural selection because of his or her religious beliefs, should he or she get any marks? These two terms perfectly describes about evolution by natural selection because of his or her religious beliefs, should he or she get any marks?
are certain viruses and bacteria. They serve many functions in cells and organisms. • Obesity significantly increases the risk of mortality from CHD. This is a coloured composite three-dimensional functional magnetic resonance imaging (fMRI) and computed tomography (CT) scan of the human brain, seen from the front. • Translation depends on
complementary base pairing between codons on mRNA and anticodons on tRNA. What is a eukaryotic cell? • Cnidaria: this phylum includes sea jellies (jellyfish) and coral polyps, among others. • Photolysis of water generates electrons for use in the light-dependent reactions. Figure 5.12 A diagram from the interactive Tree of Life online tool. Leaves
however, are essential for fluid transport. If a disease is genetic, it can be identified by genetic variations in the DNA sequence called markers. Notice that the cone cell has only one part, while the rod cell has only one part, while the rod cell has three. She knew the power of statistical analysis in determining correlation and was horrified by genetic variations in the DNA sequence called markers.
most proteins are far outside their normal pH range, and thus become denatured. It is clear that for every 12 TP molecules of the 5-carbon compound RuBP. Example: aa gives rise to the recessive trait because no dominant allele is there to mask it. In Figure 2.16, the double bond between two
carbons in the hydrocarbon chain is highlighted. acetyl CoA Figure 8.13 Next, a 4-carbon compound is produced. Bick, B. This would explain why continents and islands tend to have either prosimians (such as lemurs) or anthropoids (such as monkeys and apes), but not both types of primate. (c) If this graph shows an impulse somewhere in the middle
of an axon, and this is a myelinated fibre, what area of the axon will next undergo an action potential? Other morphological adaptations included a differently shaped head, that was larger and wider, to allow them to bite off and chew leaves more effectively. Consider psychology, anthropology, a
presence or absence of antidiuretic hormone (ADH). That's an impressive quantity of information, especially considering that you can keep it all in the nucleus of a typical cell in your body. We can also use this idea to see whether the differences between two populations are random or not. 719 15 Option D: Human physiology Fatty acids: two are
 essential In Chapter 2 you learned that there are a variety of fatty acids that are components in triglycerides and phospholipids. Under Stalin, he was promoted to a high-ranking post in agronomy and given his own scientific journal for publishing his ideas. Guidance 

Diagrams of chiasmata should show sister chromatids still closely aligned, except
at the point where crossing over occurred and a chiasma was formed. B Bryophyta. Adult jaundice has many of the same symptoms and consequences as infant jaundice forms of pathogens that cause a primary immune response within your
body. A A Example: a parent with curly hair and a parent with straight hair can have children with different degrees of hair curliness, because both alleles influence hair condition when both are present in the genotype. Some microorganisms use sunlight and others use the energy held in the chemical bonds of molecules. • Now calculate the Rf value
for each of the separated pigments. One of the primary tissue types that is used first is skeletal muscle. In March 2010, a stem cell treatment was begun that are damaged by Stargardt's disease. The development of antibiotic-resistant bacteria has happened in several cases.
Just a few generations ago, most people in the world lived on farms. 243 05 What do we do with viruses? The container is then placed on a digital balance in order to find the amount of vitamin C in various foods. Thus the time period when both chambers are at
rest can be described as both chambers undergoing diastole. For example, GnRH stimulates the secretion of both follicle-stimulating hormone (FSH) and luteinizing hormone (FSH) and lutein
one bacterium should be included in the comparison, and at least one species with more genes and one with fewer genes than a human. Components of red blood cells are recycled by the liver. Local alignment can detect small regions of similarity, which may be more biologically significant than larger regions. Mixing genetic material between non-
sister chromatids, in other words between paternal and maternal chromosomes, can occur when the chromatids intertwine and break. Each of these variables has an expected value or set point that is considered to be normal for homeostasis. For example, some of the cells that make up the retina of your eyes are receptor cells. They have discovered
that cells called microglia, a type of glial cell, can prune unused synapses. Not all proteins consist of multiple chains, so not all proteins have a quaternary structure. 245 05 Evolution and biodiversity A common ancestral species In biology, one of the objectives of classification is to represent how living (and extinct) organisms are connected
Metaphase Examine the figure below. • How can we find out who was at a crime scene by analysing their DNA? Hypothesis Ventilation rate will be positively correlated with the increasing duration of a chosen exercise. These are among the reasons why a couple will never have the same offspring twice. By systematically comparing such
characteristics, quantitative results show which organisms have a more recent split in the evolutionary past and which have a more distant split. The muscle motion and food movement caused by the action of these two muscle layers is called peristalsis. You have probably realized that methane has a very low (cold) freezing point and also a very low
boiling point. Evolution of homologous structures by adaptive radiation Other evidence for evolution comes in the form of homologous anatomical structures, which are similar in form but which are found in seemingly dissimilar species. This is the link reaction shown in Figure 8.10. Bulk vaccines can then be made from the tobacco plants. But then
there was Dolly. (c) 'Fill in' with hydrogen atoms, to ensure that all the carbon atoms are showing four covalent bonds. As arteries begin to build up plaque, they become harder and therefore less flexible. At the ends of the forks of the 'Y' are two sequences of amino acids that are unique to each type of antibody. Within the category of plants,
biologists have smaller categories for flowering plants, conifers, spore-producing plants, etc. Gram-positive bacteria will stain violet and Gram-negative will stain pink. Most types of lipids are relatively nonpolar and thus most organisms have special strategies to deal with the transport and biochemistry of lipids. The Student's t-test (named after a
scientist publishing his work under the pseudonym 'Student') compares two sets of data, for example the heights of the bean plants grown in shade. The rest will radiate within the atmosphere, preventing it from getting extremely cold at night when no more sunlight is present. • Endoplasmic
reticulum and Golgi apparatus in hepatocytes produce plasma proteins. Copernicus How could you verify that? Volcanic ash rained down, smothering the destroyed forest and covering the destroyed forest and coveri
intellectual aptitude. If a person has sickle cell anaemia, evidence for this can be observed under a microscope. A baby bird that has pigments that give it a colour matching its surroundings will have a better chance of not being seen by a predator. 2 Free-living nitrogen fixation. In self-pollination, pollen from the anther of the same plant falls upon its
own stigma. Figure 11.29 The sequence of events in mammalian embryos preventing polyspermy. 158 large quantity of DNA comes out thermocycler copies segments of DNA When collecting DNA from the scene of a crime or from a cheek smear, often only a very limited number of cells are available. We can tell the position of our arms and legs by
the use of proprioceptors found in muscle fibres, tendons, joints, and ligaments. Without knowing it, you are carrying around in each one of your cells a library of information about your past. 36 Explain the conditions under which eutrophication-induced microalgae blooms decreased the growth of the reef-building corals. Emergent properties are
based on the idea that the whole is greater than the sum of its parts. Scientists often develop software to help this type of research. This single-celled organism may be used to demonstrate several of the functions of life. 3 4 1 2 Establishing marine reserves and no-catch zones can improve biodiversity and increase fish stocks in areas that are
protected. Although there are rare exceptions, individuals are usually incapable of changing themselves to adapt. The same is true with RNA polymerase. A.4 Behavioural patterns can be inherited or learned. This results in each chromatid having an identical copy, or sister chromatid, attached to it at the centromere. Extracellular K! P P Figure 1.22
Stage 4: Extracellular potassium ions attach to the protein. In the latter case, pyruvate is converted to lactase in animals, and ethanol and carbon dioxide in plants. Therefore an increase in thyroxin will lead to an increase in body temperature, and vice versa. Other examples, including local examples that can be observed, should also be studied if
possible. This is the interaction that takes place between the activities of the excitatory and inhibitory neurones at the synapses. But this is not in fact true: the stages occur along a continuum. Unfortunately that simple logic doesn't always hold true, as evidenced by the very large incidence of obesity in modern society today. If the field is too full to
 count, mentally divide it into fourths or eighths, count the cells within that fraction, and multiply that number to get the count as accurately as possible for one field of view. B Introns. Constriction of the pupil happens because of a motor neurone causing the circular muscle to contract and so the radial muscle relaxes. Notice that the 4C molecule of
the Krebs cycle combines with the 2C molecule called acetyl-CoA. 1 and fig. • Researchers can follow the role of calcium ions in muscle contraction by using fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions in muscle contraction by using fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging technology that allows the fluorescent calcium ions and specialized imaging the fluorescent calcium ions and specialized imaging the fluorescent calcium ions and specialized imaging the fluorescent calcium ions are specialized in the fluorescent calcium ions and specialized imaging the fluorescent calcium ions are specialized in the fluorescent calcium ions and specialized imaging the fluorescent calcium ions are specialized in 
extensive branching pattern, and because of some specialized epidermal structures called root hairs. Information in this area is essential to the understanding of how these drugs might affect differentiating cells in existing organisms. Knowledge is measured by performance. Pardon me! CH4 CH4 CH4 CH4 CH4 CH4 Figure 4.9 Methane gas
production. Multiple spermatozoa are attempting to fertilize the ovum as meiosis II is being completed within the ovum. Skill: Design of experiments to investigate the effect of limiting factors on photosynthesis.
deviation We use standard deviation to summarize the spread of values around the mean, and to compare the means and spread of data between two or more samples. 603 13 Option B: Biotechnology and bioinformatics Figure 13.21 Formulas for the bioremediation of mercury. The thylakoids are flattened membrane sacs with components necessary
for the absorption of light. These different shapes affect the haemoglobin's ability to bind with oxygen molecules. A modern-day protist called Hatena normally fulfils its nutritional needs by ingesting organic matter. Actions that lead to an inspiration (breathing in) 1 The diaphragm contracts, and at the same time the external intercostal muscles and
one set of abdominal muscles help to raise the rib cage. In order to compare these haemoglobin beta chains, we need to have the protein sequences for each organism. Interactions that cause tertiary organization include the following. Vessel element. They injected eight mice with a deadly bacterial species and four of these mice were also injected
with the newly isolated penicillin. • Cranial nerves emerge from an area of the brain known as the brainstem. If you are at your resting heart rate, your heart itself is controlling the frequency and internal timing of the events of each cardiac cycle. Figure 3.16 Crossing over occurring in a pair of homologous chromosomes. 24 How many genes in this
microarray are turned on in the cancer cell? 3 For a long time, scurvy was thought to be unique to humans, as scientists could not replicate the symptoms of scurvy in rats and mice, even when these animals were denied vitamin C for a long period of time. 8.2 Energy is converted to a usable form in cell respiration. Human physiology 6.3 Defence
against infectious disease Understandings The skin and mucous membranes form a primary defence against pathogens that cause infectious disease. If any two of the species tried to mate, they would not successfully produce fertile offspring. Figure 10.6 Anaphase II, during which sister chromatids are pulled to opposite poles of the cells. Let's
consider the cycle as a series of steps. Ask your teacher what precautions to consider.* There are two options for doing this lab, depending on time and materials available. Humans have 22 pairs of autosomes and one pair of sex chromosomes (see Figure 3.11). When blood leaves an arteriole (the smallest of the arteries), 276 it enters a capillary bed
rather than a single capillary. To understand the workings of the heart, it is only necessary to look at one side of the heart with the understanding that the other side has similar pressures and volumes of blood at the same time. The line might be 10, 25, or 50 m long, and can be made using a long tape measure or piece of string or rope. (Total 2
marks) 449 11 Animal physiology Essential ideas 11.1 Immunity is based on recognition of self and destruction of foreign material. A Nucleoid region B Chromatin C Histones D Endoplasmic reticulum (Total 1 mark) www.bio.mtu.edu/campbell/prokaryo.htm 48 3 Which of the following is not a function performed by a membrane protein?
Epidemiologists need accurate data to predict the spread of the flu from one country to the next. ciliary ganglion oculomotor nerve optic tract constrictor muscle of iris Edinger-Westphal nucleus optic tract constrictor muscle of iris Edinger-Westphal nu
inside the cell wall and is similar in composition to the membranes of eukaryotic cells. They believed that the proteins formed a mosaic floating in a fluid layer of phospholipids. Each body cell contains the same genetic information, and all body cells have a common set of plasma membrane proteins. The largest quantity of phosphorous is found in
 marine sediments and mineral deposits. When Gregor Mendel proposed his ideas about 'factors' (genes) controlling inherited traits, scientists were not eager to adopt his theories. Tertiary organization The third level in protein organization is the tertiary structure. Quantity of carbon (GtC yr-1) Carbon fluxes Table 4.4 Carbon exchange into and out of
the atmosphere Examples of fluxes into the atmosphere Respiration of terrestrial organisms 120 Respiration of the ocean 92 Burning of fossil fuels (such as transport) 7.7 Changes in land use (such as transport) 7.7 Changes in land use (such as transport) 7.7 Changes in land use (such as deforestation) 1.5 Examples of fluxes out of the atmosphere Absorption of carbon dioxide into the water at the
surface of the ocean 90 Gross primary production (GPP), photosynthesis of terrestrial organisms 40 Changes in land use (such as growing crops in prairies) 0.5 Weathering, carbon dioxide being incorporated into rocks and soils 0.2 Exercises 8 9 Study Figure 4.16. NATURE OF SCIENCE It is tempting to place of the ocean 90 Gross primary production (GPP), photosynthesis of terrestrial organisms 40 Changes in land use (such as growing crops in prairies) 0.5 Weathering, carbon dioxide being incorporated into rocks and soils 0.2 Exercises 8 9 Study Figure 4.16. NATURE OF SCIENCE It is tempting to place of the ocean 90 Gross primary production (GPP), photosynthesis of terrestrial organisms 40 Changes in land use (such as growing crops in prairies) 0.5 Weathering, carbon dioxide being incorporated into rocks and soils 0.2 Exercises 8 9 Study Figure 4.16.
invertebrates in respirometers to determine oxygen consumption. Sometimes, members of separate but similar species mate and succeed in producing hybrid offspring. If their levels in the blood are elevated, they are referred to as the 'bad lipoproteins'. This diversity makes it difficult to give an overall description of common characteristics. For
example, in a woman's lifetime, it is nearly impossible for her to produce the same egg twice. When you breathe less dense air, diffusion of oxygen across the alveoli into the bloodstream is less efficient, and less oxygen enters your bloodstream. Figure 5.4 A salamander skeleton. sink cell (storage root) sucrose Figure 9.12 The pressure-flow
hypothesis. To find out more about this, use the hotlinks at the end of this section. The process that requires oxygen (and gives off carbon dioxide) is aerobic cell respiration. Even before eating food, your stomach is being prepared for digestion. 5 Explain in biological terms what your graph shows. Estimate the population size. The dark ovoid objects
spread throughout the cell are mitochondria surrounded by large numbers of endoplasmic reticulum. These trees require nearly 1.4 m (55 inches) of rainfall a year to reach their great size. There is no one pH that is best for all enzymes (see Figure 2.26). This contact starts the translation process. The two segments each connect to the corresponding
position on the other chromatid. Scientists have hypothesized that each of our hundreds of olfactory receptors is encoded for by a specific gene. sicula before. How do we know? Members of the same species have a common gene pool (i.e. a common gene).
   obe on the microarray. small quantity of DNA goes in Figure 3.36 Analysis is impossible with the DNA from just one or a few cell's DNA is in the form of chromatin. What does this story reveal about scientific observations, hypotheses, and conclusions? Each box contains open questions to help trigger critical thinking and
discussion. The tennis player is then given the task of cleaning tables. We see that our calculated value of t (0.06) is less than 0.69 on the table, indicating that the probability that the differences between the two populations of plants are due to chance alone is greater than 50%. • Step 3 - Determine gametes. Table 10.3 Critical values for 2 Degrees
of freedom (d.f.) Probability values (p) 0.1\ 0.05\ 0.025\ 0.01\ 0.005\ 1\ 2.706\ 3.841\ 5.024\ 6.635\ 7.879\ 2\ 4.605\ 5.991\ 7.378\ 9.21\ 10.597\ 3\ 6.251\ 7.815\ 9.348\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\ 11.345\ 12.838\
21.955 9 14.684 16.919 19.023 21.666 23.589 10 15.987 18.307 20.483 23.209 25.188 Look at Table 10.3 and find the critical value of 0.05 and a degree of freedom of 1.
parasitism. If one data point was unusually large or unusually small, this very large or small data point would have a big effect on the range. Pavlov was a psychologist. The following table shows the meaning of the 64 different possible codons. 526 Sensory hairs of the cochlea detect sounds of specific length A B hair cell C stereocilia apex basilar
membrane 1kHz 4kHz base cochlea 16kHz Figure 12.26 The stereocilia in the cochlea detect sounds of a specific wavelength. Figure 8.16 it is clear that the electrons are stepping down in potential energy as they pass from one carrier to another. After one
replication of DNA, the resulting DNA contains both light and heavy nitrogen. Listening to your favourite music can make you feel happy. These tubes are closed at one end (the distal end) and open into the insect's gut at the other (proximal) end. Photosynthesis is an example of an anabolic pathway. Currently, antibiotics are the most important
product of fermentation. Using any diagram or photomicrograph of a mitochondrion, practise annotating where the processes of aerobic respiration occur. Each primary bronchus continues to divide multiple times, leading to smaller and smaller bronchioles. The example in Figure 2.13 shows the formation of the disaccharide sucrose from the
reaction between the two monosaccharides glucose and fructose. The Michigan Department of Natural Resources (MDNR) puts a coded microscopic wire tag in the nose of chinook salmon and lake trout that have been planted (stocked) in the Great Lakes. The radioactive form added in the experiment is called 3 H-thymidine, in which the 3H is the
radioactive isotope of hydrogen. A current estimate for human beings is somewhere between 20 000 and 25 000 genes in each of our cells. Although these factors are not living things have with them. prophase metaphase anaphase Mitosis telophase
Laboratories all over the world are busy researching causes and treatments for all known types of cancers. What happened? Using a stain such as methylene blue or iodine often means you can see the parts of a cell more clearly. What the letters of FASTA stand for in a BLASTn or BLASTp can be seen in Tables 13.5 and 13.6. 629 13 Option B:
Biotechnology and bioinformatics Table 13.5 Nucleic acid codes (used in BLASTn) Nucleic acid code Meaning Mnemonic A A Adenine C C Cytosine G G Guanine T T Thymine U U Uracil R A or G puRine Y C, T or U Weak
interaction B Not A (i.e. C, G, T or U) B comes after A D Not C (i.e. A, G, T or U) B comes after C H Not G (i.e., A, C, T or U) B comes after C H Not G (i.e., A, C or G) V comes after D Not C (i.e. A, C, T or U) B comes after C H Not G (i.e., A, C or G) V comes after D Not C (i.e. A, C, T or U) B comes after D Not C (i.e. A, C or G) V comes after D Not C (i.e. A, C 
us do a protein alignment activity. This depolarized area of the axon to open up the channels for sodium, and thus the action potential continues down the axon. 73 Option B: Biotechnology and bioinformatics Starting materials DNA polymerase Primers: target DNA 5 3 Nucleotides: dATP dCTP dGTP dTTP target
sequence Denaturation stage 1 Heat to denature DNA. A new culture of E. 761 15 Option D: Human physiology Earlier you learned about the internal workings of lung tissue (Section 6.4). drug stops removal of neurotransmitter drug enhances effect by mimicking neurotransmitter drug blocks receptor for neurotransmitter Effect of drugs on the brain
Drugs can alter your mood or your emotional state. As he is listening, he is attempting to match his template to the full adult song. The population sees more and fewer short-necked giraffes and fewer short-necked giraffes
They also identify common pitfalls in understanding, and omissions made in answering questions. When people have lesions in the right hemisphere, they have problems identifying faces and locating an object correctly in space. In this area, there are binding sites for mRNA and three sites for the binding of tRNA, as shown in Table 7.3. Table 7.3
Ribosomal binding sites for tRNA and their functions Site Function A Holds the tRNA carrying the next amino acid to be added to the polypeptide chain E Site from which tRNA that has lost its amino acid is discharged Figure 7.13 This model shows the arrangement of subunits and binding
sites in a ribosome. The point of controlling the genes of a microorganism and regulating its biochemical pathways is to increase the production of a substance that we want by that cell. Heat energy, otherwise known as infrared radiation, has longer wavelengths than energy in the form of light. Much of the aggressive behaviour attributed to
alligators arises when people disturb a female who is protecting a nest or young hatchlings. This includes axon sprouting (new connections between axons), post-stroke neurogenesis (migration of new neurones and blood vessels. This allows the entire
scientific community to fit new knowledge into the bigger picture of science, and sometimes that only happens much later. Do the same for the high points. Therefore, the chromosomes at this stage are each composed of two sister chromatids. Amazingly, the fake fossil puzzled specialists for more than 40 years before it was finally exposed as a hoax.
The placebo effect One of the ways that scientists test a drug is to compare it with a placebo. haemoglobin in environment 60 where partial pressure of CO2 is relatively low Let's consider what happens to adult haemoglobin in different environments in the body. However, in a brain-dead person there can still be spinal reflexes. Rinse off iodine.
NATURE OF SCIENCE From the 1930s to the 1960s, there was a big debate about whether communication between nerve cells was electrical or chemical. 4 Scientists need money for their work, and they often get that money from grants offered by governments and industries. • • • • Chlorella (a type of green algae) was placed inside the lollipop.
Indeed, food material often has to move against gravity. Circulation of blood to and from the liver receives blood from two major blood vessels, and is drained by one (see Figure 15.7). A multitude of reactions are occurring inside each living organism's cells at any given moment. Oxygen-rich blood from the hepatic artery and (sometimes)
nutrient-rich blood from the hepatic portal vein both flow into sinusoids of the liver. Because Calvin carried out this procedure with algae released at different time intervals, he obtained different times. Skill: Drawing simple diagrams of the structure of single nucleotides of DNA and RNA, using circles, pentagons, and rectangles
to represent phosphates, pentoses, and bases. Standard deviation can sometimes be used in data processing to help you to decide whether your data are following a clear pattern or whether something is generating unexpected variations. of the quadrat at that position. Medical treatments such as special injections help give people affected by
haemophilia a better quality of life. Robert Hooke first described cells in 1665 after looking at cork with a self-built microscope. instances when the immune system itself can create problems. These cells can be cultured for a very long period of time because they have some of the characteristics of a tumour cell. Remember to determine the degrees of
freedom and to use 0.05 as the value for p. Because the chromosomes in sperm and egg cells do not come in pairs, but rather only have a single chromosome from each pair, they are said to be haploid. The adjective adaptation and the verb to adapt are freely used when talking about evolution. AEDs found in these areas are designed for anyone to
use because they have audible instructions and the components are very easy to handle. If the answer is no, then go to the end of its line and find the number of the next pair of statements to look at. We can trace the inheritance of albinism with a Punnett grid. This layer of
mainly dead cells forms a good barrier against most pathogens because it is not truly alive. Or is it one big Gaia-type living organism? This enables cell elongation on the side of the shoot necessary to cause growth towards the light. They begin swimming up the endometrial lining, and some enter the openings of the two Fallopian tubes. B Short
sections of DNA formed during DNA replication. The key events are summarized in the following bullet list and in Figure 15.9. • The four globin proteins of each haemoglobin to bind to oxygen (dissociate).
Applications and skills: Application: Non-disjunction can cause Down syndrome and other chromosome abnormalities. In the 1997 science fiction film GATTACA, one of the main characters brings a sample of cells to a walk-up window at an establishment that provides anonymous genome services. The molecule named [1215]MIL was used to label
active serotonin receptors in the brains of the rats. • Drawings of eukaryotic cells should show a plasma membrane enclosing cytoplasm that contains 80S ribosomes and a nucleus, mitochondria and other membrane enclosing cytoplasm that contains 80S ribosomes and a nucleus, mitochondria and other membrane enclosing cytoplasm that contains 80S ribosomes and a nucleus, mitochondria and other membrane enclosing cytoplasm.
diseases known to humans. 10 How many peptide bonds would be found in a polypeptide that contains 76 amino acids? olfactory bulb 3 The signals are relayed in glomeruli. All of the next steps of birdsong development are learned (see Figure 12.36). SARS virus is a very contagious respiratory virus that has infected thousands of people since its
discovery in 2002. Despite our understanding of the importance of variation for natural selection, biodiversity, and for our health, countries all over the world are reducing the variety of crops they plant, and are replacing balanced ecosystems with monocultures. They produce oxygen and carbohydrates while absorbing carbon dioxide from our
atmosphere. If oxygen is available, the pyruvate enters aerobic respiration in the mitochondria of the cell. This diffusion into body cells lowers the amount of glucose in the pulmonary and systemic circulations. This is a good way to recognize
hydrolysis reactions: water is always 'split' as part of the reaction. Hydrostatic pressure is produced by compression of a liquid in a confined area. Even the heart muscle and internal valves can suffer damage that can be life threatening. Why do researchers commonly use mice? Table
10.4 Round yellow Mendel's dihybrid cross Observed (O) 315 Round green 108 Wrinkled yellow 101 Wrinkled green 32 Total 556 Expected (E) Difference squared (O - E)2 (O - E)2 E Once you have worked out the value for the bottom right cell of the table, you have the chi-squared value that must be compared with the critical values table (Table
10.3). Mix the ingredients up and pour them into the bottlen of a desired protein. The chloroplast and photosynthesis are no exception to this, as shown in Table 8.8. Table 8.8
Function allowed Extensive membrane surface area of the thylakoids Allows greater absorption of light by photosystems Small space (lumen) within the thylakoids Allows for faster accumulation of protons to create a concentration gradient Stroma region similar to the cytosol of the cell Allows an area for the enzymes necessary for the Calvin cycle to
work in Double membrane on the outside Isolates the working parts and enzymes of the chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3 Examine the diagram of a typical chloroplast from the surrounding cytosol CHALLENGE YOURSELF 3
population results in evolution: the gene pool has changed actin filament tropomyosin tropomyosin tropomyosin fibres block myosin binding sites on actin filaments Figure 11.12 A motor neurone has sent action potentials to a muscle, leading to an influx of calcium ions into the sarcoplasm. They identified a particular species of fern that grows in both
areas but appears to prefer shaded areas compared with areas exposed to direct sunlight. Who should decide which research pursuits are of the most value? For example, frogs and toads have virtually no loops of Henle and so are unable to conserve water by the mechanism involving a hypertonic medulla and reabsorption of water from the collecting
duct. However, its exact structure has not been confirmed. • Wait a few minutes and your results will appear. As long as glucose is in a higher concentration outside the cell, glucose will continue to move through the open channel by diffusion. Cells rely on glucose for the process of cell respiration. The brainstem controls
heart rate, breathing rate, and blood flow to the digestive system. absorbed nutrients from intestines oxygenated blood hepatic vein blood circulation pattern to and from the liver. The Russian physiologist Ivan Pavlov designed
experiments to illustrate reflex (classical) conditioning. The bond between two carbons is a good example of this type of bond. Five groups of five in each group would be ideal, but perhaps not realistic, renal medulla renal artery renal pelvis renal vein renal cortex ureter urine to bladder Figure 11.13 Sectioned view of the human kidney. 3 They are
small. 628 • Scroll down the left-hand column to Authors. self-administration drug linked to lever food reward saline solution lever Researchers have recently used a self-administration of adolescents to tobacco (see Figure 12.10).
In areas of the world where information concerning the dangers of smoking have been regularly and widely circulated, the percentage of people who smoke has declined. This explains the sedative effect of alcohol. Dinosaurs such as the sauropods were the biggest, strongest animals ever to walk the planet. If neonicotinoids are shown to cause
damage to honeybee colonies, an international effort to curtail or stop their use will be necessary. To use a t-test calculator, go to the hotlinks site, search for the title or ISBN, and click on Chapter 14: Section C.6. 2 Dilute your soil sample 1:5 with distilled water. They play a role in recognition of like cells and are involved in immune responses. One
of the fundamental differences between steroid and peptide hormones is whether the hormone actually enters the target cell that it acts upon. 'Late' ventricular systole Figure 6.10 shows the blood pressures in early and late ventricular systole. The cores should all be as close to the same length as possible: 30-50-mm cores are recommended.
Thrombosis The term thrombosis refers to the condition when a clot (thrombus) forms within a blood vessel. She is an eyewitness to this phenomenon. It is possible to 'clone' a strawberry plant by asexual reproduction. 2 6 4 2 0 1996 year 2001 Topsoil loss caused by tillage (the preparation of soil by mechanical agitation, such as digging, stirring, and
overturning), is the most destructive effect of crops planted in rows. • Under descriptions go to the column called IDENT (which means % of identity) and scroll down to 86% identity. (ii) Suggest an advantage for male snakes selecting larger females. She makes a scatter plot and then sees if there is a trend line that fits her data reasonably well.
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Homeostasis refers to the maintenance of a constant internal environment, origin of replication bacterial chromosome plasmid 5 Introduce plasmids into bacteria by transformation 6.7 Culture The following describes how you would put a gene
of interest (in this case glyphosate resistance) into the plasmid of a vector (in this case agrobacter). 388 Often there is a higher concentration of various mineral ions inside the plant than outside. It took tireless experiments by Louis Pasteur and others to refute this idea and prove that the rats, maggots, and mould came from the surrounding
environment. 16 Starting with a blank piece of paper, practise drawing a ladder diagram of DNA in which the nitrogenous base sequence of one strand is C, T, G, G, A, T. • Xylem recycles the relatively pure water by carrying it from the sink back to the source. In 1952, two researchers, Alfred Hershey and Martha Chase, carried out experiments that
helped confirm DNA as the genetic material of life. When you pull on a zipper, helicase is like the slide mechanism. Figure 1.8 Compare this matrix crista inner membrane outer membrane drawing of a mitochondrion with the false-colour TEM of a mitochondrion. As curious as it may seem, the ABCC11 gene is also partly responsible for the smell of
underarm sweat, as well as the production of breast milk, and could potentially have a link to breast cancer. When neonicotinoid molecules bind to the same receptor proteins, the action potential is not propagated. The volume in the fermenter must remain constant, so more material is added in a fed-batch manner as the product is removed. • Before
leaving the area you are working in, measure its dimensions so that its total surface area can be determined. Field of study Genetics Characteristics needed for the model/why the species provides a good model Suitable species Table 12.1 Examples of model organisms Large numbers and short generation times Fruit fly Baker's yeast Nematode worm
Developmental biology Robust embryos that are easily manipulated Chicken African clawed frog (Xenopus) Genomic studies, such as genes that cause diseases 60% of human genetic diseases studied have a counterpart in the fruit fly and nematode Fruit fly Nematode Comparative genomics.
genome Mouse To learn more about model organisms, go to the hotlinks site, search for the title or ISBN, and click on Chapter 12: Section A.1. 497 12 Figure 12.2 Formation of Option A: Neurobiology and behaviour neural fold neural plate the neural tube from the neural plate. The secondary sex characteristics of females that arise as a result of
increased oestrogen and progesterone production at puberty are: • enlargement of breasts • growth of pubic and underarm hair • widening of hips. Evidence clearly shows temperature increases since the industrial revolution. The half-life of 14C is 5730 years, meaning that, when an animal dies, its bones will have lost half their 14C after 5730 years
The numbers inside each chamber or blood vessel represent the pressure measured in mm Hg. Heart valves open and close based on blood pressure differences on either side of any one valve. As mentioned above, the mitochondria of eukaryotic cells have a DNA code that more closely resembles bacteria than eukaryotic cells. Another way of thinking
about disruptive selection is to think of it as selection against the mean. On arrival at high altitudes, our bodies attempt to compensate by increasing the ventilation rate and heart rate. A.3 Living organisms are able to detect changes in the environment. A Exons. Active transport involves the movement of substances against a concentration gradient.
The heart rate will slow down if it is activated by the cardioinhibitory centre or speed up if it is activated by the cardioaccelerator centre. Many of the things that help to define a species are preserved at all, such as pigmentation, behaviour, and mating calls and songs. Follow the number given and continue until the
end. glutamate hippocampus area rat brain dopamine Figure 12.46 The role of glutamate in addiction: researchers found that stimulating neurones in the hippocampus (an area rich in glutamate) caused rats to search for cocaine. Although thousands of people were evacuated, a few did die that day; some of those who died were photographers trying
to get the photo of a lifetime. We can actually see the cells becoming sickle shaped. • Guidance • A significant length of DNA for an open reading frame contains sufficient nucleotides to code for a polypeptide chain. The Amflora potato produces 100% amylopectin, which is a desirable product for industry. They control the volume of the song by
altering the flow of air. The result of this is bacteria that produce human insulin that can be used to treat humans with diabetes. B High electron concentrations are rapidly developed. Does the method really work? What kinds of international regulations exist concerning antibiotic use, quarantine, and other such practices, that either encourage or
limit the spread of resistant bacteria? People with this genetic condition produce abnormally excessive quantities of mucus in various organs and have difficulties with their respiratory and digestive systems, among other complications. However, this repetitive DNA is mostly dispersed throughout the genome. 2001 Option A: Neurobiology and
behaviour Use of cochlear implants in deaf patients Cochlear implants are a product of medical technology that has improved the lives of people with severe to profound hearing aid is not a solution. 6 Plants and animals. Some couples planning to have children plot the woman's body temperature and time sexual intercourse
accordingly. These three principles are: 1 2 3 all organisms are composed of one or more cells cells are the smallest units of life all cells come from pre-existing cells. • Fat accumulation: damaged areas of the liver will quite often build up fat in place of normal liver tissue. But remember, that does not mean there is 0 3 causality. • Their cell wall is
made up of a compound called peptidoglycan. The difference leads to red blood cells that look very different from the usual flattened disc with a hollow in the middle. 455 11 Animal physiology Diseases that cross from one species to another • HIV/AIDS • Ebola • SARS • H1N1. This stored water is obtained in the rainy season. Finally, salt ions are
taken into the peritubular capillary bed. Many do not, and those connections are eliminated. The remaining cells will help to form the heart typically makes a circuit through the following sequence of blood vessels: • a large artery • smaller artery branches • an arteriole
(the smallest type of artery) • a capillary bed • a venule (the smallest type of vein) • larger veins • a large vein, which takes the blood back to the heart to be pumped out once again. Light is generally not mentioned in discussions about seed germination because it has variable effects on the process. Do you get the same for the number of ts? Within
the ovaries of a female foetus, cells called oogonia undergo mitosis repeatedly in order to build up the numbers of oogonia within the ovaries. Option A: Neurobiology and behaviour in nature, the vast majority of adaptations referred to in evolution and
natural selection are unconscious adaptations made by populations rather than by individuals. • The medulla itself contains the same kind of chemosensors. This node is located in the lower wall of the right atrium, in the septum or partition between the right atrium, in the septum or partition between the right atrium.
because of local cultural and religious traditions. What if you just have people filling out questionnaires? Researchers who attempt to isolate any one factor affecting another, making this type of study open to many interpretations. Notice that an internal
second messenger molecule is needed to open the ion gate; this is therefore a slower method. 9 Analysis • What is the osmolarity of the potato tissue? In other words, for cell respiration oxygen is a reactant and carbon dioxide is a product. Curves B and C represent chemical reactions catalysed by enzymes affected by inhibitors. Between species A
and species B there are only 26 differences. Because the menstrual cycle is a cycle, there is no true beginning or ending point. Reproductive technologies have been developed to help overcome these situations. Digestion is not necessary in an emergency, so the flow of blood to the gut is restricted by contraction of the smooth muscle of the blood
vessels carrying blood to the digestive system (causing the diameter of the blood vessels to narrow). D Infection by bacteria. A grasshopper uses exoskeleton joint leverage coupled with a catapult mechanism to jump about 1 m. Green = carbon; pink = oxygen; blue = nitrogen; white = hydrogen As you study biochemistry, you will soon learn to
recognize and classify common biochemical molecules into appropriate categories. Cell theory It has taken several hundred years of research to formulate the cell theory that is used today. It is positively phototaxic because it needs light to perform photosynthesis. Others involve both cycles and chains of reactions. • Corneal reflex: this must be
absent (when a cotton swab is dragged over the cornea, the eye does not blink). This region is called the palisade mesophyll. Genetically modified organisms A genetically modified organisms A genetically modified organisms A genetically modified organism.
described above. 101 02 Molecular biology Cytoplasm Fluid inside mitochondrion pyruvate 3C CO2 acetyl-CoA 2C also enters Krebs cycle glucose 6C Figure 2.46 Aerobic cell respiration. The motor neurones must extend their axons out of the CNS (the brain and spinal cord) in order to form these circuits. 2007 bird of prey sightings/km-2 Figure 9 A
scatter plot of grey 10 1 0.01 0.1 1 10 100 grey partridge pairs/km-2 1000 Notice how the dots are a bit irregular: this scattering is where this type of graph gets its name from. 172 What is a species? Getting a return on their investment also motivates them. The definition of a species is a group of organisms that can interbreed and produce fertile
offspring. The phenotypes of polygenic characteristics tend to show continuous variation. Salt ions (e.g. Na+, Cl-, K+) must leave the filtrate and be returned to the bloodstream by reabsorption. As you can see, it is impossible to sum up all these concepts in one catchy phrase such as 'the law of the jungle'
As shown in Table 11.6, one of the effects of the oestrogen produced by the placenta is to induce production of oxytocin protein receptors in uterine muscle. Stains may be used to make it easier to see any details. Exons and introns are discussed in Section 7.2 regarding transcription and translation. In what ways are you willing to try to reduce your
carbon footprint: diet, transport, home energy use? The way they do this is to increase the permeability of the postsynaptic membrane to positive ions, making it easier for positive ions, making it easier for positive ions, making it easier for positive ions to move in. The wall of each atrium is 2 left semilunar relatively thin muscle and is not valve closed capable of creating very much pressure. Chlorophyll b, carotenes,
and xanthophylls act as accessory pigments by absorbing light at different wavelengths, and passing this energy on to chlorophyll a to be used in photosynthesis. The evolution of animals with exoskeletons includes species with leverage potential that can give rise to incredible feats of strength and jumping ability. Because it is so important to
remember that ATG has to be at the beginning of an ORF, and if it is in the middle it is not an ORF, use this mnemonic to remember it: A = All, T = That, G = goes. Becoming familiar with common prefixes, suffixes and word roots will help you understand biological terms. These tested hypotheses may ultimately serve to simplify and unify existing
scientific ideas. Endocrine glands always produce one or more hormones, and these hormones are always secreted into the blood for distribution throughout the body. This condition is the result of no new ATP being generated after death, and thus the myosin heads cannot detach from actin-binding sites, resulting in a rigid muscle condition. What is
B? Unlike an X-ray, during which the film or sensor is exposed to an external source of radioactivity, autoradiograms (the images formed by autoradiogramy) are exposed to radioactive particles being given off by the substance itself. It is also important to note that glucose is only one of the many possible organic molecules that can be formed from
photosynthesis. The remote sensing hydroacoustic method can determine both the number and biomass of fish populations. No parents were around to teach the young birds what direction to fly. Some snails in the species have shells that coil in a clockwise manner and others in an anti-clockwise manner. In this chapter, we will begin with a look at
cell theory. 1 Choose a letter to show the alleles. aeruginosa, which can cause infections in patients with cystic fibrosis, can exist as a biofilm. The inhibitory neurotransmitter binds to its specific receptor. Thus the penicillin product must be removed efficiently for the system to continue. Dr Pieter Tans, NOAA/ESRL (www.esrl.noaa.gov/gmd/
ccgg/trends/) and Dr Ralph Keeling, Scripps Institution of Oceanography (scrippsco2.ucsd.edu/) Recent monthly mean CO2 at Mauna Loa 390 385 380 2009 2010 2012 2011 2013 2014 year The up-and-down pattern shown in light blue is caused by seasonal fluctuations in carbon dioxide levels. The disease has caused epidemics in many parts of the
Steve Allen 742 t, Steve Gschmeissner 16b, 46t, 272c, 285t, 300t, 303b, 304t, 453t, 675tl, 730l, Susumu Nishinaga 469, Thomas & Pat Leeson 564b, 676b, 691, 647 t, Thomas Deerinck 2, Tim Evans 56, Tony Camacho 563t, U.S Coastguard 601, US Department of Agriculture 678t, Victor Habbick Visions 674 cl, Visual Science 50, Volker Steger 124b,
William Ervin 695b, Zephyr 507, 716; Shirley Burchill: 144b, 187, 229, 251t, 698; Shutterstock.com: chungking 209t, EpicStockMedia 521, Igor Sirbu 255br, Martin Fowler 177 tr, Nicram Sabod 255bl, Paul Aniszewski 185, Sashkin 494, Tyler Olson 777tr, Umberto Shtanzman 777br; Sidney Bailet: 140; Cover images: Front: Science Photo Library Ltd
Frank Fox All other images © Pearson Education Every effort has been made to trace the copyright holders and we apologise in advance for any unintentional omissions. Scientists found that morphine and heroin bound to the brain receptors because they were mimicking endorphins. It will take you to a separate page devoted to that protein. 6 You
are sitting at the dining room table with your parents. It showed that a vampire bat will die if it does not have food for two nights in a row. The final bit of evidence for endosymbiotic theory is DNA. They patented their BRCA genes just as any pharmaceutical company would patent a new molecule that they thought would make a useful medicine.
Sometimes it is interesting to study two at once. When red light (which has a wavelength of 660 nm) is present in available light, the inactive form of phytochrome, Pr, is converted to the active form, Pfr. These structures include a flagellum for motility and an acrosome that contains the enzymes necessary for fertilization. Cells near the outer edge of
the tube (shown as the nearly full circle) are the spermatogonia. Each antibody is uniquely designed to fit an antigen. As learning can only be measured by performance, the success of a learned experience depends on recall. Between these two extremes is a fish stock size that can produce the MSY. For simplicity, Figure 10.3 shows only one chiasma
but in reality many can form along all four chromatids. Histamine causes the symptoms, including some that can be quite serious. This speed is essential in cells such as bacteria, which may divide every 20 minutes. This orchid in Ecuador got its name
from the fact that the petals on the flower look like a bat's wings. There are many air spaces in this area, which provide gas exchange surfaces. Variations and phylogeny is the study of the evolutionary past of a species.
This chapter will explore how genes are shuffled to make new combinations, and not only how unique individuals are produced but also how new species evolve. In 1950, J. Theory of knowledge • What counts as knowledge in biology? Determine how many plants you hit per square metre, then use the surface area calculation to estimate the total
number of individuals of that plant that are living in that area: (plants per m2) × (surface area in m2) = (population estimation). (b) Follicle-stimulating hormone (FSH). Coal is found in seams, where the layers of sediments were deposited, covered, and then transformed and often twisted and deformed by geological forces over millions of years. Fish
A tadpole is the larval stage of an amphibian such as this frog. Typical examples might be walking up a flight of stairs or jumping jacks. So, when we study cell respiration or photosynthesis as biochemical processes, we do not need to study a completely different process for each organism or species. Who should decide how fast and how far humans are the study cell respiration or photosynthesis as biochemical processes, we do not need to study a completely different process.
should go with our study of DNA and the technology that is rapidly emerging? But is it possible to maintain life for a long period of time outside established ecosystems? Thus, like all forms of sexual reproduction, reproduction in humans serves the bigger purpose of ensuring genetic variation in the species. Because of random orientation, the
chromatids can be pulled towards either of the newly forming daughter cells. Specifically, lactase enzyme molecules are exposed to these beads for enough time for pre-digestion to occur. Often, international trust does not exist to keep these practices functioning
Although the theoretical percentage is calculated to be 50% girls and 50% boys, in reality few families have exactly half and half. Such charts often come with a caution that states children and pregnant women should not use them. Here you can find links to animations, simulations, movie clips and related background material, which can help to
deepen your interest and understanding of the topic. A probe, in this case for sickle cell disease, is a known sequence of a complementary DNA sequence that binds with a DNA strands. If the PSA is elevated, it indicates
possible prostate cancer. Enzyme-catalysed reactions proceed at higher reaction rates at a lower temperature than the same reaction without an enzyme. As we have seen with the peppered moth, how frequent an allele is can change over time because of changes in the environment. They recycle almost all of their water and lose very little of it in the
urine they produce. 1998 fur, mammary glands claws or nails lungs jaws Using modern bioinformatic tools, we can compare nucleic acid and protein databases from many organisms to examine their evolutionary relationships. odorant receptor air with odorant molecules How does smell work? These bacterial cells are now able to produce the useful
protein. In Figure 10.14, the green and yellow genes are linked. People with a normal SNP will not have sickle cell anaemia. This is accelerating the rate of the depletion of phosphate reserves. myosin with actin Preparing to be able to draw diagrams
from memory in an exam has to involve actually practising drawing them. • Systolic pressure: the top number measures the pressure in the arteries when the heart muscle contracts). Gibbons, orang-utans, gorillas, chimpanzees, humans. These are complex questions that require conclusive evidence in order to be able to say one
way or the other. The squared correlation coefficient, r2, also called the coefficient of determination, is used to see how well a regression model matches the data collected. They also noticed that the earlier the birds arrived in Germany, the more choice of territory they had, and the more eggs they laid. (4) (Total Total 4 marks) marks 765 Theory of
knowledge An astronomer, a physicist, and a mathematician are on a train going to a conference in Edinburgh. They grew the plants in the same location at a research facility in Delaware and compared their growth in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware and compared their growth in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how these plants in the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location at a research facility in Delaware with how the same location
they produce spores, which are microscopic reproductive structures. 11 Explain how PCR is carried out. CHALLENGE YOURSELF 3 Construct your own dichotomous key for use in identifying specimens. Notice in Table 5 that, in addition to the degrees of freedom, there are probability values for p. a a A Aa Aa aa aa Figure 3.26 A Punnett grid for
TT and tt. Draw each of the molecules described below and then check each against the formula given in the answers. This means that there is a 95% likelihood that the difference has been caused by something besides chance. Therefore, the wrapping or packaging of DNA regulates the transcription process. Your email is like the neurotransmitter,
moving from the presynaptic membrane to the postsynaptic membrane to the postsynaptic membrane and believe that the person is dead, because the patient is 'brain dead'.
before and after DNA replication. DNA microarrays can be used to test for genetic predisposition or to diagnose the disease. Triglyceride lipids, when needed, can be hydrolysed into two carbon segments that can enter into cell respiration at a chemical sequence point that is very efficient for the production of ATP. The B cells need T cells in order
to recognize foreign invading cells and make antibodies against them. This prevents transcription of the segment of that particular region. For taxonomists, viruses are not classified as living things: they do not fall anywhere in the three domains. Evolutionary history, habitat, and the type of nitrogenous waste The waste products that result from the
deamination of amino acids are called nitrogenous wastes because each type of waste product contains one or more atoms of nitrogen. 5 Living cells will be white because they change methylene blue to white. The trend line in Figure 9 shows that there is a negative correlation.
reliability: Mendel's genetic crosses with pea plants generated numerical data. Bloodletting was sometimes done by making cuts and sometimes by the application of leeches. It is one of those words everyone thinks they know, but it is not an easy concept. The heart rate can be increased by impulses brought to the heart through two
nerves from the medulla of the brain. Observations without an experiment can only show a correlation. Think of the placenta as being a large pancake-shaped structure. What about ones that are absolutely necessary? A Angiospermophyta. 60 NATURE OF SCIENCE 40 Figure 13.10 The percentage of soybean and cotton crop adoption over 10 years.
In an experiment like this, when the colonies of bacteria grow close to the disks, they show resistance to the antibiotic is stopping the bacteria the way it should. Are we upside down or falling backwards? Is that not less risky and dangerous than
artificial selection? The next trophic level is occupied by secondary consumers (organisms that eat the producers), and the trophic level after that is occupied by secondary consumers (organisms that eat primary consumers). 21 Explain how memory and learning are affected by slow-acting neurotransmitters. The medulla oblongata is also the
cardiovascular centre for the body. For something to be considered 'true', does it have to be formally proven using a scientific method? Notice the branching between one area of muscle cells and another. More debates Coming back to the pairs of statements above, what would lead someone to believe one or the other statement? The names of these
three domains are the Archaea domain, the Eubacteria domain and Eukaryote domain. 420 In addition, the calculation only considers the mathematical probability in the production of one gamete. Study Figure 8.22. Rickets develops in children when the bones near the growth plates (areas at the ends of developing bones) do not mineralize properly.
90 80 70 Figure 12.28 Normal decline in olfactory sensitivity with age. This results in a compound with two phosphate groups. These usable nitrates are absorbed by plant roots (which is why some plants host the nitrogen-fixing bacteria in their root nodules, as seen in the Challenge yourself photo above), and so the plants pass on nitrogen-fixing bacteria in their root nodules, as seen in the Challenge yourself photo above), and so the plants pass on nitrogen-fixing bacteria in their root nodules, as seen in the Challenge yourself photo above), and so the plants pass on nitrogen-fixing bacteria in their root nodules, as seen in the Challenge yourself photo above), and so the plants pass on nitrogen-fixing bacteria in their root nodules, as seen in the Challenge yourself photo above).
nutrients when they are consumed by animals. Chromatin is formed of strands of DNA and proteins called histones. If you set up a Punnett grid for these parents, you will see that there is a 1 in 4 chance (25%) that they will have a child with cystic fibrosis, and there are three possibilities for the genotypes in their children: Mark is Ff, Chloe is ff, and
Lee is FF. Most animals are osmoregulators. This colourful vegetation and blue sky are a stark contrast to what we would see on the surface of our inhospitable neighbours, the Moon, Mars, or Venus. • • • • • • Add bacteria to a glass slide and fix on the slide with heat. • sinusoids are wider than capillaries • sinusoids are lined by endothelial cells
with gaps between them • these gaps allow large molecules like proteins to be exchanged between hepatocytes and the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components, making all exchanges with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with blood components with the bloodstream • hepatocytes are in direct contact with bloodstream • hepatocytes are in direct 
erythrocytes for recycling cell components • sinusoids receive a mixture of oxygenated blood (from hepatic artery branches), and this mixture eventually drains into small branches of the hepatic vein. The kind of mutation that causes sickle cells is a base substitution mutation. Fluorescence
intensity indicates the amount of gene expressed in the tissue sample. Finally, the transformed plant cell acclimates and regenerates into a plant. 1 2 3 Curve B. As a complete region of a DNA molecule is transcribed to form mRNA, the first RNA formed is called pre-mRNA or the primary RNA transcript. lump of sugar sugar molecule Figure 1.17
sclerosis, affect 1 billion people worldwide. You can use a table of critical t-values (Table 2) to find out what this number means. Do you believe plants possess a 'language' based on the information presented here? The nuclear membrane does not provide complete isolation because it has numerous pores that allow communication with the cell's
cytoplasm. pupil circular muscle contracted radial muscle centracted in your alimentary canal. Hence, he can only be Hh and not HH. There are two types of cloned B cells: • plasma cells, which secrete antibodies immediately and help to
fight off the first (or primary) infection. As axons of neurones are typically quite long, it is convenient to think of the conductor of a neurone impulse as the axon
(1) (ii) State the diameter of the pore labelled X. There has been more time for DNA mutations to occur since the split between A and B. The dogs had learned to salivate to the NS alone. Slabs of peat left to dry in Scotland. • The colour change is very strong, indicating that the patient has antibodies to HIV that
have attached to the antigen for HIV in the microtitre plate. 1.6 Cell division is essential but must be controlled. Homozygous - Having two identical alleles of a gene (see Figure 3.21). But if they have the plasmid has been taken up by the cells. If a species is extinct we will never hear
its song again. Solution (a) We know from the data given in part I of the worked example that q = 0.10 and that p = 0.90, training test drug injection Figure 5.19 An example of a modification of a species' circumscription. Histograms must follow the scale shown on the x-axis. In addition, the air was
filled with black soot from the large enough to analyse, notably using gel electrophoresis. • Skill: Recognition of the chambers and valves of the heart and the blood vessels connected to it in dissected hearts or in diagrams of heart
structure. Microorganisms in fermenters become limited by their own waste products. In 2012, more than a third of the 50 companies with the highest revenues worldwide were oil and gas companies with the highest revenues worldwide were oil and gas companies, four of which had revenues exceeding $400 000 000. This was a radical idea because vitamin C is normally regarded as a substance only useful in
very small quantities. • Auxin influences cell growth rates by changing the pattern of gene expression. 415 10 Genetics and evolution Multiple genes What happens to chromosomes during the formation of gametes so that offspring are always different? suspect 5 suspect 5 suspect 5 suspect 2 suspect 2 suspect 1 CHALLENGE YOURSELF
12 Using the adjacent DNA profiles from six suspects, can you identify which one matches the DNA profile of the blood stain found at the crime scene? Now you can determine your accuracy, for example ±10 yeast cells. Would you tell your family and friends? organic alcohol attached to a phosphate group g l y c e r o l polar (hydrophilic) region fatty
acid fatty acid 28 Some non-polar substances are transported directly through the lipid bilayer. This example is adapted from the website. Figure 2.19 shows a representation of the condensation reaction that creates the covalent bonds between the glycerol portion and the three fatty acids of a triglyceride lipid. Somatic has to do with the body, and
you know skeletal muscles are voluntary. Some medical treatments, such as injections for treating haemophilia, have been known to spread HIV when the injection was purified from human blood. The methyl group appears to cause a section of DNA to wrap more tightly around histones, thus preventing transcription of that particular allele. When
heart muscle cells touch each other, they synchronize their contractions. That bacterium is not killed by the antibiotic and it later multiplies in the patient's body to make her sick again. Four carbon dioxides are released during the Krebs cycle. Application: Biogas is produced by bacteria and archaeans from organic matter in fermenters.
Bioinformation is kept in safety in databases. Goats are cheaper to rear than cattle, reproduce more quickly, and produce more abundant milk. The two atoms shown in black are carbon, the red atom is oxygen, and all the white atoms are hydrogen. Will the Malthusian catastrophe eventually come about: will we run out of food for our species some
day? A primary immune response takes at least a week or more to be successful, and thus it is common to experience the symptoms associated with a disease while the immune system is working to reduce and finally eliminate the pathogen. What is the structure labelled A called? In the four examples given above, simply reverse the reaction arrow
and each example shows a condensation reaction. Some organisms derive their ATP completely without the use of oxygen and are referred to as anaerobic. This allows other catalytic pathways to be activated, which do not result in toxic substances. (1) (b) Identify which individuals are recombinants in this cross. The cells of all organisms are made up
of a staggering number of molecules. Chylomicrons are produced in the alimentary canal and then transported into the bloodstream. Figure 7.20 A sausage model of haemoglobin. Can anything live in the highly acidic environment of our stomach? Eventually, a researcher may decide to publish his or her findings in an appropriate scientific journal
D.4 Internal and external factors influence heart function. • Not all membranes are identical or symmetrical, as the first model implied. The higher levels of protein structure allow enzymes to form unique areas, such as the first model implied. The higher levels of protein structure allow enzymes to form unique areas, such as the first model implied. The higher levels of protein structure allow enzymes to form unique areas, such as the first model implied. The higher levels of protein structure allow enzymes to form unique areas, such as the first model implied.
differentiation in the neural tube. and Kalaichelvan, P.T. 2008), reproduced with permission; Figure 13.22 from http:// www.hypertextbookshop.com/biofilmbook/working versionOld/contents/ chapters/chapter002/section004/blue/page001.html, © MSU Center for Biofilm Engineering, P. P P ATP A Intracellular 3 The phosphorylation causes the
protein to change its shape, thus expelling sodium ions to the exterior. It responds chiefly to two neurotransmitters: dopamine and serotonin. With advances in DNA, as well as its mitochondrial DNA, has been effective in establishing biochemical phylogeny. They benefit from the
fact that this nitrogenous waste is very energy 'inexpensive'. You will recall that the hormone insulin should result in increased facilitated diffusion of glucose (through channels) into almost all body cells. % ferredoxin (electron carrier) excited electron carrier) excited electron carrier (PQ) energy of electrons (H! e" (P680) reaction centre!
6 7 8 H2O electron carrier (P700) reaction centre photon '$ " 2H! 1 2! O2 Photosystem I (P680) 5 NADPH e" water-splitting enzyme e" 4 NADP! ! H! # e" cytochrome complex (electron carrier) photon & e" excited electron carrier) photon & e" excited electron carrier) photon & e" excited electron carrier) photon by the excited electron carrier (P700) The excited electron carrier) photon of the excited electron carrier (P700) The excited electron carrier) photon by the excited electron carrier (P700) The excited electron carrier (P700
energy at each exchange. The muscular walls of the atria are very thin in comparison with the ventricles. A false-colour SEM of a sectioned neurone with a myelin sheath. 19.2 Currently, the major use of phosphate is in chemical fertilizer, which is used in modern agricultural production. By using radioactive tracer experiments with this apparatus,
Calvin was successful in his studies. In other words, 'pollution' can be considered to be simply misplaced resources. Another characteristic of peatlands is the pH of the waterlogged histosol: it is very acidic. In the case of soybeans, the protein is an enzyme that allows the plant to use an alternative pathway 591 13 Option B: Biotechnology and
bioinformatics that causes resistance to the herbicide glyphosate. rotary distributor This is a trickling filter system at a sewage plant in Yorkshire, England. Objective data, both qualitative and quantitative, are used to establish relationships whenever possible. 5 Place each core in a different test tube labelled with the core's identification letter and
the molarity of the sucrose solution to be placed in the tube. • Coronary heart disease is the most common cause of death in the UK. pharynx trachea left and right primary bronchi Figure 6.12 Air can enter the trachea from either the mouth or nasal passages. A strip of chromatography paper must be used for this lab as well. An axon can move
forward at about 1 mm a day. 4 What can be concluded from this experiment? Sensory cells send messages to certain parts of the brain that control emotion and memory. !CoA CoA oxaloacetate 4C 2 citrate 6C Citrate (a 6-carbon compound) is oxidized to form a 5-carbon compound. When we burn wood in a fire, we are releasing the stored chemical
energy in the form of heat and light. This is why good scientific research on the consequences and benefits of certain food types is essential. • Dopamine is broken down and the products are toxic to the serotonin-producing neurones. Two basic kinds of movement are seen in invertebrate animals: taxis and kinesis. 38 How does this affect the
reproductive (fecundity) status of the grouper populations? Biological processes and chemical pathways are usually quite complex. Application: Florey and Chain's experiments to test penicillin on bacterial infections in mice. These behavioural changes may be so extreme that a new species is formed, as might eventually occur with European
blackcaps. Finally, the gap junctions within the intercalated discs of the cardiac muscle cells finish conducting the impulse and both ventricles undergo systole simultaneously. Keep scrolling down until you finally arrive at Sequences (just before References). Inhibitory neurotransmitters This is a useful trick for remembering the details of
hyperpolarization: when the 'kat' (K+) is 'hyper' (hyperpolarized), we put her outside. Others argue that this research could result in a significant reduction in human suffering, and is, therefore, totally acceptable. ! nerve impulse Figure 12.44 The effect of benzodiazepines at the synapse. (c) When would it be possible for two individuals to have
exactly the same base sequence as above and even at the other 12 STR loci used in DNA profiling? Electrical charges related to the molecules of the two strands cause a characteristic twisting action of the DNA ladder to produce the double helix shape that Watson and Crick described in the model they proposed in the early 1950s. Haemoglobin
consists of four polypeptides (globins) and a non-protein molecular component at the centre of each globin called a haem group. • Fermentation is carried out by batch or continuous culture. In these examples, the parents are both equines (they belong
to the horse family, Equidae), so they are related, but they are certainly not the same species. Chlorella and the functions of life *Safety alerts: Be cautious of sharp objects. Although a pair of homologous chromosomes carries the same genes, they are not identical because the alleles for the genes from each parent could be different. Clearly,
photosynthesis is essentially the reverse of respiration. This means that 1.1% of the population has the genotype tt. Figure 1.15 This is a model of a phospholipid. The Malpighian tubule system in insects and the kidney carry out osmoregulation and removal of nitrogenous waste. They are shown using a logarithmic scale, which means that each
 increment is 10 times the size of the one before. 71 02 Molecular biology OH OH OH glycerol H Figure 2.19 Condensation reaction showing the four reactants necessary to form a triglyceride lipid. Always define your terms at the beginning of your answer. Table 2.6 Interpreting BMI values BMI Description category Below 18.5 Underweight 18.5-24.9
Normal weight 25.0-29.9 Overweight 30.0 and above Obese Here are the two formulas for calculating BMI: • formula 1, metric units, BMI = weight (in) × height (in) × heigh
1.7) = 20.1. Therefore this person is categorized as having a normal weight. Carry out this procedure for each of the microscope objective lenses you use and record the information required in the following table. The switch to flowering is a response to the length of light and dark periods in many plants. C To accept electrons from the electron
transport chain. C They lower the energy of activation for a reaction has mentioned heat being lost, but what does it mean when heat is 'lost'? Planaria is a flatworm that lives in lakes and ponds. The synthesis of vitamin C from glucose requires four enzymes that
are used in a step-by-step set of reactions. This cyclic pathway is discussed on the following page. This increases the concentration of these ions, which then move passively through the ATP synthase channel, providing the energy to phosphorylate ADP. Now you can go to a database such as GenBank and find the gene you are looking for. You will
recall that the term 'organic' implies that carbon is present. This indicates that these proteins are acting as enzymes, speeding up a specific reaction without themselves changing. The entire polypeptide breaks away from the final tRNA molecule, and becomes a free-floating polypeptide in the cytoplasm of the cell. She was the first clone whose
genetic material did not originate from an egg cell. The steps of evolution by natural selection are outlined below. The anterior and posterior lobes of the pituitary communicate with the hypothalamus in different ways. 

Leptin is secreted by cells in adipose tissue and acts on the hypothalamus of the brain to inhibit appetite. (At that time the
mechanism, homogenation, of mixing the cream and milk so that they do not separate was not common.) Blue tits would 566 suck the cream from the tops of the bottles before the bottles before the bottles were taken inside. sediments 540 000 000 The amount of P dissolved in the oceans is about 1000 times the amount in organisms. About 68% of the data in this
graph are located in the dotted area. What does this reveal about established knowledge in science? Error bars are a graphical representation of the variability of data. Think of all the ways that the students in a class could be put into different groups: by eye colour, by shoe size, by birth date, by academic results, by favourite musical
group, by alphabetical order, by length of fingernails, by what they had for breakfast! What is important for a system of classification is that it is clear, consistent, logical, easily implemented, and that there is a general consequence that water is lost
from the plant. As embryogenesis continues, the neural plate folds in, closes, and becomes the neural tube. In a study performed by the US Department of the Interior on Key Biscayne National Park in southern Florida, a large rise in the number of people living and fishing in Florida has negatively affected the population of fish. Should it continue to
be used in classrooms as an illustration of how evolution works? To support the critics of evolutionary biologists. There are thousands of websites and publications that carefully try to dismantle and disprove the arguments of evolutionary biologists. There are also repressor proteins that bind to segments of DNA called silencers. Another arguments of evolutionary biologists.
was that, because Myriad was the sole company to administer BRCA diagnostics, it was impossible for a patient to get a second opinion, a key step in the diagnosis and treatment of a medical condition as serious as cancer. Push down firmly to squash the tissue. 746 • The incidence of CHD increases with increasing age. Application: Use of databases
to identify potential new anti-malarial drugs. Consider the similarities and differences when comparing and contrasting the two. When someone hears the term skeleton, they naturally think of the many bones characteristic of most vertebrate animals. The capillary beds join together into a blood vessel known as a portal vein. Researchers can attach
GFP to the cells producing insulin. It is the first stage of cellular respiration where oxygen is actually needed, and it occurs within the mitochondrion. You will be learning about: • means • t-tests • standard deviation • significant difference • causation and correlation. How accurate and reliable are these analyses? In this chapter, we will
cell; they do not feed, grow, or metabolize in the way that living organisms do, so they are considered to be nonliving. Those three enzymes are part of a fluid known simply as pancreatic juice that is released into the first portion of the small intestine through a duct. Application: Events such as strokes may promote reorganization of brain function
Both forms are composed of DNA and the histone proteins. Two of these six electrons form the stable inner shell, and four are found in the second and unfilled shell. All of these have advantages and disadvantages and would need to be debated. • Listening for extended periods of time can impair hearing. In this chapter you will learn more in-depth
detail about several of the systems of the body. The layer on top of this is called the epidermis. 5 Striated or voluntary muscles that occur in humans generally have a larger number of mitochondria than other cell types. In fact, it can be 10-30 times slower because there are many biochemical steps between the internal second messenger and the
second messenger receptor. One approach, often referred to as reductionism, reduces the complex phenomena of organisms to the interaction of their parts. 303 06 Human physiology A false-colour SEM of a nerve (bundle of neurones) with myelin sheaths. Most trees and shrubs (woody plants) have active lateral meristems. (1) (ii) Identify which
supplementary food was least effective in reducing calcium loss. Dopamine promotes desire, while serotonin inhibits desire. Table 2.2 shows some of the common categories and examples of molecules. Pacemakers can be used for patients with slow heart rates, irregular heartbeats, and a host of other problems. For example, a tuber
or bulb may be storing sugar or breaking down starch to provide sugar, depending on the season: tubers and bulbs act as sinks in the early spring. The system is not very efficient because many of the eggs may never become fertilized, but the vast numbers of eggs laid coupled with the millions of spermatozoa deposited
locally typically ensures that a reasonable number of the eggs do become fertilized. P. One recommendation is to eat at least five servings of fruit or vegetables each day. What about feathers? D.1 Human nutrition Understandings: Essential nutrients cannot be synthesized by the body, therefore they have to be included in the diet. Rosalind Franklin
(British) and Maurice Wilkins (born in New Zealand) had calculated the distance between the various molecules in DNA by X-ray crystallography. You will read about those two proteins in the next section. It can be argued that, in order for something to be considered valid as scientific knowledge, it has to be verifiable. The codons are specific for
certain amino acids or are start or stop messages. 5 Which three animals have a plant and insect diet? In the bottom right 278 diagram the blue arrows represent deoxygenated blood and the red arrows represent oxygenated blood. Pfr has the ability to absorb far-red light (which has a wavelength of 410 730 nm). 118 As we have seen with the
example of cystic fibrosis, mutated genes can have a negative effect on a person's health. The lagging strand is assembled by fragments being produced moving away from the progressing replication fork in the 5 to 3 direction. Most, however, continue in the cycle to reproduce the originating compound of the cycle, RuBP. This toxic methyl mercury
attaches to plankton that is then eaten by small fish that are then eaten by larger fish. Make flashcards of your mnemonic devices to help you remember the many things you must memorize in biology. ADP P i myosin actin ATP the contraction cycle continues if ATP is available and Ca2+ level in the sarcoplasm is high. Because macrophages can
easily change their shape, they are able to squeeze their way in and out of small blood vessels. The thinking was that blood and other bodily 'humours' (fluids) needed to be in balance, and an illness was often attributed to these humours being out of balance. These two molecules are held together by a covalent bond called a phosphodiester bond or
linkage. The most compelling evidence that there was once life on Mars comes from a meteorite found in Antarctica that The National Aeronautics and Space Administration (NASA) claims came from Mars and contains fossils of bacteria.
Eukaryote chromosomes The DNA of eukaryotic cells most often occurs in the form of chromosomes. This allows only certain areas of the DNA molecule to be involved in protein synthesis. Euglena can be tested to determine whether it responds to different wavelengths of light. (Total 1 mark) 348 7 What is a polysome? A person who is hanging upside
down can still swallow food and the food will travel 'up' to the stomach. It shows the number of receptors for serotonin that are active over time in a group of rats that were previously given eight doses of MDMA over a period of 4 days. DNA polymerase adds free nucleotides and one chain terminator nucleotide at random to each copy of fragment 1.
of eyewitnesses' testimonies in a court of law. mRNA molecule The terminator The sections of DNA involved in transcription are: promoter transcription unit terminator. • 40 • Preparation of temporary mounts of root squashes is recommended but phases in
mitosis can also be viewed using permanent slides. Other environmental factors that affect gene expression are being researched. 129 03 Genetics Examining chromosomes in root tips *Safety alerts: The chemicals in this lab, as well as the risk of breaking glass during the squashing process, require vigilance and caution. In our inner ear, there are
there is a law about energy stating that energy cannot be created or destroyed, only converted from one form to another. Variations on the experiment include using: a glass container that can be sealed at the top; different sources of sulfur instead of the raw egg yolk
Fill in Table 10.9. Allele frequencies Genotype frequencies Table 10.9 9 Recessive b q Dominant B p Homozygous Bb 2pq Ho
about this chapter, go to the hotlinks site, search for the title or ISBN and click on Chapter 6. • The myosin heads then attach to binding sites on the actin (step 2 of Figure 11.10). (b) The two amino acids that contain sulfur atoms. This autoradiogram (or autoradiogram) shows banded lines that were formed from nine different DNA samples during
gel electrophoresis. Scientists, using both animal models and new technologies, are now discovering the answers to these questions. M. Science encourages constructive criticism and verification, and is open to modification if the criticisms are valid. This marine snail can be stimulated to retract its siphon when it is touched, as part of its defence
mechanism. The latter was the thinking of virtually every person trained in medicine for more than 1300 years. 2000), p. 424 • r = allele for wrinkled peas • y = allele for green peas. This accumulation allows movement of the hydrogen ions through the enzyme ATP synthase. neurotransmitter synaptic vesicle presynaptic membrane synaptic cleft
postsynaptic membrane Na! receptor neurotransmitter # Neurotransmitter molecules are released and bind to receptors on the postsynaptic membrane. NATURE OF SCIENCE Assessing the risks and benefits of scientific research: should we grow fuel crops or food crops with our limited phosphorous reserves? A.2 The parts of the brain specialize in
different functions. At the end of each of the Y is a binding site. THC is an inhibitory neurotransmitter and causes the postsynaptic neurone to be hyperpolarized. Excess cDNA that did not hybridize with a probe is rinsed off. 1 2 sealed flask distilled water nutrient broth 38 nutr
oxygen is present they actually carry out a different type of respiration, in which ethanol and carbon dioxide are not produced. Embryos of both sexes are virtually identical until about the eighth week following fertilization. Applications and skills: Application can cause Down syndrome and other chromosome abnormalities. "GABA
storage sites neurone 1 $ benzodiazepines # GABA released from neurone 2 Cl! Cl! neurone 2 Cl! % GABA receptor | enhances GABA inhibitory effect (may block nerve impulse inhibited THC and cocaine affect
mood, synapse, and behaviour Marijuana users often describe the feelings produced by using the drug as being relaxing and mellow. • When the solvent has reached this position on the paper, remove the paper from the chamber, keeping all parts under the exhaust or fume hood, and immediately mark the position of the solvent line. This process
 used one solvent to separate the first set of components. Figure 4.18 Different wavelengths of energy have different properties. Note the lower rate of photosynthesis with the green wavelength. Most people will have to cope with at least some of the risk factors of CHD during their working life. The kingdoms of plants, animals, particularly the second solution of the risk factors 
belong here. TACCGTGCATAGAAAATC To learn more about amino acids and protein structure, go to the hotlinks site, search for the title or ISBN, and click on Chapter 7: Section 7.3. 347 07 Nucleic acids Practice questions 1 What does a nucleosome consist of ? Researchers hypothesize that microglia select a synapse for removal based on the
inactivity of the synapse. NATURE OF SCIENCE Perhaps in the design of the Chlorella activity you had an idea based on your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about what the outcome of your previous experiences in science about the previous experiences are not about the previous experiences.
374 Ribulose bisphosphate (RuBP), a 5-carbon compound, binds to an incoming carbon dioxide molecule in a process called carbon fixation. With the higher hydrogen ion concentration in the intermembrane space, these ions begin to move passively through a channel in ATP synthase back into the mitochondrial matrix. 

The capacity of stem cells to
divide and differentiate along different pathways is necessary in embryonic development and also makes stem cells suitable for therapeutic uses. A Nile crocodile hatchling (3) (Total 8 marks) 2 Below is a micrograph of an E. You can think of myoglobin as providing a final reservoir of oxygen when you are exercising heavily. A person infected with
HIV will eventually experience a severe drop in his or her lymphocyte population, and will lose the ability to produce adequate antibodies. This can be done as a class activity. After collecting their data, they wanted to see if the presence of ferns was statistically significantly larger in the shaded areas (the woodland) compared with the areas in direct
sunlight (the prairie). Application: Scientific evidence for health risks of trans fats and saturated fatty acids. However, the theory that is used to explain hydrogen bonding is largely supported by many pieces of evidence, including those described above. In a study presented at a conference at Kyoto University in Japan, natural biofilms from the
surface of stones were used to adsorb lithium ions and remove them from a lake. The electrons to reduce the Benedict's reagent resulting in the colour change come from the oxidation of the sugar molecules. The inset shows a sectioned drawing of a single alveolus and the structures that make gas exchange efficient. An example of this occurs in
mammalian females. • Methods have been developed for cloning adult animals using differentiated cells. He knew that cows developed a similar disease called cowpox. 4 Record the data. runoff 21 1.0 4.2 Atmospheric deposition into oceans. It is possible for some structures to be both a source and a sink. Spermatogonia first replicate the DNA within
their still diploid nucleus. Hz measures the frequency of those sound waves. 6.5 Neurones and synapses Understandings: Neurones transmit electrical impulses. Anaemia is the result of low red blood cell levels and is characterized by a paleness of skin and low energy levels. 500 Some neurones, for example mammalian motor neurones, have to send
their axons out of the area of the neural tube and travel much further in their journey towards other target cells. The first cells must have arisen from non-living material. This chapter will discuss a range of physiological processes of both humans and some of our closer vertebrate relatives. This type of synapse is called a motor end plate or
neuromuscular junction, viii International mindedness The impact of the study of biology is global, and includes environmental, political, and socio-economic considerations. Transgenic goats can now produce a clotting protein needed by haemophiliacs. When the allergen is encountered a second time, these IgE antibodies bind to the allergen and
trigger a response that leads to the mast cell releasing large amounts of a chemical called histamine. This area of the medulla is known as the respiratory control centre and has two mechanisms that come into play when the rate of ventilation needs to increase. Water then stays in the collecting duct, along with the various waste solutes, and the urine
is more dilute. Is it possible that the plants in the shade are also growing 786 in several different types of soil? The products are carbon dioxide, water, and ATP. Look back at the diagram of synaptic transmission (Figure 12.38). Who decides whether an experiment is safe? 9.4 Reproduction in plants Understandings: Flowering involves a change in
gene expression in the shoot apex. Application: pH of blood is regulated to stay within the narrow range of 7.35 to 7.45. However, all organisms maintain the same general functions that allow them to continue life. For example, if p = 0.25 (or 25%) frequency, then q = 0.75 because whichever chromosomes do not have the dominant allele must carry
the recessive one. Prokaryotes can reproduce using binary fission (dividing), whereas organisms such as plants and animals more frequently use sexual reproduction (involving a male and a female). Underproduction of dopamine results in the movement disorder of Parkinson's disease. Some lesions that have been studied were in either the right or
the left half of the brain, and have provided us with information about the differences between the two halves. Sensations of all kinds are temporarily blocked from reaching the brain. In Section 6.2 you learnt about the work of William Harvey and how he provided us with information of how blood circulates in the body. 

NATURE OF SCIENCE
Experimental design: accurate, quantitative measurements in enzyme experiments require replicates to ensure reliability. The molecule may have so many bends/kinks that it starts to curve over onto itself or twist around itself. Eventually, the connection made will be the best one between one motor neurone and the muscle fibre. (b) State two fuels
that can be produced from biomass. NATURE OF SCIENCE Francis Crick and James Watson used models to arrive at the structure of DNA. 565 12 Option A: Neurobiology and behaviour Synchronized oestrus in lions In a study of 15 lion prides in Serengeti National Park, it was shown that when a pride of female lions is taken over by new males, the
reproductive state of the females is synchronized. It is referred to as hydrophobic (water-fearing). Did he think that the unexpected results were mistakes and so omitted them from his findings? DNA structure suggested a mechanism for DNA replication. • Methane is produced from organic matter in anaerobic conditions by methanogenic archaeans
and some diffuses into the atmosphere or accumulates in the ground. In 1865, an Austrian monk named Gregor Mendel published the results of his experiments on how garden pea plants passed on their characteristics. This is called cyclosis or cytoplasmic streaming. One parent plant was homozygous dominant for both traits (round and yellow
seeds), whereas the other parent was homozygous recessive for both traits (wrinkled and green). • • • Bacteria of each culture were treated to release their DNA into a solution. Plants that contain this herbicide are called 'Roundup ready'. There are ethical and legal considers to consider: in certain circumstances, it is illegal to copy a plant in
this way. (a) In the polymer, which numbered carbons are always attached to the phosphate group? Thomas Henry Huxley Biology and values Which red circle is bigger? It has an essential role in the normal actions of an enzyme. Taste and sound are not just for pleasure.
alveolus and an adjacent capillary. Exercises 17 If the mRNA transcript is forming in the 5 to 3 direction, in what direction is the transcription bubble moving on the DNA antisense strand? 16 Outline a lab experiment using reflex conditioning. The roles of carbon dioxide and water vapour in the greenhouse effect. The consequence of the Moon having
little or no atmosphere is that it has no greenhouse effect. We can maintain our balance in precarious positions because of the accuracy of the hair cells in the semicircular canals of our ears. 2 You inquest a glucose molecule within the starch of a breakfast cereal. 583 13 Option B: Biotechnology and bioinformatics CHALLENGE YOURSELF 100 80
citric acid (gl-1) Figure 13.5 The effect of agitation: the relationship between circulation time (tc) and citric acid production by A. As can be seen in Figure 10.6, in anaphase II the centromeres of the chromosomes split, releasing each sister chromatid to become an individual chromosome. 6 Why is this diet not as beneficial to a species? To find it, the
data must first be put in order from the lowest to the highest value. These differences should be appreciated and celebrated as strengths. The order of these categories could be changed and it would not make a difference should be appreciated as strengths. The order of these categories could be changed and it would not make a difference should be appreciated as strengths.
through the selectively permeable membrane. It can be considered curious that industrialized countries that for centuries that are more recently following such economic development that they cannot do the same. One outcome of this collaboration is the HapMap.
III Component of triglyceride. The photosynthetic pigment that dominates in most plant species is the molecule chlorophyll. This involved the sequencing of DNA. Scientific beliefs change over time, and it can be enzymes or
structural molecules that cause physical characteristics (e.g. colour and leaf shape). However, a typical sports field might be 5000 m2, so there is no way a group can sample all 5000 m2, so there is no way a group can sample all 5000 m2, so there is no way a group can sample all 5000 m2, so there is no way a group can sample all 5000 m2, so there is no way a group can sample all 5000 m2, so there is no way a group can sample all 5000 m2, so there is no way a group can sample all 5000 m2, so there is no way a group can sample all 5000 m2 and cover the entire field:
8.15. Reproductive isolation of populations can be temporal, behavioural, or geographic. Have you ever wondered how similar you are to some of the creatures around you? Circumscription is the process of placing taxa where they clearly show monophyletic groups, allowing us to show that they all share a recent common ancestor. These structures
are called pili and can be used for attachment. Application: Red-green colour blindness and haemophilia as examples of sex-linked inheritance. Chemorepellent factors repel the axon, so that the axon will elongate in a different direction. Transgenic plants The simplest kind of genetically modified (GM) food is one in which an undesirable gene has
been removed. The surface area kidney dialysis or haemodialysis or haemodialysis. 712 Practice questions 1 The brown-headed cowbird, Molothrus ater, is a parasitic bird that lays its eggs in the nests of other species. Energy flow Understandings: Most ecosystems rely on a supply of energy from sunlight. stimulates adrenaline and noradrenaline secretion stimulates
pancreas glucose release stimulates large intestine lumbar region inhibits aliva production dilates bronchi to see the pupil reflex, ask someone to close their eyes and then suddenly open them (see Figure 12.12). When an
enzyme loses its shape, including the shape of the active site, it is said to be denatured. • How can I be sure to obtain only flowers of a certain colour? It was completed in 2003 and is a map of the entire human genome, with all of the proper order and all of the genes located on the correct chromosome. • Skill: Analysis of
evidence from electron microscopy that led to the proposal of the Dayson-Danielli model. • Application: Synchronized oestrus in female lions in a pride as an example of innate behaviour that increases the chances of survival and reproduction. One of the services commonly offered by such clinics is IVF: in vitro fertilization. Mining phosphorous for
fertilizer is consuming the phosphorus more quickly than geological cycles can replace it, and crops remove phosphate from the soil. CHALLENGE YOURSELF A G C Figure 7.9 An example of T A C T A G G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A C T C G C A T T A G C G A T T A G C G A C T C T C G C A T T A G C G A T T A G C G A C T C T C G C A T T A G C G A C T C T C G C A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G A T T A G C G
a ratio of 2.96:1. Two of the glycerol carbons have fatty acids. Summary Here is a list of the major distinguishing characteristics of prokaryotic cells. Migration in European blackcaps N Britain winter Spain 0 500 Kilometres Fitness in this context means the ability to survive and reproduce. These are the reactions that make
up your overall metabolism, and include diverse sets of reactions, including: • replication of DNA, in preparation for cell division • synthesis of RNA, allowing chemical communication between the nucleus and cytoplasm The 'collisional energy' referred to in this section is called activation energy. Determine the critical value in order to obtain a 95%
certainty that there is a statistically significant difference between these two sets of numbers. Campbell and Reece 1999 neural crest outer layer of ectoderm neural tube. On the contrary, each allele in a pair can mix with either
allele of another pair. Notice on the graph that, as the lactose is broken down, the penicillin is produced. These invaginations are called the basal labyrinth and operate in the opposite direction but have a similar function as the microvilli. Most cells contain both types of ER, with the rough ER being closer to the nuclear membrane. • Men with type II
diabetes have as much as a four-fold risk of CHD compared with men without type II diabetes, women with type II diabetes have as much as a fivefold risk of CHD compared with men without type II diabetes. The primary cell wall of plants is made up of cellulose. Figure 3.9 Homologous chromosomes. 

Skill: Mapping of the cardiac cycle to a
normal ECG trace. In the Krebs cycle, the oxidation of acetyl groups is coupled to the reduction of hydrogen carriers, liberating carbon dioxide. Its amino acid is then added to the growing polypeptide chain by a peptide bond. Each strand of DNA is composed of a backbone of alternating phosphate and deoxyribose molecules. What are the ethical
issues? Skill: Analysis of results of the Hershey and Chase experiment to provide evidence that DNA is the genetic material. NATURE OF SCIENCE In 1796, Edward Jenner administered the very first vaccine. From what you have read about sickle cell disease and malaria in this chapter, what do you think? Does the child's karyotype include any
anomalies? By doing this, the population of meristematic cells is continually renewed. Drugs Most drugs make their way into the bloodstream and are filtered by the kidneys. In fact, the fossil record indicates that more than 99.99% of all life that has ever existed on Earth is now extinct. This organelle functions in the collection, packaging,
modification, and distribution of materials synthesized in the cell. This creates a bend or kink in the shape of the molecule. The underneath layer is called the dermis and is very much alive. Would a temperature difference in the new water be a factor that could interfere with this ability to survive? Once MPF P the chromosomes have mitotic cyclin G2
checkpoint been replicated, the cell M enters its second growth C phase, called G2. Other organelles may be visible within the cell if you have a microscope with a high enough magnification and resolution. Microarray chip Figure 13.29 A DNA microarray chip Figu
allow detection of the specific radioisotope used. In order to use coal for energy, it must be extracted from below the ground, which is why mining is necessary. You might note the higher and lower % identities of different organisms on the list. Through biosequestration, an accumulation of foraminifera shells as sediments at the bottom of the ocean
can trap carbon in limestone for millions of years. These characteristics and the ability of molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross membranes are arranged along a continuum like this: small and non-polar molecules cross m
on two major factors: size and charge. (1) (Total 7 marks) 5 Outline Pavlov's experiments on the conditioning of dogs. In contrast, mutations that cause disease or death are detrimental mutations, and they are less likely to be passed on to future generations, because they decrease the chances of an individual's survival. There is a significant amount
of oxygen consumption occurring. What about animals: can they clone themselves the way plants sometimes do? The result is that, in the offspring, there should be certain predictable ratios. This is referred to as the metaphase plate. Many of these electrolytes are particularly important in the mechanisms behind how we send action potentials along
neurones, synaptic transmission between neurones, and muscle contraction. In this activity, you will research these factors and formulate a hypothesis concerning how a specific factor affects germination of a particular type of seed. 37 01 NATURE OF SCIENCE Cells 1.5 Testing the general principles that underlie the natural world: the principle that
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cells only come from pre-existing cells needs to be verified. In fact, these bacteria grew larger biomasses as they degraded the oil compared with the same bacteria living on glucose. The only flask sample that showed the presence of bacteria was the opened one. This amine group (NH2) is incorporated into one of three types of waste molecules
ammonia, urea, or 467 11 Animal physiology uric acid. This computer graphic shows an enzyme (the larger molecule on the right) and its substrate. Solution From the information given, we know that q is 0.10, and as the proportions of p and q must always add up to 1, we can say that p = 1 - q. In between is a chain of hydrocarbons (hydrogen atoms
and carbon atoms) that is usually between 11 and 23 carbons long (12-24 carbons when counting the carbon of the methyl group as well). To learn more about mitochondria, go to the hotlinks site, search for the title or ISBN, and click on Chapter 8: Section 8.2. 360 2 NADH P P 2 4 ADP 4 ATP 2 pyruvate Summary of glycolysis • Two ATPs are used to
start the process. It is open for testing and for falsification. They return to spawn with females at least one year earlier than the hooknoses. This type of unsaturated fatty acid is referred to as monounsaturated. 634 Many tutorials are available for Ensembl if you want to explore further. Notice that, even though the blastocyst is a hollow ball of cells
containing an inner cell mass, from the outside it simply looks like a ball of cells. The result of this is that the environment by tropisms. 4 Once each core is removed from the graduated cylinder, blot it dry with a paper towel and determine its
mass using a laboratory balance. Molecular biology H O N Gly Phe Val Ala Arg C H OH \beta-pleated sheet \alpha-helix H N O C O H C C H H C N H O C C O H N H N H O When trying to identify individual amino acids within a large, complex polypeptide, try to identify the peptide bonds between each of the covalently bonded amino acids. Synovial joints
provide limited movements Some joints in the body of mammals are synovial joints. Polyploidy You will recall that haploid cells, such as sex cells, contain one set of chromosomes (n). To what extent is it necessary to consider the social context of scientific work when evaluating ethical questions about research? Very specific diseases, such as scurvy
 and rickets, are the result. Only use arrows when you are writing about a process such as photosynthesis. This is because the climate and soil are different locations. This is a form of negative feedback. 217 05 Evolution and
biodiversity Darwin and Wallace At the age of 22, Charles Darwin had the opportunity to travel on board the HMS Beagle for a scientific exploration mission starting in 1831 and lasting for 5 years. 13 Why is oxygen important for the germination of seeds? The embryo at this stage is a hollow ball of cells and is called a blastocyst (see Figure 11.30)
Today, it is preferable to use ancestry and genetics to classify organisms. It decreases the activity of glutamate, an excitatory neurotransmitter. There is only one way for this to happen: one parent must have type B blood and also be a carrier of the allele for
type O blood (if necessary, remind yourself of the blood group alleles, as shown above). This is the longest and most variable of the cell-cycle phases. All other blood vessels receive blood after it has been processed by liver cells called hepatocytes. One sample is not enough data. Dr Alice Stewart was particularly talented with numbers. (b) What
influence does this have on the population of dark-coloured moths? A general rule of thumb is, if you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to someone else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to some else, then you know it well enough to explain to expla
relax and the diameter of the blood vessels becomes wider. DNA may exist in two forms, chromatin and chromosomes. Homologous structures. It is the first step in the production of seeds. When blood flows through the sinusoids, hepatocytes are bathed with the liquid (plasma) component of blood. Some
strains of bacteria are even resistant to multiple antibiotics. Other causes of cancer and disease Diseases such as cancer can sometimes be caused by mutagenic chemicals. 13 01 Cells is joining bacterial cells in preparation for the transfer of DNA from one cell to another (sexual reproduction). If your DNA does not have a certain gene, you may be
unable to smell a certain smell. At each end of a bubble there is a replication fork. DNA sequencing shows that the Figworts must be in five separate groups, some of them entirely new groups made for the occasion, like children of a second marriage assigned a name they've never known. Unfortunately, all three factors are changing in the oceans of
the world as a result of human activities. The pupil closes as a result of a parasympathetic response caused by acetylcholine. Action potentials are sent by a cranial nerve called the variations in that
0.1% that make us different? Notice that photoheterotrophs and chemoheterotrophs are chemoheterotrophs.
LEU LEU GLY ASN VAL LEU VAL CYS VAL LEU ALA HIS Species B PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA LEU VAL ALA ARG (a) How many differences are there between the human sequence of species PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA LEU VAL ALA ARG (a) How many differences are there between the human sequence of species PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA LEU VAL ALA ARG (a) How many differences are there between the human sequence of species PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA ARG (a) How many differences are there between the human sequence of species PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA ARG (a) How many differences are there between the human sequence of species PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA ARG (a) How many differences are there between the human sequence and the sequence of species PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA ARG (a) How many differences are there between the human sequence of species PRO GLU ASN PHE ARG LEU LEU GLY ASN VAL LEU ALA ARG (a) How many differences are there are the sequence of species PRO GLU ASN PHE ARG LEU ALA ARG (a) How many differences are the sequence and the sequence of species PRO GLU ASN PHE ARG LEU ALA ARG (a) How many differences are the sequence and the sequence are the sequence of species PRO GLU ASN PHE ARG LEU ALA ARG (a) How many differences are the sequence are 
recommended to use protective gloves when handling the Congo red or red ink. But physical objects are not always responsible for separating populations of a species. 2008, Fig. H O H H OH HO C H H Figure 2.5 The hydrogens added. 

Pathway engineering optimizes genetic and regulatory processes within microorganisms. The other 20% of our red ink.
height is the result of environmental factors. All rights reserved (a) Calculate the percentage of CO2 found as bicarbonate ions in the plasma of venous blood at rest. There are two distinct forms of cloning, making copies
of entire organisms • therapeutic cloning, making copies of embryonic stem cells. Yet animal experiments can never replicate the complete picture of human interactions with drugs. 232 After many generations, the genes for longer necks are passed down more successfully than the genes for shorter necks. It had been estimated previously that the
window for improvement of PSA was the first year following the stroke. rate of enzymecatalysed reaction enzyme starts to lose its shape, so reaction rate as enzyme continues to denature increase in molecular collisions further increase in temperature Whether or not
an enzyme is permanently destroyed by denaturation is largely dependent on whether covalent bonds (such as peptide bonds) have broken. These molecules are usually toxic to a host. Other scientists are using stem cells to test the safety and effects of new drugs. • The volume and content of gastric secretions are controlled by nervous and hormonal
mechanisms. These toxins come in the form of pesticides and herbicides and herbic
construction, limestone is used and, in the process, some of the carbon is released back into the atmosphere as carbon dioxide, cancelling out the biosequestration. In addition to this, the process of crossing-over contributes to the shuffling of
genetic material and further increases the genetic variety. So to calculate q, we take the square root of 0.011, which gives us 0.105. A Hormonebinding sites B Cell adhesion C Enzyme synthesis D Pumps for active transport (Total Total 1 mark) 4 Which of the following take(s) place during either interphase or mitosis in animal cells? • Individuals with
 genetic characteristics that are well adapted for their environment tend to be more successful at accessing resources and have a better chance of surviving to maturity. The Golgi apparatus possibly modifies the protein and surrounds the protein and surrounds the protein with another vesicle. We have included at least one example in each subsection, and hope you will come
up with your own as you keep these ideas at the surface of your learning. Water is the solvent of life. Application: Pavlov's experiments into reflex conditioning in dogs. Finally, when a valve at the lower end of the stomach opens and releases the partially digested food (called chyme) into the duodenum of the small intestine, a set of signals terminates
the secretion of acid and pepsinogen from the gastric pits. Skill: Identification of exocrine gland cells that secrete digestive juices and villus epithelium cells that absorb digested foods from electron micrographs. Should we be worried? The cell divides in two. The circular DNA is extracted. Are food labels today effective at indicating whether or not
the food is genetically modified? The technique is quite reliable: if all 13 loci involving STRs are analysed, the likelihood of two individuals having the same profile is close to 1 in 1 billion, with the exception of identical twins. There is a down side to it, however: some questions arise about the morality of such a practice. Application: The role of
inheritance and learning in the development of birdsong. If you think the answer has many sides to it, is a debatable area, or leads to further questions, you are probably on the right track. EST can be used to identify potential genes. This is called ventilation. Also notice on the graph that the biomass of the mould is levelling off while the penicilling of the pen
production is increasing. To represent the alleles, Mendel used a system of letters that is incompatible with the system we use today so, in this example, Mendel's letters have been replaced with modern conventions: • R = allele for round peas • Y = alle
 F1 refers to the first filial generation and it is the resulting offspring of the cross between the parents who are distinctly different (e.g. one green, the other yellow). The autonomic nervous system also controls digestion and blood pressure. If four or five stimulations are given, the memory lasts several days. People from India, Pakistan, Bangladesh,
and Sri Lanka living in the UK have a 50% higher incidence of mortality from CHD compared with other ethnic groups. The following bullet points would be suitable text for annotating a diagram of the brain. (a) (b) (c) (d) A single-celled organism that prefers very salty water. Why is the idea of falsification important to scientific knowledge? • A puff of the brain.
serotonin (a slow-acting NT) acts on a presynaptic neurone. In some research these organisms are as important than the mouse. Does it mean we can accept or reject the null hypothesis? Are the latter 'less scientific'? Anyone who looks at a science topic as only a set of things to memorize is missing the much bigger and more
important picture. Biologists have been classifying plants using the external features for many years. Cytokinesis As you can see, the phases of mitosis involve nuclear division. 10 Some, but not all, substances can be tested for in the urine of a patient. Is predicted intelligence acceptable screening? If fertilization does occur, the events stimulate the
secondary oocyte to complete meiosis II. Two relatively new techniques have allowed major developments in the analysis of phloem sap. But they did not survive the environmental changes that drove them to extinction. Table 7.5 Examples of proteins and their functions Protein example Function Haemoglobin A protein containing iron that transports
oxygen from the lungs to all parts of the body in vertebrates Actin and myosin Proteins that interact to bring about muscle movement (contraction) in animals Insulin A hormone secreted by the pancreas that helps maintain blood glucose level in many vertebrates Immunoglobulins A group of proteins that act as antibodies to fight bacteria and viruses
Amylase A digestive enzyme that catalyses the hydrolysis of starch There are proteins that have a structural role, proteins that store amino acids, and proteins that acids ac
the rate of photosynthesis in Figure 2.52, why is the early part of the graph labelled as a positive correlation? The action of slow-acting neurotransmitters on neurones is 547 12 Option A: Neurobiology and behaviour what allows the brain to have the functions of 'learning' and 'memory'. In its natural setting, the appropriate length of darkness occurs
towards the winter season. However, the test is not perfect and results include a small number of false positives. Note their location in the cell cycle and that they must combine with a CDK to become active. • Decant the serum; it is the serum; it is the serum; it is the serum that will contain the antibodies. Before adding snails or shrimp, for example, you would need to decide if you
can justify exposing such organisms to things they would not encounter in their natural habitat such as low oxygen levels or low food supplies. Figure 11.5 The segments of an insect's leg are moved up and down by the action of antagonistic muscle pairs. Most people 291 06 Human physiology never seriously consider why we need oxygen, but
everyone knows that we do. Skill: Analysis of oscilloscope traces showing resting potentials and action potentials. Many companies specialize in the safe removal of asbestos insulation from older buildings. The placenta facilitates the exchange of materials between the mother and foetus. Dirckx; Figure 13.23 from Persister cells, dormancy and
 infectious disease, Nature Reviews Microbiology, 5, January, fig. Recently, scientists studying knockout mice (genetically manipulated mice addicted to cocaine) found another neurotransmitter that might be as important or more important than dopamine: glutamate (see Figure 12.46). In this case the person will say that he or she has seen nothing. In
their genetic makeup, many agricultural societies show a higher frequency of the genetic code that allows humans to digest lactose throughout adulthood. actin 462 myosin False-colour electron micrograph of myofibrils of skeletal (striated) muscle. • The various specific forms of a gene are alleles. Some scientists did not share their research or
findings. The first way we will use the 2 test is to compare our observed results with what we can theoretically calculate the results should be (the 'expected' results). Eukaryotic cells contain huge numbers of nucleotides compared with prokaryotic cells. CHALLENGE YOURSELF 6 Do you know your carbon footprint? In addition, all the proteins found
in living organisms use the same 20 amino acids to form their polypeptide chains. Non-competitive inhibitors do not compete for the enzyme. It is estimated that if Earth had no atmosphere, the average temperature would be 32°C colder (-18°C), making the possibility of life very different. Plants contain a variety of pigments in
chloroplasts. Amyris is the biotech start-up company that initially engineered the pathway to produce artemisinin. GHGs have the ability to absorb and radiate infrared radiation (heat). For example, a flowering plant might make some flowers with more nectar and some flowers with less nectar, but because producing excessive nectar would be a drain
on the plant's sugar resources, and producing too small a quantity would discourage insects from returning, an intermediate quantity is produced that is a balance between too much and too little. Inorganic phosphate is released. This system of naming organisms using two names is called binomial nomenclature. They are called bipolar because they
each have two processes extending from the cell body. Passive transport will occur until there is an equal concentration of the substance in both areas involved. This problem was not foreseen, nor was it scientifically studied before steroids had become a common dietary additive for both people and livestock. This is called equilibrium. When water
changes from a liquid to a gas at 100°C, the high temperature is necessary to create the relatively high rate of molecular motion needed to enable the molecular motion needed to enable
father. It has been seen in animal models that sustained levels of glucose in the brain are beneficial for learning. This seems paradoxical, because the production of seeds, spores, and eggs involves using energy and nutrients that also are vital to the parents' survival. This active transport is a chemiosmotic process involving proton pumps and
specialized membrane proteins called cotransport proteins that can allow both passive and H2O active transport. growth in metres 16 12 8 4 0 beech maple hickory oak Figure 3 Mean population density ±1 SD of two species of Paramecium grown in solution. Remember, the start codon was near the 5 end of the mRNA. That decision saved the bald
eagle from extinction. Studies were done by collecting statistics on the many different characteristics of the parents and families of children born with Down syndrome. Twenty-eight days of ovarian events are being shown with a single ovary as if in time lapse. Worked example Is it possible for a couple to have four children, each child showing a
different blood type? Emphysema is often accompanied by other damage to the airways leading to the alveoli, and collectively the symptoms are referred to chronic obstructive pulmonary disease (COPD). From the mRNA a single strand of copied DNA (cDNA) is made using an enzyme called reverse transcriptase (RT). However, some DNA is found in
structures called plasmids. Another very interesting area of study involves cell-based therapies, especially as they may have a positive influence on the treatment of diseases and traumas such as Alzheimer's disease, spinal cord injuries, heart disease, burns, and strokes. Of course, historians will also tell you that there were other causes;
history is complex, but the potato blight was a major factor in the famine. Argument for the question: It's important for scientists to be able to modify ideas as new evidence is revealed. How is it possible that each insect, each child, each goldfish, each tree, is unique, among thousands, millions or even billions? Acetocarmine contains acid and should
not get on the skin or in the eyes. Those who attain a minimum requirement of food are allowed to continue to the next round; those who do not are eliminated by natural selection. • Skill: Measurement of transpiration rates using potometers. Figure 6.1 The human digestive system. Use the hotlinks at the end of this section to watch a movie called
GMO/OMG premiering in New York City in September 2013. Another plant of potential interest to the developing world is a genetically modified rice plant that will show the volume and mass of the potato cores before and after being placed in
solutions of six different sucrose molarities. When are they ever going to make up their minds and get it right? Do you have a younger brother or sister who might be fascinated by you telling them the story of how we hear? The chemical digestion of starch begins in the mouth, with the addition of saliva to the food. The flow of ions causes either
depolarization (a continuation of the nerve impulse) or hyperpolarization (a termination of the nerve impulse). There are organismspecific databases like FlyBase and WormBase. His numbers do not show the expected variations that are typically found by farmers and researchers when breeding plants. leaves cotyledon (seed leaf) hypocotyl seed coat
(testa) plumule primary root epicotyl withered cotyledons hypocotyl secondary roots Seed germination is an uncertain time in a plant's life. Research conducted in the first few decades of the 20th century demonstrated that DNA contains our genetic blueprint. However, the ribosomes of eukaryotic cells are larger and denser that those of prokaryotic
cells. Understanding the mechanisms by which species evolve by natural selection is arguably one of the most important and influential concepts in biology. • Energy is needed to produce carbohydrates and other carbon dioxide. You may find useful online sources if you want to investigate this story. The DNA strand that
carries the genetic code is called the sense strand (or the coding strand). This is the amount of carbon dioxide you as an individual are contributing to the atmosphere. • Application: Changes in beaks of finches on Daphne Major. The units used are energy per unit area per unit time: kilojoules per square metre per year
(kJ m-2 yr-1). This means that many of the hydrogen and ionic bonds that help shape the molecule become broken. • Click search. The first shows a wide distribution of data points from the mean. Dalton asked for his eyes to be
dissected after his death (he died in 1844) to verify his hypothesis that the liquid inside them was blue. In Figure 10, the graph on the left illustrates the 'pure' mathematical law about light intensity and distance from the light source. Plant adaptations for water conservation The transpiration process is affected by a number of environmental factors
as summarized in Table 9.2. Table 9.2. Table 9.2 Environmental effects on transpiration by warming the leaf and opening stomata Humidity Decreasing humidity increases transpiration because of the greater difference in water concentration Wind Increases the rate of transpiration
because humid air near the stomata is carried away Temperature Increasing temperature Causes greater transpiration, turgor loss occurs and the stomata close, and the transpiration rate decreases Carbon dioxide High carbon dioxide
levels in the air around the plant usually cause the guard cells to lose turgor and the stomata to close Plants that survive in desert and high saline environments have encompassing many types of organisms, and the lower taxa have increasingly specific
characteristics; the hierarchy narrows the categories down into smaller and smaller numbers of subcategories down into smaller numbers of subcategories to apply pressure to.
Each chamber of the heart has to have an opening to receive blood and another opening to allow blood to exit. 4.3 Carbon compounds. From the plant's perspective, the useful products formed during this stage of photosynthesis are ATP and hydrogen.
General anaesthetics are usually used in surgery; during the surgery the patient loses consciousness completely and has no awareness of pain. Illustration showing a small portion of cardiac muscle. Partially decomposed organic matter from past geological eras was converted either into coal or into oil and gas which accumulates in porous rocks.
But how do we decide which evidence is to be discarded? Students are expected to know that an alkali is used to absorb carbon dioxide, so reductions in volume are due to oxygen use. 

Peat forms when organic matter is not fully decomposed because of acidic and/or anaerobic conditions in waterlogged soils.
These ranges can also be called bins, and you can think of a histogram as a series of bins that you fill up with the appropriate data as the data are sorted. D.6 Transport of respiratory gases Understandings: Oxygen dissociation curves show the affinity of haemoglobin for oxygen. The autonomic nervous system controls involuntary processes in the
body using centres located in the brainstem. • The two alleles of each gene separate into different haploid daughter nuclei during meiosis. These structures and molecules are manufactured in the nucleolus. They
are composed of microtubules. Be aware, however, that there are other, less wellstudied, ecosystems that exist in total darkness, such as those in deep ocean water and those found deep underground, but these are not well understood because they are so difficult to access. Exercises 19 Why did bacteria grow in the broth of the flask that was left
open by Pasteur? The endosperm of the seed can be starchy (allele E) or sugary (allele E) or 
is more likely to dissociate oxygen, and foetal haemoglobin is more likely to bind to that same oxygen. 2pq = 0.18, so 18% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the population is Tt. Lastly p2 = 0.81, so 81% of the p3 = 0.81, so 81
accumulate. Notice the large gaping holes where healthy alveoli once were. One type is referred to as integral proteins and the other type is referred to as peripheral proteins. For this, we have to go far back in time, before dinosaurs roamed Earth. During the Carboniferous period, hundreds of millions of years ago, some places in the world that are
now dry land were underwater and hosted abundant aquatic or marine life, including algae and zooplankton. Answer the questions below the diagram with the appropriate letter. 14 Explain how sound is perceived by the ear. ELISA diagnostic test The enzyme-linked immunosorbent assay (ELISA) is a diagnostic tool that was the first test widely used
for the screening of human immunodeficiency virus (HIV). Soil that is waterlogged is so saturated with water that oxygen cannot get into the soil. This gives us information about our equilibrium. • Addiction can be affected by genetic predisposition, social environment, and dopamine secretion. The rat originally pressed the pedal by accident during
human 8-week-old embryo. Thus the entire small intestine of a human contains millions of villi and even more microvilli. Melatonin Deep within your brain is a very small gland called the pineal gland. In Saudi Arabia, where the culture and the law prohibit alcohol use, alcoholism is rare. Inhibitory neurotransmitters cause hyperpolarization of the
neurone (the inside of the neurone becomes more negative), making it even more difficult for an action potential to be generated. Over millions of years, sediments can accumulate above the peat, and the weight and pressure of those sediments can accumulate above the peat, and the weight and pressure of those sediments can accumulate above the peat, and the weight and pressure of those sediments can accumulate above the peat.
careful to use the same sampling methods every time they sample so that results can be compared. Jacks are not brightly coloured like the hooknoses, and are not so easily seen. You then found out that a new technology using a viral vector had been developed that would supplement your defective gene with a normal gene. In appearance they are
very similar to a bunch of grapes. 10 You have a leaf from each of two very different plants. Calculating the age of fish in a population Knowing how many younger fish and how many older fish are present is very useful. To test whether it is methane, attach the burner and squeeze the balloon. choroid retina cornea fovea lens pupil iris blind spot
of reasons. Name the members of the mammal clade in this cladogram. All condensation reactions occur in a very similar way. Nerve impulses are action potentials propagated along the axons of neurones. Follow all directions from your teacher in the disposal of all chemicals used. She is a product of artificial selection by humans and she never
existed in this form before human intervention. 2.9 Photosynthesis Understandings: To learn more about aerobic cell respiration, go to the hotlinks site, search for the title or ISBN, and click on Chapter 2: Section 2.8. NATURE OF SCIENCE Experimental design: controlling relevant variables in photosynthesis experiments is essential. 5 (b) Possesses
some breast cancer cells. • The proton pump moves hydrogen ions into the spaces of three bases. The SA node is a group of modified cardiac muscle cells that are capable of generating action potentials at a regular frequency. Think
of this as a graph with electrical activity (measured in millivolts) plotted on the y-axis and time plotted on the y-axis an
William Harvey carried out his studies before the microscope had been invented. Use the hotlinks at the end of this section to try one: what do you get, and how do you compare with the rest of the world? 9.57 (b), p. One component of their cells. Spermatozoa do not
contain any unnecessary organelles or structures; their small size allows them to swim great distances and unnecessary structures would be a burden (see Figure 11.26). lower half of data set 3.2 4.4 4.4 middle of data set 5.2 upper half 
four. coli to make human insulin, a protein needed to treat diabetes (see Section 2.7). One such staple crop is corn or maize. Read the first sentence of the abstract and you will learn about the differences between prokaryotic and eukaryotic cells. 448 A B C
carefully label your experiment so that no one throws it away thinking it is rubbish. Notice how the absence of two consecutive hydrogen atoms on the same side of the carbon atom chain causes the molecule to bend at the zone where the double bond is. Antirrhinum Plantago Digitalis Figure 5.21 2 Veronica Study the phylogenic tree below showing
some primates and their chromosome numbers. Another approach is that of holism or of looking at systems. The mucosa has many small folds or projections called villi (singular villus). In 1995, less than 2% of surveyed fishing trips kept more than one grouper. Here is a summary of one way of doing it: the Sanger technique. Each gene is found at a
specific place on a specific pair of chromosomes. Select the icon to view a worksheet with further activities Hepatitis B vaccine production from tobacco plants NATURE OF SCIENCE In order to make sure that the plasmid has transferred to the agrobacter cell, agrobacter is grown on culture media containing an antibiotic. He manipulated the stem
cells so that they would promote nerve regeneration. Many of the homeostatic mechanisms initiated by your nervous system are under the control of your autonomic nervous system. ESTs can be: • mapped to a certain chromosome location • or, if the gene containing the EST has been sequenced, it can align the EST to that genome. Beta-D-glucose
has exactly the same chemical formula as alpha-Dglucose and the two are, in fact, isomers of each other. 11.4 Sexual reproduction involves the development and fusion of haploid gametes. Record the time necessary to achieve this positive result. They get their chemical energy from autotrophs or other heterotrophs. The same action potentials from
year 0 1930 19401950 1960 1970198019902000 2010 year Figure 14.40 Growth of: (A) Florida's human population from 1840-2000; (B) south Florida commercial and recreational fishing fleets from 1964-2004. You may have noticed that there are no valves where blood enters the atria.
 Which species has a different number? The area where the brain forms is well advanced over the caudal (tail) area. This has led to the possibility of identifying thoughts or, as some call it, 'mind reading'. Hepatitis B virus. 1222-1225 (Nicholson, Carla A. It is known as the C3 photosynthetic
pathway. • Other bacteria have receptors that receive the signal of the inducer. Option B: Biotechnology and bioinformatics 5 Introduce the recombinant DNA (the target gene from another organism + plasmid DNA) back into the bacteria. Every cell appears to have many different types of transcription factors. • The variable radical of amino acids
can be shown as R. Many microorganisms can be used to decontaminate an area, because they have the right enzymes to break down the long chains of hydrocarbon molecules that are found in organic pollutants. When plants and animals die, the nitrogen compounds are returned to the ground by decomposition. If you search the internet for human
phylogeny, you will probably find that few sources agree with each other. What other success stories or failures about gene therapy have been reported in scientific journals? 3 To reduce evaporation further, place each slide in a Petri dish. A common criticism of modern diets, especially in industrialized countries, is that they do not contain enough
fibre. Figure 6.8 shows the left side of the heart with openings in the left atrium for entry of the pulmonary veins. This excites the postsynaptic neurone and it begins to fire, releasing a molecule called dopamine. Type II diabetes is often associated with genetic history, obesity, lack of exercise and advanced age, and is more common in certain ethnic
groups. Plants of this type are called succulents. These two organisms share a core set of genes, so that experiments with mice can give us information about human genes. It is a complicated series of responses to the environment in which animals live. C Chromatin and nucleotides. Notice also that there is no way that myosin can get any shorter
town in Connecticut where the first cases were discovered in 1975. What type of vascular tissue is II? 3.5 Biologists have developed techniques for artificial manipulation of DNA, cells, and organisms. • Overall, the life that existed more than 500 million years ago was vastly different in appearance from life today. Drake et al. There are three main
sources for variation in a population: Key fact These key facts are drawn out of the main text and highlighted in bold. Most of the new neurones in the human cortex are formed between the fifth month of development. Applications of DNA profiling DNA profiling DNA profiling can be used in paternity suits when the identity of someone's biological
father needs to be known for legal reasons. (Follow Figure 13.34 as you read these steps.) • Take a blood sample. Here is a series of worked examples to help you get some hands-on experience: you will not be able to understand fully how to use the Hardy-Weinberg equation without practice. When drawing nucleotides, it is common practice to put
the capitalized first letter of the base inside the rectangle. unfiltered blood proximal convoluted tubule distal convoluted tubule afferent arteriole efferent arteriole efferent arteriole efferent arteriole efferent arteriole efferent arteriole efferent arteriole ions peritubular capitlary bed blood to renal pelvis Figure 11.14 A single
nephron of the mammalian kidney. In many areas of the world, these products are now produced by genetically engineered bacteria and have no risk of transmitting HIV. Because a recessive trait. Telophase I 1 2 3
Spindles and spindle fibres disintegrate. Researchers at Vostok Station in Antarctica have collected layers of ice from more than 3000 m down, yielding climate information going back more than 400 000 years. Lack of the enzyme prevents metabolism (use) of dATP. Who should decide whether such experimentation and exploration into our private
thoughts should be pursued or banned? Human physiology 2 3 4 5 Because the thoracic cavity has increased its volume, the pressure inside the cavity decreases. The remainder of this section will focus on a group of common plant hormones called auxins. 4.3 Continued availability of carbon in ecosystems depends on carbon cycling. Are physical
NATURE OF SCIENCE For centuries, it was firmly believed that rats, maggots, and mould sprang from rotting meat and vegetable matter. Inserting recombinant DNA into the plant cell 1 Agrobacter plasmid plasmid c. As you will recall, glycolysis occurs in the cytoplasm of the cell, produces small amounts of adenosine triphosphate (ATP) and ends
with the product known as pyruvate. This is referred to as the principle of priority and is taken very seriously. 4 Describe the shape of your graph, especially noting the effects of the variable applied for your procedure. They are a bit like olive oil in their consistency. Those that cannot be synthesized from other molecules, and thus must be a part of
our diet, are called essential nutrients. Looking back, it might be tempting to say that doctors using X-rays on pregnant women after Stewart's report were acting unethically: what do you think? 2.1 Molecules to metabolism Understandings: NATURE OF SCIENCE Falsification of theories: the artificial synthesis of urea helped to falsify vitalism.
Respect for life is very important in our studies. However, three of the four endproduct cells of oogenesis are not used as gametes because they are much too small to produce a viable zygote if fertilized. NATURE OF SCIENCE There has been controversy about the methods of diagnosis and treatment of attention deficit hyperactivity disorder (ADHD)
since the 1970s. The chromosome in prokaryotes You will recall from Chapter 1 that the nucleoid region of a bacterial cell contains a single, long, continuous, circular thread of DNA. 693-706, fig. To see an introduction to photosynthesis, go to the hotlinks site, search for the title or ISBN, and click on Chapter 8: Section 8.3. 368 8.3 Photosynthesis
Understandings: Light-dependent reactions take place in the intermembrane space of the thylakoids. Archaean species thrive today in diverse habitats, from extreme conditions such as hydrothermal vents and hot springs, to the guts of mammals. Chromosomes condense by supercoiling during mitosis. If you look back at the two sequences given
previously in the worked example on page 117, the first is for the section of the haemoglobin gene's DNA that codes for standard-shaped red blood cells, whereas the second sequence shows the mutation that leads to the sickle shape. 73 and p. • Click on chromosome 21. Find an mRNA codon chart and answer the following. The mechanism of
breathing is not altered, just the frequency. The motor cortex controls voluntary movements. Solutions 1 2 3 4 5 6 I = xylem, II = phloem. The hope is that eventually an understanding of the complete process is obtained. When exploring chemotaxis, experiments can be performed that vary the pH, the concentration of dissolved drugs, food, or
pesticides. 1 Give a full description of the six individuals in Figure 3.33, saying who is affected and who is not. • From here you can explore chromosome or by looking at the chart of chromosome statistics. To ensure continued existence in an area, a plant must flower when pollinators are available
and when necessary resources are plentiful. So much can be explained by natural selection, from why zebras have stripes, to why new bacterial populations that are resistant to antibiotics are being found in hospitals. P Figure 8.9 The third stage of 2 glycolysis. • Dracula vampira Luer, 1978. • Application: Prokaryotes divide by binary fission.
Chemoattractive factors attract the axon to grow towards it. This system is a resource for all the researchers studying the genomes of humans, other vertebrates, and model organisms. An enzyme can function as a catalyst many, many times. It would appear so. (3) The receptor-hormone complex enters the nucleus through a nuclear pore. From what
inorganic molecules can aquatic organisms get their carbon? The original methods used to examine phloem contents involved studying the exudates from severed sieve tubes. Biologists at one time firmly believed in the one gene-one protein concept. (iii) Beside each drawing include the: • total magnification • diameter of the field of view • estimated
length of an individual cell. One way to have more working surface is to add folds to the surface. Which process is directly assisted by this adaptation? • Adaptations are characteristics that make an individual suited to its environment and way of life. 87, p. Finally, the phenotypes can be deduced by looking at the genotypes. The membranes also
provide a barrier, allowing proton accumulation on one side. What was the significance of the micropyle to the ovule? Sometimes the waiting list can be quite long. 2.2 Water is the medium of life. (2) (b) State two characteristics of stem cells that can be quite long.
photosynthesis is to keep track of the change in biomass of experimental plants. This pump only works by moving sodium in one direction across the membrane. There are 20 different amino acids that are used to produce the proteins of organisms, and these can be arranged in any order. [S] Curve A represents a
those offspring, natural variation as a result of genetic differences (e.g. body size, morphology, pigmentation, visual acuity, resistance to disease). Moving the branches of the tree of life around and reclassifying a taxon in a new branch in this manner means changing the species' circumscription. balance charges 759 15 Option D: Human physiology,
The rate of ventilation is controlled by the respiratory control centre in the medulla oblongata The use of ATP molecules, and thus an increase in the rate of aerobic cellular respiration. The political debate is often driven by non-scientific arguments. Another analogy that is very commonly used for enzyme-substrates
activity is a lock and key. The result is that the protein loses its normal threedimensional shape and function of a protein. What correlation evidence was observed in the example of UK blackcaps? In this example, each group will use a 1-m2 quadrat. TMV is a
retrovirus that has the capacity to cause disease in tobacco plants. A motor neurone does not send action potentials are only sent when there has been a voluntary 'decision' by the cerebrum to make a movement. 13 How are the products of the light-dependent reaction important to the light-independent reaction? You
might guess that, because there are three a alleles and only one A, there should be a three out of four chance of seeing offspring with the recessive trait. This leads to over stimulation of the postsynaptic neurone.
scientists to make advances in bioinformatics applications such as locating genes within genomes and identifying conserved sequences. Consequently, ethologists typically work 'in the field', observing behaviour in such a way that their subjects are affected by their activities as little as possible. This is why it is colder in the winter. Notice that
freshwater fish expend energy in order to actively transport ions in through their gills and in the production of a very dilute urine. Some foods make us remember our childhood. Use of immobilized lactase to produce lactose-free milk It has been found that there is an extremely high incidence of lactose intolerance in some ethnic groups and a
relatively low incidence in others. Researchers from the University of Texas Health Science Center in San Antonio have reported that eating less during early pregnancy impairs foetal brain development in a non-human primate model. If you printed out 3000 base letters per page, it would need 1 million pages, which would stack about 100 m high. In
a follow-up experiment, he found that the goslings would imprint on a box attached to a model train. For example, researchers have shown a series of images to participants and recorded the patterns that show up on the fMRI scanner for each image. For example, the vast majority of strains of the viviparum variety of A. The functions of life manifest
in different ways in different types of organisms. The cause can always be traced back to liver function. What does his statement imply about the degree of prestige or respect each scientific discipline enjoys? • Vibrations are transformed into nerve impulses. The northern-most population showed the least robust growth, matching values that were
recorded in populations of its native Massachusetts. This illustrates that scientists must always be observant, to spot unplanned and surprising discoveries. Blood pressure measures the force of the blood pushing outwards on the wall of the arteries. As is the case with useful nutrients, the hepatic portal vein brings absorbed alcohol to the liver first.
Each cluster of alveoli has one or more surrounding capillary bed(s). Polar amino acids include serine, threonine, tyrosine, and glutamine. As well as the effect they have in phototropism, auxins are also involved in: • stimulation of cell division in most meristematic tissue • differentiation of xylem and phloem • development of lateral roots in tissue
cultures • suppression of lateral bud growth when present in the apical bud • stimulation of fruit production without pollination. A software suite of imageprocessing tools for full automation of fruit production without pollination. A software suite of imageprocessing tools for full automation of fruit production without pollination.
bean plants. The good news is that they are now in a position that allows the Na/K pump to once again begin actively transporting them across the membrane at the ratio characteristic of this pump (three sodium ions pumped out for every two potassium ions pumped in). See the Mathematics, and information and communication chapter for more
about statistical tests. In order to set up a Punnett grid, the following steps must be followed. This binding results in the reaction occurring much faster than would be expected without the enzyme. Mortality was low. After the mapping was completed, more than 1400 were known, and today the number is in the thousands and increasing. Since the
mid 1990s, DNA analysis of the plants classified in this taxon have led botanists to rethink their classification. All birds have feathers and lay eggs with hardened shells. Type II diabetes is controlled by diet. So you can see how the atmosphere acts as a kind of blanket around the planet warm, and during the day it provides
a barrier protecting life from too much solar radiation. As seen in Figure 3.35, gel electrophoresis can stop there or a hybridization probe can be added. In this analogy, the lock represents the enzyme's active site and the key represents the enzyme's active site and the key represents the substrate. Just as penicillin was first discovered in a fungus, lots of pharmaceutical drugs come from naturally
occurring compounds. For this exercise, find the relevant PDF file in the hotlinks at the end of this section. Stored glycogen can be seen as large vesicles or 'granules' in electron micrographs of hepatocytes. The y-axis of an oxygen dissociation curve shows the percentage saturation of haemoglobin with oxygen. The place where the two connect to
each other is called a chiasma (plural chiasmata). This practice has often been used to kill unwanted trees. Evolution and biodiversity database is the Integrated Taxonomic Information System (ITIS), which you can find in the hotlinks at the end of this section. Synthesis of the polypeptide involves a repeated cycle of events. Some examples are
with the genotypes DD or Dd has the Rhesus positive (Rh+) phenotype. • Applications and skills: Applications with that increase in travel has come an associated increase in the rate of spread of global disease. Carbonic acid then dissociates into a hydrogen carbonate ion and a hydrogen
between the amino acids alanine and valine. The classic debate of nature versus nurture is a good topic for a Theory of knowledge discussion. • The enzyme enables this reaction to occur at a much higher reaction rate and with less collisional energy compared with
the same reaction occurring without the enzyme. • Brain metabolism requires large energy inputs. The presence or absence of the hormone's receptor protein determines whether or not a cell is a target cell of that particular hormone. The human genome data and that of the sequencing of many other species are now available in public databases
such as The National Center for Biotechnology Information (NCBI). Variation within populations Organisms such as bacteria reproduce simply by making a copy of their genetic information (NCBI). Variation within populations Organisms such as bacteria reproduce simply by making a copy of their genetic information (NCBI). Variation within populations Organisms such as bacteria reproduce simply by making a copy of their genetic information (NCBI).
black dots are glycogen granules, the storage form of glucose. If one population evolves at a different rate from another, the two could become so dissimilar that they no longer belong to the same species. People who had injuries in the same areas but on the right side of the brain had no language problems. • If the data set appears to be reasonably
linear on your graph, draw a single best-fit line representing the overall data pattern. It contains soluble blue copper (I) ions. Many of the young do not in fact survive predation and other dangers as they mature. Shankaran et al. Because the three-dimensional shape of the internal portion of the lock is complex
and specific, only one key will fit. decomposers Pyramid of energy is used to show how much and how fast energy flows from one trophic level to the next in a community (see Figure 4.3). The filtrate then enters the ascending portion of the loop of Henle, where the tubule is relatively impermeable to water, but permeable to salt
ions. (a) (b) C C HO C O C C C C C O C OH OH Figure 2.3 The carbon backbone of alpha-D-glucose. This was an international project and the information is now available free worldwide. Table 2.4 Polarity of different molecules Substance High or low relative solubility in water Mode of transport in an aqueous environment (no special
 mode means the substance dissolves directly and easily into water) Glucose Polar molecule/high solubility No special mode of transport needed/dissolve directly in aqueous plasma Cholesterol Largely non-polar/very
low solubility Transported by blood proteins that have polar amino acids on the outer portion to give water solubility, and non-polar fatty acid components/very low solubility Transported by blood proteins that have polar amino acids on the outer portion to give water solubility, and
non-polar amino acids internally to bind the nonpolar fatty acid molecules Oxygen Travels as diatomic O2/ low solubility in water is exacerbated by the relatively high temperature of warm-blooded animals (oxygen is less soluble in warm aqueous solutions)/haemoglobin is used to bind and transport oxygen molecules reversibly
Sodium chloride Ionizes/high solubility No special mode of transport needed/sodium chloride is an ionic compound, it ionizes into separately charged Na+ and Cl- ions in aqueous plasma 66 Exercises 4 Choose any specific aquatic or terrestrial animal and make a list of all the ways in which water is important to that animal. • Skill: Interpretation of
systolic and diastolic blood pressure measurements. This means that any value we calculate for 2 that is greater than 3.841 tells us to reject the null hypothesis. We could probably be safe in taking this thought experiment back many generations and assume that, even though there are variations in each generation, there comes a time when the
ancestor was significantly different from the modern rabbit. The waste is then eliminated along with the faeces. Coronary heart disease (CHD) is the term used for the slow progression of plaque build-up in arteries and the corresponding problems that can result. One blind man touches the elephant's side and says 'It's like a wall'. Evaluating these
methods New paradigms are emerging to guide the management of marine fisheries. Application: Monoclonal antibodies to HCG are used in pregnancy test kits. Pituitary gland secretes hormones, 9.2 Transport in the phloem of plants. The term 'eukaryote' comes from the Greek word 'eukaryon' meaning true kernel or true nucleus. C II and III
only. It is very difficult to measure the effects of any one factor and its impact on the incidence of CHD. Flowering plants are so important in our lives. 6 What causes heart valves to open and close? T wave P wave O S ORS complex Figure 15.14 An electrical trace of two cardiac cycles (note the repetition from left to right side). This
information can be interpreted as: • there is at least a 95% probability that the deviation of 19 seeds from the expected values can be attributed to chance • there is at most a 5% chance that there might be another factor influencing the results. The new cell developed in vitro in a similar way to a zygote, and started to form an embryo. Eventually the
placenta itself takes over the production of progesterone during the entire gestation. The codons they form always code for the same amino acids, so transferred DNA codes for the same polypeptide chain in the host organism as it did in the donor organism. Novocain is a
local anaesthetic that can block nerve transmission to the pain centres. This indicates that the data are spread out widely from the mean. With repeated use, the circuits of the brain are altered and strengthened. During mitosis the replicated chromosomes separate and move to opposite poles of the cell, thus providing the same genetic material at
each of these locations. Even A when thousands of nucleotides are involved, there is still a free 5 carbon end with a phosphate group attached and a free 3 G carbon end with a hydroxyl group attached. Lipopolysaccharides are carbohydrates bonded to lipids. How much influence should a government have on family planning? 390 • Before meaningful
readings may occur, the leaves must be dry. The graph shows that more than 90% of the haemoglobin becomes saturated with oxygen within the lungs. aureus are referred to as MRSA (pronounced 'mersa'): these are strains of S. The target tissues for these two hormones are the ovaries. Cut both DNAs with the same 'molecular scissors', which are
called restriction enzymes. This proves that he must have given one h to each of them. When a pathogenic bacterial species, does enter the body, a series of events begins known as the immune response. At this point, the seed usually goes into a dormancy period. Who should decide on how funding is distributed, or the prioritizing
of the use of laboratory space and resources? One reason why revising before an exam is beneficial is that 'recall' drags up a memory from your LTM and puts it back in your STM (or working memory). See where Na+ diffuses into the neurone. The mitotic spindle begins to form and is complete at the end of prophase. As there is no allele on the Y
chromosome, Y is written alone without any superscript. Helicase begins at a point in or at the end of a DNA molecule, and moves one complementary base pair at a time, breaking the hydrogen bonds so the double-stranded DNA molecule becomes two separate strands. Simply looking at a diagram will not enable you to draw that diagram. Follow the
directions given earlier for making a good drawing. • A termination sequence signals the end of the gene sequence. Rare and endangered plant species may be maintained using micropropagation procedures. 269 06 Human physiology Digestion is an enzyme-facilitated chemical process When you eat a snack or meal, a series of events is begun that
leads to your body cells being provided with the nutrients that they need. 5.2 The diversity of life has evolved and continues to evolve by natural selection. Besides these general conditions, many plants have specific conditions, many plants have specific conditions that must be met in order to germinate. All the descendants are female lizards. In addition to coal, chemical transformations
underground can produce other petroleum products, such as crude oil and, as we have seen, natural gas. Application: Reclassification of the figwort family using evidence from cladistics. These copper (I) ions are not soluble in water and will form a red-orange coloured precipitate. Here are the basic principles. tRemove 40 more kernels and record
how many are marked. The SA node acts as the pacemaker for the heart by sending out an 'electrical' signal to initiate the contraction of both atria. Fermenters have been developed that are large-scale vats that can be contraction of both atria. Fermenters have been developed that are large-scale vats that can be contraction of both atria.
manner of understanding complex concepts always successful? This is stressful for the body and is not a longterm solution or adaptation. 474 Cortex Medulla (hypertonic) H2O H2O water stays in urine/urine volume relatively low A
longer loop of Henle is an adaptation for water conservation Kidneys are highly diverse organs when you compare different species. Female vampire bats feed their young with regurgitated blood. Passive transport: diffusion and osmosis Examine Figure 1.17. With the first information published from the Human Genome Project in 2001, it became
apparent that less than 2% of the chromosomes were occupied by genes that code for protein. Ultimately, this energy can be traced back to sunlight. Isopods show kinesis to humidity. Microorganisms can be classified into four nutritional groups based on their type of metabolism. Use this diagram to follow the process of urine formation in the next
few sections of the text. The seed parts and their functions are summarized in Table 9.6. Table 9.6
embryo shoot Become the new plant when germination occurs Figure 9.22 A dicotyledonous seed typically shows these structures. The letter S used in the measurement of ribosomes refers to Svedberg units, which indicate the relative rate of sedimentation during high-speed centrifugation. Water 'fearing' substances Molecules in
living systems interact with water in a variety of ways. In this analogy, the glove represents the active site and the hand represents the substrate. Each core E, and core F. $ First sperm to reach zona pellucida uses enzymes of acrosome. Packaging is essential because the
nucleus is microscopic and a single human molecule of DNA in a chromosome may be 4 cm long. It contains four polypeptide chains, each of which contains a non-polypeptide group called a haem. The hormones produced by the anterior pituitary enter the bloodstream through the same capillary beds that allowed the releasing hormones to exit.
Solution IA i IB IAIB IBi i IAI ii Figure 3.29 A Punnet grid for blood type alleles. The photos he took using autoradiography looked like the image below, and Cairns called them that is why it is called random orientation.
Again, with Mendel's experiment (5493 round peas expected and 1831 wrinkled peas expected), we can use the chi-squared test with confidence that it will give a reliable result. CHALLENGE YOURSELF 3 What type of nitrogenous waste is produced and excreted by each of the following animals. The waste products of digestion and dead bodies of
plants and animals are full of molecules containing nitrogen. • They block transmission of impulses involved in pain perception. The cerebral hemispheres are covered by a thin layer of grey matter (cells with no myelin sheath around them) called the cerebral cortex. • Inflammation: this is the swelling of damaged liver tissue as a result of alcohol
exposure, sometimes referred to as alcoholic hepatitis. Investigation of factors affecting enzyme activity *Safety alerts: Eye protection and lab aprons should be worn for all stages of these experiments.* Enzymes are protein catalysts. The other end of the same muscle is connected to a bone that is designed to move. 7 Number the tubes (1-5) with a
glass marking pencil. It contains many -pleated sheets that add to the strength of the web. What is the outgroup when considering the clade of multicellular organisms? 

Application: Use of biofilms in trickle filter beds for sewage treatment. In 2011, a company in Wisconsin had a plant-derived hepatitis B vaccine that was about to enter the second
stage of human clinical trials. • The scientist enters the sequence of the gene into GenBank. After another replication, the DNA is either all light or hybrid. The best way to establish a natural classification Natural classification uses ancestry to group organisms together, whereas artificial
classifications use arbitrary characteristics, such as whether or not a plant or animal tastes good, or is useful to the textile industry, or whose name begins with the letter 'c'. Use safety goggles and lab aprons. Use the list of questions above and your critical thinking to evaluate whether some or all of these are valid as scientific knowledge. coli
Protein In Table 7.2 notice that all the proteins end with the suffix -ase. Day 2 (Tuesday) 1 Add 5 drops of methylene blue solution to tube number 1. Gregor Mendel controlled the process of pollination in garden pea plants in the development of his genetic principles. light oxygen ATP chlorophyll light-dependent and other photoreactions synthetic
pigments water hydrogen ions electrons hydrogen that is split away due to the photolysis of water is typically released from the plant leaf as a waste product. You can follow the same procedure to calibrate the other two objectives, or you can calculate the other two objectives, or you can calculate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can calculate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives, or you can follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure to calibrate the other two objectives are the follow the same procedure the same procedure to calibrate the other two objectives are the same proce
is then positioned inside a closed chromatography chamber filled with a shallow layer of chromatography solvent. 36 How do you know? If a trait or gene is described as autosomes, not on the sex chromosomes. One way is by binding to the pathogen and 'marking' it for destruction by other cells of the
immune system. In traditional Linnaean classification, birds occupy a class of their own, but this is where cladistics comes up with a surprise. The difference between galactose and
glucose is shown in the blue areas. At the lower end of the graph, little oxygen is already bound and this gives the shape of the lower portion of the photosystem that contains: • a pair of
 chlorophyll a molecules • a matrix of protein • a primary electron acceptor. However, all we can measure is the height of all the bean plants growing in the sunlight. Application: The effect of anaesthetics on awareness. A gene to help digestion For most of our existence, humans have been hunter-gatherers and our genes are generally well adapted
for this lifestyle. • The colour is quantified in a plate spectrometer reader. (Total 1 mark) 5 Explain the shape of the families that has incorporated species from the old classification is the family Plataginaceae, and that is where we now find
foxgloves. The nerve impulses arriving at the brain result in sensation. In one phase, growth is the major process. Have you ever been stung by a bee? We know that after a stroke there are both chemical and physical changes in the pathways. When the British introduced opium into China, it quickly became a major social problem. The de-energized
electron from Photosystem II fills the void left by the newly energized electron. They are: • essential amino acids • minerals • most vitamins. Another method is to measure the rings of fish scales. One of the more serious locations for this to occur is in the arteries that feed oxygenated blood directly into the heart muscle itself.
Cells that are larger in size have modifications that allow them to function efficiently. The inhaled air passes through the larynx (the voicebox with vocal cords) and then down the trachea. When the pollen grain adheres to the stigma, which is covered by a sticky, sugary substance, it begins to grow a pollen tube. We would be pleased to insert the
appropriate acknowledgement in any subsequent edition of this publication. In the testes and ovaries, respectively, meiosis produces haploid sperms and eggs, so that, when fertilization occurs, the zygote will receive 23 + 23 = 46 chromosomes; half from the mother, and half from the father. Application: Models of water transport in xylem using
simple apparatus including blotting or filter paper, porous pots, and capillary tubing. A question to consider here is how or why a primary tumour forms. B represents feedback inhibition. The following investigation was carried out to determine whether differences in this plant along the eastern coast of the USA were the result of genetic variations or
not. The larger the growth, the more the lung tissue becomes dysfunctional, ATP functions as an energy storage compound. The need for food becomes essential at times to regain the energy levels necessary for us to function.
diagram, or scan of the brain. However, within a region of the world where people have a similar recent genetic heritage, growth might be stunted by any number of environmental factors, such as: • • • poor diet, notably a lack of protein, calcium, or vitamin D lack of exercise illness, which can sometimes be attributed to child neglect social
problems, such as war, a low standard of living (poverty), or a low quality of life, which is often associated with substandard healthcare systems. • The breakdown of erythrocytes starts with phagocytosis of red blood cells by Kupffer cells. Lichens, like the ones pictured on the tree in the photo, are very sensitive to air pollution, and the industrial
revolution was producing chemicals, such as sulfur dioxide, that kill lichens. Usually, the chromosomes uncoil and new nuclear membranes form. The microscope was invented 17 years after his death. ATP production in photosynthesis is very similar to ATP production in photosynthesis in photosynthesis is very similar to ATP production in photosynthesis in photo
other for the prairie. In addition, no organism can use 100% of the energy present in the body? (Total 1 mark) 378 7 During glycolysis a hexose sugar is broken down to two pyruvate molecules. In addition to simply seeing
whether the data points follow a predictable pattern, a regression model can be used to predict values that were not measured. Refer to Section 2.7 to review the procedure and findings. What are the facts that support your opinion? Pitcher plants also need a large amount of the nitrogen-rich enzyme rubisco. During the first week after fertilization,
there is no true growth of the embryo. Now we know that there are Gs in positions 2, 3, 6, 9 and 12. The neurone is locally depolarized and the depolarized and the depolarized and the depolarized and the neurone is locally depolarized and the depolarized and the depolarized and the neurone.
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temperature for photosynthesis in this plant. It is a type of memorization. Any remaining blood in the atrium is moved to the ventricle by the systole. See how many you can think of before you look at the lists of examples below. When the methane is oxidized, the two molecules produced are water vapour and carbon dioxide gas. The pH of bloods in the atrium is moved to the ventricle by the systole.
plasma must be regulated in order to maintain a narrow range of 7.35 to 7.45. D Pfr is converted by red light to Pr, which acts as an inhibitor of flowering. The somatic system takes sensory information from sensory receptors to the CNS and then sends back motor commands from the CNS to the muscles. 14 Look at the grid below showing the
chances that a couple's children might have haemophilia. Such a pattern of feeding is called a food chain. This is highly controversial, and historical applications, proteins have to be capable of assuming many forms and structures. Each
model successfully fits the observed phenomena, does that validate it as being true? The axons of neurones in some organisms (including humans) that have a very highly developed nervous system, have surrounding membranous structures collectively called the myelin sheath. When two molecules collide, there are a large number of factors that
determine whether a reaction occurs or not. B Child I is related to the man but child II is not. Granules of glycogen can be seen as small black dots. Up to the point of birth, bilirubin is processed by the A newborn receiving phototherapy for infant mother through the placenta. You can see these colours when you let sunlight pass through a prism.
There are many animals that use this physiological and behavioural strategy in order to reproduce. In 1950, Bell Laboratories invented the transistor battery, which was small and a big improvement over the vacuum tube. 

Application: Genetic modification of tobacco mosaic virus to allow bulk production of Hepatitis B vaccine in tobacco plants.
Both the ethanol and carbon dioxide that are produced are waste produced into the environment. • Propagation of nerve impulses is the result of local currents that cause some birds in the
population to migrate to the west towards the UK. Xylem is involved in supporting the plant as well as being the specialized water-conducting tissue of terrestrial plants. A light microscope photograph showing a small area of the small intestine. The THC may dilate the pupils, causing colour perception to be more intense. contractile ring of
microfilaments Cleavage of an animal cell (SEM) wall of parent cell daughter cells Cell plate formation in a plant cell (TEM) The growth of organisms, development of embryos, tissue repair, and asexual reproduction all involve mitosis. cis face (receiving side of Golgi apparatus)! Vesicle coming from ER. This is usually done by inhibiting the action of
the enzyme in the first step of the pathway. 3.18, p. Parent phenotypes: round yellow green wrinkled Parent genotypes: RRYY rryy Parent gametes: RY ry F1 genotypes: Rryy F1 phenotypes: round yellow peas. Glyphosate is a broad-spectrum herbicide that travels in the phloem
of the plant and is readily translocated to roots, stems, and leaves. • Add the enzyme RT to each mRNA. Each one of these will be explored below. It is small and convenient to wear. H! photon H! P i ADP ATP Stroma thylakoid membrane PQ Figure 8.22 Chemiosmosis in a plant cell chloroplast. Figure 9.14 A typical plant root and its parts. the oxygen
given off and taken in by a hypothetical plant over a 48-hour period. In 1828, Friedrich Wöhler, a German physician and chemist, made a discovery that helped change the thinking behind vitalism. Foraging behaviour in shore crabs Diet Profitability 50 40 30 20 0.5 10 0 0 0 1.0 1.5 2.0 2.5 3.0 Size of mussel (cm) 3.5 4.0 percentage of diet profitability
(Joules/s) 1.0 Observations of shore crabs, which prey on mussels, have shown that crabs choose a mid-size mussel to prey upon rather than a larger mussel. The cell cycle begins and ends as one cell, so it can be represented by a circle divided into various named sections, as shown in Figure 1.26. 3 Spindle fibres from opposite poles attach to each of
the sister chromatids at the centromeres. As long as progesterone continues to be produced, the endometrium will not break down and an embryo will still be able to implant. Albinism occurs in North America in approximately one in 20 000 persons. Not surprisingly, it is one more produced by microorganisms. • Within the
growing pollen tube is the nucleus that will produce the sperm. For clarity, only a small number of chromosomes is shown. Person 2 has a T (thymine) nucleotide instead of a G (guanine) in the SNP, but also expresses a normal protein. It is also an organ that cannot stop working for any length of time. Or are they mutually exclusive? How do scientists
know that the current situation is exceptional, that the changes in Earth's atmosphere are being caused by human activities and are not just part of a natural phenomenon? Perhaps the child did not have access to proper nutrition during that interval. The result is a mass of cells (a tumour) with no useful function to the organism. There are exceptions
to this, however; for example, pepsin is an enzyme that is active in the stomach. As shown here, each stoma has two cells, called guard cells, that surround it. Repeatedly bonding glucose monosaccharides produces a variety of very large molecules or polymers. They eat a wide variety of food, which they can chew with teeth. Rather, because it will
have difficulty feeding itself and surviving, the chances are very low that it will find a mate and reproduce to be able to pass on its genes to the next generation. With this procedure, calcium chloride and a buffered saline solution containing phosphate ions are added to the DNA. 16 Explain the central ethical issue concerning stem cell research
Another reason is that studying the very complicated pathways involved with dopamine has provided new therapeutic targets for patients suffering from dopamine abnormalities, such as Parkinson's disease. Chemiosmosis allows the process of phosphorylation of ADP. The DNA is the genetic material of the cell. We are 95% confident that the
difference between the barnacles is statistically significant. Enzymes regulate these pathways and genes control the enzymes. Collectively, these actions increase the volume of the thoracic cavity. 422 10.2 Inheritance Understandings: Gene loci are said to be linked if on the same chromosome. 2 Outline the process of adaptive radiation. This is an
example of diffusion. • Application: Helicobacter pylori infection as a cause of stomach ulcers. The enlargement of the cerebral cortex Figure 12.16 Functional divisions of the cerebral cortex Figure 12.16 Functional divisions of the cerebral cortex. The fossil record provides evidence for evolution. There are many online 'Footprint calculators' available, notably from the Nature
Conservancy and WWF. (b) Place 10 individuals in each chamber. In this lab you will watch the population growth of yeast over several days. 25 01 Cells (ii) Carefully and accurately make a scale drawing of these cells and any visible internal parts. In this way a larger surface area of cerebral cortex can be contained in a limited space. Primarys
defence is to keep pathogens out Our bodies are exposed to many disease-causing agents. • A positive result from the procedure is working well. Antisense or template strand. In aquatic ecosystems carbon disvide and hydrogen carbonate ions. The spheres represent the relative sizes
of the individual atoms (C6H12O6). The answers help us learn how these animals survive to reproduce, but also to understand more about how we interact with our natural world. Approximately one-third of the world's population resides in areas where there is a deficiency of iodine. For example, question 27 in Challenge yourself is asking about
genetic behaviour and natural selection. Each reaction is called a hydrolysis and requires a molecule of water as a reactant. 524 • Cone cells are photoreceptor cells that are activated by bright light. One of those ingenious ways is your skin. The closer it is to 1, the better the model. Carbon As seen in Chapter 2, the element carbon is the cornerstone
of life as we know it. This makes this cDNA green. When those consumers die, their cells and tissues are broken down by decomposers, and the minerals are returned to the soil. Both the percentage of bees flying towards (orientated flight) and the percentage circling the odour source were measured. • This vibration is passed to the fluid in the
cochlea. This is because the Moon has almost no atmosphere. Let's look at what blood pressure is and how it is measured. Plant cells do not have cholesterol molecules; they depend on saturated or unsaturated or unsaturated fatty acids to maintain proper membrane fluidity. Have the tables turned? Each blue box represents a particular amino acid. Essential
substances are no more important for our physiology than any other substances, but they are substances that cannot be synthesized from other molecules and thus must be a part of our diet. Because of their cost, enzymes in industry need to be reused repeatedly. The bottom right cell of the table is what is needed: it shows the sum of the last row's
values and this is the 2 value we are interested in. High levels of oxidative radical levels are known to cause neurotoxicity. Figure 8.18 Glucose NADH or FADH2 Electron transport chain Chemiosmosis ATP To account for the production of ATP in cellular respiration, let's look at the three main processes, glycolysis, the Krebs cycle, and the electron
transport chain, in a table. 22 A comparison of plant and animal cells and their extracellular components We will now to compare two general types of eukaryotic cell: plant and animal cells and their extracellular components We will now to compare two general types of eukaryotic cell: plant and animal cells. and their extracellular components We will now look at how to compare two general types of eukaryotic cell: plant and animal cells.
run across the surface of bodies of water. • Applications and skills Application: Causes and consequences of blood clot formation in coronary arteries. Kangaroo rats only venture from their burrows during the night, when the air is cooler. This process is called clotting. What is the purpose of meiosis, and why is it so important to produce variety in
the daughter cells that are produced by meiosis? • A protein layer is not likely because it is largely non-polar and would not interface with water, as shown by cell studies. The ethanol is added to gasoline for vehicles, and contributes to a reduction in gasoline use. Dr Wöhler did not add the two inorganic substances together with the intention of
making urea. This is an example of a paradigm shift, another good term to know in TOK. • Cirrhosis: this is the scar tissue left when areas of hepatocytes, blood vessels, and ducts have been destroyed by exposure to alcohol. Competitive inhibition may be reversible or irreversible. CHALLENGE YOURSELF Look at Figure 12.28 and answer the
following questions. Look carefully at the two sequences below. (Hille, B. Option D: Human physiology The sounds of the heart When you listen directly to the heart using a stethoscope, you can hear a rhythmic set of sounds that most people describe as a series of 'lub dub' sounds. 207 04 Ecology Many factors are thought to contribute to global
temperature changes over time, for example volcanic activity and particles suspended in the air, the quantity of radiation from the Sun, the position of its axis, and probably other phenomena that are yet to be
discovered. The gene pool can be thought of as a reservoir of genes from which the population can get all its various traits. Also within the right atrium is another mass of specialized muscle tissue, known as the atrioventricular node (AV node). Oil and gas companies are prepared to go to the most inaccessible places in the world to dig out the black
gold, whether it is in the hot sands of deserts or at the bottom of icy cold oceans. A marker indicates that we have susceptibility, but it does not mean we will definitely develop the disease. Many lives have been saved by smelling smoke. Over time, with a deficiency of iodine, the thyroid gland tries to compensate by growing larger, and becomes
markedly visible as it swells in size. The higher the proportion of stable daughter isotopes, the older the plasmid DNA from the bacterium (agrobacter) by adding a marker gene. Applications and skills: Applications are dietary supply. Each wire within that
cable is like a neurone. 772 772 How do doctors know which medication is the best for their patients? • Carbon dioxide is produced by the combustion of biomass and fossilized organic matter. The initiator tRNA moves to the P site. Lining up organisms with arrows between them is how food chains are represented. In either case, the resulting cells
or organisms were made using laboratory techniques. This means that each whole number on the pH scale represents an increase or decrease by a power of 10. A global perspective should be included in this discussion. Regurgitation of blood to close fellow bats seems to be an altruistic behaviour that has developed by natural selection. 6CO2 +
6H2O C6H12O6 + 6O2 This conversion of an inorganic form of an element to an organic form is known as fixation. urethra anus vas deferens epididymis testis scrotum Table 6.5 The male gonads: the sperm are produced here in small tubes called seminiferous tubules
Epididymis The area where sperm are received, become mature, and are capable of swimming motion via movement of their flagella Scrotum Sacs that hold the testes outside the body cavity so that sperm production and maturation can occur at a temperature cooler than body temperature Vas deferens A muscular tube that carries mature sperm
from the epididymis to the urethra during an ejaculation Seminal fluid, including carbohydrates for the semen Prostate gland A gland that produces much of the semen Prostate gl
After all the glands have added fluids, this is the tube via which the semen leaves the penis 313 06 Human physiology oviduct (Fallopian tube) ovary uterus urinary bladder cervix urethra vagina Figure 6.25 Female reproductive system from sagittal (top) and frontal (bottom) views. Two invertebrates you can use to investigate taxes are Planaria and
Euglena. Let's consider pollination first. The plant cell walls composed largely of cellulose are clearly visible, and in the interior of the cells are chloroplasts, which produce and store carbohydrates such as starch. During splicing the introns are removed, exons may be 'rearranged', and a cap and a poly-A tail (see page 338) are added to the ends of
what is now called mature mRNA. Above 0.400 is a positive result for this test. Initially, the pancreas continues to produce a normal amount of insulin, but this level may decrease after a period of time. They have sophisticated systems for receiving information from their environment. fructose-1, 6-bisphosphate P glyceraldehyde-3-phosphate P
glyceraldehyde-3-phosphate 359 08 Metabolism, cell respiration, and photosynthesis 3 Once the two G3P molecules are formed, they enter an oxidation phase involving ATP formation and the production of the reduced coenzyme NAD. What do the real atoms and molecules look like? 3.4 The inheritance of genes follows patterns. Photosynthetic
autotrophs take carbon dioxide from the atmosphere and convert it into carbohydrates. Connecting the sugars together into a long chain can make starch; plants can store energy for a future generation in the form of starch granules, tubers, or seeds. Worksheets Data and observations Table 8.6 Experimental cuvette Start colour/
absorbance Finish colour/absorbance Dark/unboiled Light/unboiled L
such as 'yes' or 'no', you can be pretty sure that you are not treating it like a TOK question. Halocins are types of antibiotics made by halophile (salt-loving) archaeans. As we have seen, the cerebrum consists of two divisions, the left and right cerebral hemispheres. Does the fact that a couple cannot have a child exclude them from the species? rate of
photosynthesis (as percentage of rate at 670 nm) 100 80 60 40 20 0 400 violet blue 500 green wavelength/nm 106 600 red 700 Photosynthesis occurs in two stages Photosynthesis occurs in the photosynthesis occurs in the photosynthesis occurs in the photosynthesis occurs in two stages Photosynthesis occurs in the photosynthesis occurs in the photosynthesis occurs in two stages Photosynthesis occurs in the photosynthesis occurs
the PCR process. This illustrates that there is no single pH that is best for all enzymes. Line graphs Infant body mass/kg A line graph plots single points over regular increments such that each x-value has only one corresponding y-value. NATURE OF SCIENCE Want to see the data for yourself? 3 After these organisms had used the
food particles, what life function would they carry out to get rid of potentially toxic wastes? This conversion occurs rapidly. 1 2 332 Single-stranded fragments are placed in four different test tubes. Historically, scientists moved away from the study of 'lower' chordates such as frogs to the study of 'higher' chordates such as chicks, with the aim of
understanding normal and abnormal embryogenesis. They often make us feel better by just looking at them. He used a small brush to place the pollen on the reproductive parts of the flowers, thus replacing the insects that do it naturally. Processing includes any mathematical manipulated data (graphing of rawnormal embryogenesis.)
data is not considered to be processing). The ovules are present within the ovary of the carpel. The term that describes this is 'antiparallel'. All of the birds in the study tended to migrate in humans than carbohydrates. Figure 15.19
The posterior pituitary (left) with its hormones and relationship with the hypothalamus via neurosecretory cells. The European Bioinformatics Institute (EBI) and the Sanger Institute, both located near Cambridge, UK, have cooperated to develop an integrated software and database system of genomic information. Individuals that are better adapted
tend to survive and produce more offspring while the less well adapted tend to die or produce fewer offspring. From this specific example, two more general questions arise. Using class data will make your results more accurate tend to die or produce fewer offspring while the less well adapted tend to die or produce fewer offspring. From this specific example, two more general questions arise.
eat their crops. 532 Experimental design Follow these steps to design an experiment to investigate innate behaviours of an invertebrate. Table 13.2 Gram-positive bacteria Genm-negative bacteria 586 Gram-negative bacteria
placement In outer layer of bacteria Covered by outer membrane Outer membrane Outer membrane Outer membrane of the cell wall plasma membrane of bacteria. Cancer studies in the peripheral zones
where people are allowed to live, beyond 30 km from the shut-down Chernobyl reactor, suggest that there has been an increase in cancer frequencies. Again, if you think it is an easy, quick decision, then you are not treating the question in the way that you should. 3.000 bp antibiotic marker 2 DNA containing gene of interest bacterium Figure 13.17
Recombinant DNA of an agrobacter plasmid and a gene of interest. To improve on the simple ratio method, an equation was developed where E = weight of the brain, S = weight
Emphysema is a chronic, slowly progressive disease that turns healthy alveoli into large, irregularly shaped structures with gaping holes. When it comes to classifying animals, for example, every 4 years the International Congress of Zoology takes place in a different city; it is an event during which animal experts from all over the world share and
discuss their findings about animal behaviour, genetics, and classification. A funnel might be necessary. • Pollen germinates to produce a pollen tube. The width of their shells was measured to see whether there was a significant size difference depending on how close they lived to the water. It has no value as biological knowledge, but it does have
historical value and it helps to illustrate how science works. This is absorbed by the nearby hepatocytes and becomes a key component of bile. It is extremely important that research be carried out to determine the cause(s) of this population decrease. There is a time delay before the AV node sends out action potentials through the conducting fibres
that run down the septum between the two ventricles and then to various branches (called Purkinje fibres). DNA determines the order of amino acids, and they have no way of reassembling properly if they become detached from each other. Charles Darwin (1809-82). Every repeating pattern on an ECG is a representation of one cardiac cycle.
Functional plasticity is the ability of the brain to move function of DNA was not known, so classifications were based on observable characteristics. What is causing this wide variation in data? Oxygen is the final
electron acceptor because it has a very high electronegativity and, therefore, a strong attraction for electrons. In a typical human adult, bacteria would account for about 2% of his or her body mass. . This keeps the glucose level in the normal range. And Ricaurte, G.A. 1992), with permission from Elsevier; Figure 12.51 from Ascorbic acid prevents
3,4- MethylenedioxymethamphetamineInduced Hydroxyl radical formation and the behavioral and neurochemical consequences of the depletion of brain 5-H, Synapse, 40, pp. Give the names of the hydrocarbon-rich substances that are described below. Hormones from the hypothalamus and pituitary gland hypothalamus GnRH negative feedback
anterior lobe of pituitary gland LH FSH ovaries oestrogen progesterone (after ovulation) endometrium of uterus (increased vascular tissue) 316 negative feedback A part of a female's brainstem known as the hypothalamus is the regulatory centre of the menstrual cycle. Here is an imaginary example of a DNA sequence from four different organisms:
inhibitors are ethanol and fomepizole. This is a computer graphic of glucose. Large amounts of cocaine can cause erratic and violent behaviour. 199 04 Figure 4.15 Coral reefs are formed from dissolved calcium and carbonate ions found in ocean water. In humans there are 23 bivalents with more than 8 million possible orientations. Curve B will
eventually equal the maximum reaction when enough substrate is added. Here is how it would work for the monosaccharide sugar called alpha-D-glucose, a substance that we know has the chemical formula of C6H12O6. NATURE OF SCIENCE Falsification of theories with one theory being superseded by another: scurvy was thought to be specific
to humans, because attempts to induce the symptoms in laboratory rats and mice were entirely unsuccessful. How do we classify them? Modern biotechnology offers us the chance to make dramatic improvements in industry, agriculture, medicine, and environmental science. In plants, they allow the uptake of water, which provides rigidity to the
organism. The easier and quicker sequencing methods used now are based on Sanger's original technique. When we say the word 'animal' to a child, he or she will probably think of animals with backbones, perhaps because many children's books feature vertebrates as the main characters. Ventilation is the rate of breathing and is typically given as
breaths min-1. Figure 12.29 The structure of the retina. For perhaps the first time in a controlled setting, an organic molecule was synthesized from inorganic substances. • Go to the BLAST website. 

Recombinant DNA can be introduced into whole plants, leaf discs, or protoplasts. Remember that embryonic cells are undifferentiated cells so there is a controlled setting.
nothing exceptionally astounding about this kind of cloning. Its target tissue is the endometrium of the uterus. As an analogy, it would be similar to someone meeting your extended family for the first time and incorrectly assuming that your second cousins were your brothers and sisters, simply because you all had similar physical features. An equal
volume of water moves into and out of their cells as a result of their iso-osmotic balance with their marine environment. Today seaweed is classified as algae. Burning is the release of chemical energy called rapid oxidation. Memory How much did you remember about genetics when you took a biology exam? Monosaccharides: the building blocks of
disaccharides Biochemically important molecules can be extremely large and complex but they are always made of smaller monomer (building block) molecules. There are huge differences between different forms of life but cells are the basic unit and different forms of life but cells have many characteristics in common. Histograms Histograms have some similarities
with bar charts, except that the x-axis has a quantitative scale marking off intervals of continuous data. This reveals that the regression model shown by the trend line matches the observed data better and better. Transient polymorphism Within a population there is often more than one common form. The genes for these two characteristics are
linked. 1 Acetyl CoA from the link reaction combines with a 4-carbon compound called oxaloacetate. Interactions at the synapse? This planarian is part of the group Turbellaria. Evolution and biodiversity 5.4 Cladistics Understandings: A clade is a
and adhesion in the xylem cohesion by hydrogen bonding between water molecules water molecule root hair soil particle Water uptake from soil water in land plants. Resolution refers to the clarity of a viewed object. Darker areas indicate proportions of deaths that are related to tobacco use
and are coloured according to the column of the respective cause of death. Vesicles containing the neurotransmitter fuse with the plasma membrane and human waste. It is this release (dissociation) of oxygen that gives these graphs their name: oxygen
dissociation curves. 25 Name the genes. From the ELISA test results shown in Table 13.3, could any of the patients be positive for HIV? (1) A peptide hormone fits the complementary shape and charge of a receptor protein within the plasma membrane of a target cell. 1 (a) Work out how the years are divided up on the x-axis of the graph. follicle cell
layer "Many sperm cells are needed so that one can achieve fertilization. There may be some aspects of the framework that apply nicely to the sheep example, and others that do not fit well, but give it a try. Rf = distance moved by pigment/distance moved by pigment/distance moved by pigment/distance moved by pigment that apply nicely to the sheep example, and others that do not fit well, but give it a try. Rf = distance moved by pigment/distance moved by p
this study through an online exercise including analysis of the data they collected. Lemurs arrived on the Comoro Islands and Madagascar about 6.5 million years ago and have adapted to the many habitats available there. This gives rise to the polarity of water. Once again, report on the movement and final location of the paramecia. We refer to this
the blackcaps are now two populations separated by the timing of their breeding. Diseases affecting humans, such as cancer and diabetes, also affect mice. As we will see, natural selection has another side to it that has little to do with chance and allows for systematic accumulations of small changes to produce highly adapted forms of life.
Substances that are polar, large in size, or both, do not cross membranes easily. This structure enables the conversion of the energy in sunlight to a chemical energy form called carbohydrate. Botanists can select plant genetic characteristics by controlling the process of pollination. There are specific names for these categories. The paper is then
placed in the closed chromatography chamber until the solvent comes to within 1-2 cm of the paper. • The menstrual cycle is controlled by negative and positive feedback mechanisms involving ovarian and pituitary hormones. How many of these products do you rely on every day? (a) Can a person who has blood type AB Rh+ receive bloo
from someone who is O Rh+? This leads to deeper breathing and thus more air moving into the lungs. First of all, there is the concept of the null hypothesis (H0). Some varieties of tomato have an increased yield if the apical bud is removed early in growth. Application: Use of defibrillation to treat life-threatening cardiac conditions. This seems
reasonable, and yet the philosopher David Hume criticized induction, saying that there is no logical reason to assume that it is the case. In a grid with four squares, each square represents a 25% chance • the probable
Birds and reptiles both use an egg that is self-contained for nutrients and water for development until hatching. • Oculomotor nerves synapse on the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13) • The axons of the ciliary ganglion (the small circle in Figure 12.13)
paired with a type of protein called histone (see Figure 7.4). Science gets the age of rocks, and religion the rock of ages; science studies how to go to heaven. Hormone therapy is a branch of medicine that attempts to correct resulting disorders. They spend time at each base camp in order to allow a certain degree of
physiological adaptation at each new, higher, altitude. A nerve impulse is only initiated if the threshold potential is reached. Do you notice anything peculiar about the axes? Bioinformatics is a research field that uses both computer science and information technology to help us understand biological processes. Artwork showing a single antibody
molecule. Walking on peatlands can be a bit of a challenge because they are very spongy. The soil that forms peat is called a histosol, and a layer of peat is typically between 10 and 40 cm thick. 543 12 Option A: Neurobiology and behaviour Some neurotransmitters are excitatory and stimulate the next neurone to forward the message. Factors to
consider include temperature, humidity, moving air, and high light conditions, to name just a few. Many graphs were made to see if there was a correlation between various factors. This type of insecticide works by binding to postsynaptic receptors that normally accept the neurotransmitter acetylcholine. Like mitochondria, chloroplasts are capable of
reproducing independently of a cell. In the summer, days are longer and the sunlight hits Earth's surface more directly and intensely. Once you have produced your hypothesis, design an experiment to test it. Fermenters have: • a size that fits the need for optimum production of the desired metabolite, e.g. penicillin • a means of mechanical agitation
or air bubbles for mixing the microorganism with the substrate materials • devices to maintain the optimum industrial production • processes for avoiding contamination. We can do the same thing using protein BLAST (BLASTp). See Table 13.7 for some examples. How severe this is is a few processes for avoiding contamination.
depends on how much of the spinal cord remains exposed. Within the small intestine there is another enzyme that completes the digestion of starch. (1) (b) Compare the effect of deforestation on cowbird parasitism of the worm-eating warbler and the Kentucky warbler. Put very simply, muscle tissue is able to shorten (contract) because each
sarcomere gets shorter. 371 08 Besides the non-cyclic electron pathway used to produce ATP by photophosphorylation, there is an alternative pathway involving a cyclic pathway involving a cyclic pathway involving a cyclic pathway involving a cyclic pathway.
are not good enough to see how the integral or transmembrane proteins and cholesterol are arranged in the membrane, but chemical tests reveal that they are there. 1 2 From a blood or tissue sample, mRNA is isolated. Again, innovations in technology have allowed scientists to diagnose and treat disease. You may recall from Section 2.1 that a
handful of types of organic molecule make up all living organisms. The conditions and opportunity must be just right for this to occur. Application: Comparison of the pentadactyl limb of mammals, birds, amphibians, and reptiles with different methods of locomotion. • The entire sarcomere shortens as the Z lines move towards each other (step 3 of
Figure 11.10). The plan is for farmers to grow medicines as well as crops. The prefix nanomeans 10-9. Movement of the fluid over the hair cells detects rotational movement of the head. If so, this must be completed well before the investigation begins.* Note: This investigation is best done as a whole class project with shared data sets. • Skill:
Annotation of a diagram of the retina to show the cell types and the direction in which light moves. 1 2 734 Kupffer cells: these cells line the inside of sinusoids and use phagocytosis to remove old erythrocytes and bacteria from the blood. • Each group should start in a different part of the area and spin a pencil to determine a random direction. Dr
majority of plant leaves appear green to our eyes. A transect is a line traced from one environment to another, such as from a grassland into a woodland, or from an ocean's intertidal zone over dunes. Also, check out the NCBI 1000 Genome Browser, an online map of human genes chromosome by chromosome. Their urine is always quite dilute
Eventually the person responds with an eye blink to just the musical note. During a meal, your stomach fills with food, expands, and stimulates cells of the vagus nerve. 173 04 Ecology Hybrids To understand the idea of fertile offspring, think about what happens when two different but similar species mate and produce offspring. Telomeres are
presently a major area of research. The location of each type of amino acid is important within the three-dimensional structure of the protein. The hepatic portal vein is the only major blood vessel in the body in which blood levels fluctuate to a large degree. These databases are ready for you to use as you begin to explore the subject of bioinformatics
One effect of oestrogen is an increase in the density of blood vessels of the endometrium, that is, as stated earlier, the endometrium becomes highly vascular. The adult stage of Elysia is therefore green in colour. By looking at deeper ice cores, we know that there has been a succession of ice ages over millions of years. Judge using your eye first and
then use a ruler to check your answer. Bar charts vitamin C levels 100 80 60 40 20 0 banana broccoli orange type of food 790 • line graphs • scatter plots. Why would a scientist want to align sequences of DNA, RNA, or proteins? Marie Curie, who discovered the radioactive elements polonium and radium, did not benefit from the safety standards we
have today, and died at the age of 66 from her exposure to radioactivity. • To make the substrate solution (lactose), starting with powdered milk, follow the instructions given with the powder, and then decant the volumes needed. Let's continue using our example of bean plants growing in the sunlight and shade to determine how standard deviation is
useful for comparing the means and the spread of data between two samples. • Application: Breakdown of heart muscle due to anorexia. 1 2 3 A primer is produced under the direction of primase at the replication fork. By drilling into the ice and taking cylinder-shaped samples, called ice cores, scientists can study the substances trapped in the
layers, such as air bubbles from the year when the layer was deposited. At various points these conducting fibres have branches called Purkinje fibres that spread out into the thick cardiac muscle tissue of the ventricles. In his classification of organisms, Linnaeus used physical characteristics and social behaviour to establish four groups of humans
Only the prokaryotic system is expected. It is the ratio of the number of cells in a tumour or tissue type undergoing mitosis compared with the number of cells not undergoing mitosis. • NATURE OF SCIENCE Making accurate, quantitative measurements: it is important to obtain reliable data on the concentration of carbon dioxide and methane in
the atmosphere. Generally speaking, in an asexually reproducing population, all the members of the population are identical. PCR can be used to amplify small amounts of DNA. The condition of his plumage and quality of his colour tells a female whether the male is healthy and will produce healthy offspring. As you can guess, the motor cortex in the
right cerebral hemisphere controls movement 519 12 The hand area of the primary motor cortex is known to be larger among professional pianists than among amateur pianists. For example, determine the means of the numbers of isopods in humid and dry conditions after 45 minutes (±0.5) in the two trials, compared with the controls. Half of all
prescription drugs are from rainforest plants or marine sponges. Measuring the rate of photosynthesis Look again at the summary reaction for photosynthesis are products of photosynthesis. Urine is the fluid produced equation shows us that carbon dioxide molecules are reactants and oxygen molecules are products of photosynthesis. Urine is the fluid produced equation shows us that carbon dioxide molecules are reactants and oxygen molecules are products of photosynthesis.
by the kidneys; it consists of water and dissolved waste products that have been removed from the bloodstream. You may have come across this kind of invertebrate under rotting logs. The Hardy-Weinberg equation is used
Facilitated diffusion Facilitated diffusion is a particular type of diffusion involving a membrane with specific carrier proteins that are capable of combining with the substance to aid its movement. 

Application: Tandem repeats are used in DNA profiling. zig zag dance courts leads to nest follows shows nest entrance enters nest trembles spawns
fertilizes eggs 530 Some innate behaviours are performed in a certain order. If the person's exercise rate then exceeds his or her body's capacity to supply oxygen, at least some of the glucose entering into cell respiration will follow the anaerobic pathway called lactic acid fermentation. 100 net gain of 2 ATP pyruvate 3C glucose 6C lactate 3C
(reaction reversible when oxygen available) pyruvate 3C lactate 3C Figure 2.45 A simplified version of the events of lactic acid fermentation. (Total 1 mark) 7 Describe the inheritance of ABO blood groups. Several recent studies have provided evidence that people with the same genotype will express different phenotypes when in different
environments. Such an apparatus allows the heaviest, most dense molecules with the longest hydrocarbon chains to accumulate at the bottom, and the lightest, least dense molecules with the shortest hydrocarbon chains to accumulate at the bottom, and the lightest, least dense molecules with the shortest hydrocarbon chains to accumulate at the bottom, and the lightest, least dense molecules with the shortest hydrocarbon chains to accumulate at the bottom, and the lightest, least dense molecules with the shortest hydrocarbon chains to accumulate at the bottom.
oxygen. The action potentials from the SA node spread out nearly instantaneously and result in the thin-walled atria undergoing systole. Fibre, also referred to as dietary fibre (or, more informally, roughage), is composed mostly of the cellulose and lignin in plant material (see the list above). Why do you think it takes so many years to change an
established idea? Two of the more serious consequences are that people with high BMIs are much more likely to experience hypertension (high blood pressure) and develop type II diabetes. In other words, if you had a measles infection, you would
produce another type of antibody. Excitatory neurotransmitters increase the permeability of the postsynaptic membrane to positive ions. Is NASA planning to collect more fossils from Mars directly, and bring them back to Earth to study? To absorb light, plants have special molecules called pigments. Curve C. • Ethnicity has a significant impact on
CHD risk. The name Scrophulariaceae, sometimes affectionately referred to by botanists as 'scrophs', comes from the time when plants were frequently named for the diseases they could be used 262 to treat. MRIs have shown a structural change in the hippocampus of these taxi drivers, which increases with the length of time a driver has been doing
the routes. Which of the following conceptual drawings best represent the interconnections between the ways of knowledge? A A ribosome that is synthesizing proteins from several mRNA molecules at the same time. Bubbles expand in both directions. It shows the three-dimensional conformation of lysozyme, an enzyme present
in sweat, saliva, and tears. 795 Mathematics, and information and communication technology skills Table 5 Critical values (p) Degrees of freedom (d.f.) Do not confuse Tables 2 and 5. The shaded peaks represent saturated lipids and the unshaded peaks represent unsaturated lipids. Species is the basic unit for classifying
organisms. A parasite called Plasmodium is transmitted to human blood by an infected female Anopheles mosquito feeding on the blood. When the cell is not dividing, the chromosomes are not visible structures. • P wave: this part shows the voltage given off by the SA node, thus it marks atrial systole. 6 What structures are involved in sexual
reproduction in prokaryotic cells? Notice how this is very different from nutrient cycling with substances such as nitrogen and carbon. The most severe consequence of untreated jaundice is a brain condition called acute bilirubin encephalopathy. Scientists have investigated memory and learning at a cellular level by identifying specific molecular
activities in certain nerve cells. Applications and skills: Application: Effects on the nervous system of two stimulants and two sedatives. • This hydrostatic pressure is diminished by the removal of sugar from the sieve tube at the sink. Kidney dialysis takes several hours each session and must be repeated every 1-3 days. For many of these questions
there is not enough conclusive scientific data to reach a satisfactory answer. An American alligator, Alligator mississippiensis, with one of her young. The authors who put the information about the gene into the database are named: Hong, C.J. et al. The BMI is a calculation of body mass that is corrected for height. What it is and does Trachea The
tube that carries air to and from the lungs Nasal passages Tubes that allow air to enter the nose and then the trachea Urethra A tube that carries urine from the bladder to the outside Vagina The reproductive track leading from the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the bladder to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus to the outside Vagina The reproductive track leading from the uterus track leading from the ute
their human hosts by about 10 to 1 cells. • Eubacteria: 'true' bacteria, prokaryotes with no organized nucleus and no membrane-bound organized nucleus and no membrane organized
levels in different types of food. Dichromatic vision can be caused by the presence of blue and green cones (green-blindness), or by the presence of blue and red cones (taq). Does this mean that half the
people have the phenotype caused by the recessive allele? Further left are the circular and longitudinal muscle layers used for peristalsis. Proteins can be denatured by heat and alteration of the pH environment The intra-molecular bonds of proteins that hold together their secondary, tertiary, and quaternary structures are susceptible to alteration structures are susceptible to alteration structures.
in normal temperature and pH; the intra-molecular bonds can be disrupted. The human brain is very poorly adapted for remembering stories. BLAST searches can identify similar sequences in different organisms Similar sequences are often found in different organisms. Radioisotopes are
radioactive forms of elements that decay over time at a predictable rate. These patents, and the diagnostic tests associated with them, have made Myriad a very successful and profitable company. SA node Figure 15.13 A flowchart of the events associated with one heart beat or one cardiac cycle. For example, if you brought bottles of oxygen gas with
you to breathe, eventually they would run out. foetal blood to placenta foetal capillaries placenta The molecular exchanges of the placenta Molecules passed from foetus to mother within the placenta Molecular exchanges that typify the placenta Molecular exchanges of the placenta Molecular exchanges that typify the placenta foetal capillaries placenta foetal capill
Carbon dioxide Oxygen Urea Nutrients (glucose, amino acids, etc.) Water Water Hormones Vitamins and minerals Alcohol, nicotine, and other drugs if used by the mother during pregnancy At no time does the blood of the foetus and the blood of the mother during pregnancy At no time does the blood. If the
single polypeptide is able to carry out its function as it is, then that polypeptide is considered to be a protein. Skill: Design of experiments to test the effect of temperature, pH, and substrate concentration on the activity of enzymes. Figure 12.31 Porcellio scaber (left) and Armadillidium vulgare (right). Both chambers go back into diastole and the
cardiac cycle repeats itself again, and again. New alleles can be introduced as a result of mutation, and old alleles can disappear when the last organism carrying the allele dies. When these methanogenic archaea metabolize food, they produce methane (CH4) as a waste gas. The biosphere refers to all the places where life is found, and the
lithosphere refers to all the places where rocks are found. The growth cone responds CAMs to the various chemical stimuli that show it what path to follow and what connections to make. • S100 for melanoma: this is a protein biomarker that if elevated indicates a high number of cancerous melanoma cells. Birds control the pitch by altering the
tension in the membranes of the syrinx. Such a process is rarely observable during a human lifetime. Sedimentary rocks that slowly wear away make phosphorus available again to plants. 178 Systematic sampling techniques There is another way of using a quadrat rather than the random sampling described in the lab above: systematic sampling
using a transect. In this way, the recombinant chromatids that end up in the sperm or the egg cells are a mosaic of the two parent cells' original chromatids. This is why it is important to calculate the standard deviation, in addition to the mean, of a data set. Biogas can be used in all applications designed for natural gas. (b) Name the outgroup in this
cladogram. However, the first cells must have been formed in this way. Model organisms are organisms that are easy to study, and are used widely by scientists studying in a similar field. 4 What is the energy source for the production of the complementary strand of DNA? A higher mitotic index indicates a more rapid proliferation of cells of a certain
type. Examine the graph from the World Health Organization below and note the positive correlation. Between the nucleosomes, the difference is that now they have two full copies of each chromosome connected at the centromere. Membranese, there are still two pairs of chromosomes, the difference is that now they have two full copies of each chromosomes, the difference is that now they have two full copies of each chromosome connected at the centromere.
Some hormones (e.g. leptin) have very specific and limited target tissues, while others (e.g. insulin) have a broad range of target tissues. These substances include: • cellulose, from the cell walls • bile pigments, from bile, which give the characteristic colour to faeces • bacteria
because a few survive the low pH in stomach and become a constantly regenerating population of billions of mutualistic inhabitants of our digestive tract. The bacteria are then placed in a medium with only light nitrogen (14N). The dark area in the centre is the lumen, where blood flows. 7 Dental plaque involves the presence of bacteria. A layer of
mineral oil may be placed on the surface of the water container to minimize loss of water by evaporation. Figure 3.14 How chromosome number is maintained in the sexual life cycle. Study the diagram of a Chlorella. If this blood vessel is feeding oxygenated blood to oxygen-demanding tissue like the cardiac muscle of the heart, a myocardial infarction
could result. These antibodies then bind to specific white blood cells called mast cells. There is nothing in the genotype's notation GGLL that shows that G must be inherited with L. This is all due to the rafts of floating island of plants and biofilm that has reduced the nitrogen concentration by 95% and the phosphate concentration by 40%. This is
known as haemoglobin's affinity for oxygen. An action potential consists of depolarization and repolarization of the neurone. 1.12, p. We have also seen that during the process of cell respiration, not all the energy is converted into useful energy is converted into useful energy.
to produce novel products. Thus there are many similarities between these two processes, especially when the focus is the behaviour of the chromosomes. A signal is sent to the hypothalamus to stop eating. What was once pure fiction is coming closer and closer to becoming an everyday reality, thanks to stem cell research. Even in areas of the world
where excellent sources of nutrition are available, an individual's own choice of what is in his or her diet can lead to serious nutritional imbalances. 4 Microscope magnification. A good example of this would be the protein components that make up
ribosomes, as all cells need ribosomes. Lung infections can be caused by Pseudomonas aeruginosa. CHALLENGE YOURSELF Figure 12.50 The effect of MDMA on the number of available serotonin receptors in the brains of a group of rats. The ATP and NADPH produced by the light-dependent reaction provide the energy and reducing power for the
light-independent reaction to occur. When the cherry tree produces flowers, haploid spores are formed and develop into the haploid bodies referred to as gametophytes. Books on botany and the best ones make sure they are backwards
compatible (making reference to the previous classification) and forwards compatible (incorporating the latest classification). Dr Prasad and colleagues attached a protein called transferrin to the quantum rod. This explains why a human female cannot become pregnant while she is already pregnant. Most women probably would not care whether or
not they have the gene for dry or fluid earwax, but if they could find out whether they had an allele that could reduce their chances of having breast cancer, they might be much more interested. Fish 8 (a) Does not produce an amnion.
                                                                                                                                                                                                                                                                                                                                                 . Peer pressure is verv influential on adolescents and, to a lesser extent, adults. It
is bordered by a double membrane referred to as the nuclear envelope. The voltage can be traced back to the SA node and the AV node. Extracting or producing pure enzymes in the large quantities needed for industrial use is expensive. The hypocotyl is the region immediately below the cotyledon attachment point. 2.2 NATURE OF SCIENCE Water
Understandings: Water molecules are polar and hydrogen bonds form between them. The mixture of gases exerts an overall (total) pressure; the portion of the total pressure that is caused by oxygen alone is the partial pressure of oxygen. 2001 150 120 90 60 30 0 0 1 2 3 4 5 6 7 8 injections of MDMA time (hours) Some experiments have documented
that molecules called antioxidants can reduce MDMA-caused neurotoxicity. (c) In Figure 2.54, what could possibly cause a change from the plateau shown to an increasing rate? These copies are denatured (separated into single strands) by heating them in a solution at 92°-94°C. 22 Outline the effect of anaesthetics on awareness. Most mitochondrial
reactions involve the production of usable cellular energy called adenosine triphosphate (ATP). Adult birds continue to produce uric acid, and this gives them some independence from having to find water frequently; animals that use ammonia or urea as their waste product have to drink relatively frequently compared with birds. Birds are a warm-
blooded vertebrate, and fertile chick eggs are available all over the world for scientists to use, with very little expense involved. Such an example specimen is called a holotype. By digging in layers of sediment 15 000 years old and looking at the kinds of bones, shells, coral reefs, plant fossils, and even pollen grains, climatologists can work out what
the climate was like at that time in the past. The common foxglove, Digitalis purpurea, has been reclassified, so instead of being in the figwort family it is now in the plantain family. 6 CH2OH OH H 4 HO 5 CH2OH OH H 3 2 OH HOCH2 H O H OH Glucose + O CH2OH OH H 3 2 OH HOCH2 H OH Glucose + O CH2OH OH OH 
CH2OH H H OH OH fructose H sucrose Figure 2.13 The condensation reaction between glucose and fructose to form the disaccharide sucrose and a water molecule. I mean, as I walked through the biosphere, I was incredibly conscious of the fact that the plants surrounding me were providing me with the oxygen that I needed to breathe, and that I
was providing them some of the carbon dioxide they needed to grow.' She says we need to think about this when we are living in Biosphere I, which, in case you hadn't worked it out, is Planet Earth. In a lab report, it is acceptable to exclude an outlier from data processing, but it is important to declare it and explain why it was excluded. People often
equate a nerve impulse to electricity. You will recall that, in DNA replication, DNA polymerase allows assembly only in a 5 to 3 direction. These techniques offer new hope for obtaining treatments and vaccines for diseases; for creating new plants for farmers; for freeing wrongly convicted people from prison by proving their innocence with DNA tests.
Viruses were given a working copy of the gene and injected into three young patients' bone marrow cells. Recently, there has been evidence that some types of cancer may be caused by stem cells undergoing a cancer-like or malignant transformation. Certain foods can make you feel comforted. A stack of thylakoids make up a granum (plural grana).
Because men do not have a second X chromosome, there are only two possible genotypes, XBY or XbY, for them in relation to colour blindness. By 2050 the world population will have increased to 9.2 billion, a 4-fold increase in 100 years, making food production a huge social issue. Polygenic inheritance involves two or more
genes influencing the expression of one trait. Notice that the collecting duct extends into the highly hypertonic interstitial fluid of the medulla. If a spermatogonium begins meiosis, four spermatozoa are the eventual result. P C P 8 Use the symbols mentioned on page 86 to represent all the possible nucleotides of DNA. An example of bioremediation of
a hydrocarbon pollutant is the action of Marinobacter on benzene. What is the term that describes the minimum electric potential necessary to propagate an impulse? A methyl group is an organic functional group with the formula CH3. These disc-shaped areas contain openings called gap junctions where cytoplasm from one cell freely passes to the
next cell. Thick waxy cuticles decrease the chance of meaningful data. Data were collected that demonstrated that blue tits normally peel bark off trees to look for insects. • Ribulose bisphosphate is reformed using ATP. 354 A initial substrate B end product enzyme 1 intermediate A enzyme 2 initial substrate Figure 8.5 A short pathway! enzyme 1
intermediate A enzyme 2 intermediate B enzyme 3 end product that, when in sufficient quantity, causes end-product inhibition. One of the smallest is the size of a sesame seed and occurs in the aquatic plant Wolffia. coli infected with the 35S had no radioactivity
within their cell wall. One interesting and highly studied animal is the kangaroo rat that lives in the desert areas of south-western USA. This consists of loosely packed cells with few chloroplasts. Causes of addiction Many drugs can lead to addiction: alcohol, tobacco, psychoactive drugs, and some pharmaceuticals. Figure 9.3 A: When solution
pressure is high inside the guard cells, they bow outwards and open the stoma. When scientists attempt to explain these complex reactions, they usually break them down into smaller, intermediate steps. Each graph below shows the movement of a single crab recorded at 1 s intervals, as it moves upstream towards the source of the chemical. Practice
questions 1 Which of the following are used as evidence for evolution? This means that only one of the two strands of DNA will be used as a template to create the mRNA molecule. 720 For example, some cultures are dependent on a single staple crop for much of their diet. As the phosphate reserves run out, food prices are expected to increase as
rock phosphate reserves become more and more expensive to extract. Chylomicrons are very small particles made up primarily of fat and some protein. Example: ddG attached to 4th position. Nuclear pore Chloroplasts are specialized plastids containing the green pigment chlorophyll. Technology has developed many improvements over the years. 60
% of population 50 40 30 Figure 10.19 Blood type is an example of discontinuous variation. This restores the 4C molecule that can begin the cycle all over again. 623 13 Option B: Biotechnology and bioinformatics Steps in gene therapy Most gene delivery strategies rely on viral vectors to introduce therapeutic genes into cells. It means that there is a
50% probability that the differences are caused by chance alone. Using sound to monitor fish populations An echo sounder reads information from a pulse that it sends into the water. • The impact of a gas depends on its ability to absorb long-wave radiation as well as on its concentration in the atmosphere. Polypeptide chains are assembled in the
cavity between the two subunits. Make sure you follow the guidelines given for drawings. The same thing happens with a tooth that has just been cleaned perfectly by the dentist. In contrast, cooler climates or ones with fewer hours of sunlight per year have a lower biomass and therefore cannot support as many organisms. 1, p. Chemoreceptors
Chemoreceptors respond to chemical substances. Many examples of enzyme inhibitors exist in medicine. The neural tube then elongates and becomes the brain and spinal cord of the frog. These young must be able to follow their parent so that they can find their own food. Let's consider the interesting case of a bird called the European blackcap,
Sylvia atricapilla. • If Bt crops kill insects, what happens to the local ecosystem that relies on the insects for food or pollination? When the role of DNA in inheritance (genetics) became understood, it appeared to some to contradict evolution by natural selection; such contradictions often arise with new developments in science. Chemotaxis is the
response to chemicals in the environment. 183 04 Ecology Two major events in the modern environmental movement were the first photographs of Planet Earth from space, during the Apollo missions in the late 1960s and early 1970s, and the publication in 1962 of Silent Spring by Rachel Carson, a book imagining a future with no more birds.
However, some plants have chloroplasts in cells of other organs. Nitrogen is extremely important to living organisms, as it is one of the elements needed in nucleotides and amino acids, the building blocks of life. Birdsong is a well-studied example of animal behaviour. However, overuse of antibiotics can lead to the production of resistant strains of
bacteria. Remember the experiment in conditioning carried out by Pavlov and the dogs he conditioned to salivate in response to a bell. Reptiles, birds, and mammals all have a four-chambered heart (although the ventricles of a reptile heart are only partially divided). A small percentage are harmful (pathogenic), and the highly acidic environment of
the stomach helps to kill many of these before releasing the chyme into the small intestine. CHALLENGE YOURSELF Adoption rates of GR (glyphosate-resistant) soybeans and cotton in the USA are shown in Figure 13.10. While most modern governments have ruled hallucinogenic psychedelic drugs to be illegal, their use was not uncommon in ancient
cultures. Of course, we are talking about the flowers. The identity of the fatty acid is determined by its number of carbon atoms and the location(s) of the double bond(s). According to this system, there are three domains of all living things: Archaea, Eubacteria (prokaryotes), and Eukaryote (eukaroytes). Before answering these questions, it is
important to appreciate the point that, although we have made considerable progress in the past few decades, our maps of human chromosomes are still far from complete, and there are many DNA sequences for which we do not know the function. Because of molecular polarity differences, phospholipids will not allow glucose to pass through the
membrane without going through the protein channels. Humans and other animals are composed of eukaryotic cells. Information stored here is retrieved in the number of modifications to the original letter over time. The bone plates in adults are already fully
formed, so rickets cannot develop. • Muscle contractions cause the pressure changes inside the thorax that force air in and out of the lungs to ventilate them. As mentioned on page 10, meristematic cells are undifferentiated cells that can divide rapidly, allowing growth in plants. Each of the two blue sidechains is an amine functional group and the
red atom is a double-bonded oxygen atom. The blockage of blood flow may be due to a blood clot. During G1, the major event is growth of the cell. These are conscious adaptations made by individuals. Sensory neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in to the CNS, and motor neurones bring information in the cell.
comes from. 3 Climate change deniers will grab onto such inaccurate predictions and say, 'See? 1 2 3 4 5 The chromatin fibres become more tightly coiled to form chromosomes. However, modern-day plants have two types of photosystem. Because DNA contains phosphorus and not sulfur, this allowed Hershey and Chase to conclude that DNA, not
protein, was the genetic material of the bacteriophage. If blue tits get past the cream to the milk, they are lactose intolerant and get bad diarrhoea from drinking the milk. Mathematician: To be more precise, we can say that in Scotland there exists at least one field in which there is at least one sheep, which is black on at least one side. 5 Active
transport of nitrates. 41 01 Cells Cyclins are a group of proteins that control the cell's progression through the cell cycle. Bulb thermometers will be needed for the temperature group, and a mass scale for the substrate concentration group. If you draw a diagram that is 50 mm, what is the magnification of your drawing? When GABA binds to the
postsynaptic membrane, it causes chloride ions (Cl-) to enter the neurone. Biolistics coats particles with DNA and fires them right through the cell wall. Osmosis Partially permeable membranes are also called selectively permeable membranes.
The backbone of the molecule is shown in stick form. When THC binds to these receptors, it interferes with short-term memory. Hepatitis B is a vaccine that can be made by tobacco plants in bulk. The ADP reactant fits into part of the enzyme's active site, and the inorganic phosphate group reactant fits perfectly oriented next to it, and, within a small
fraction of a second, the two reactants become covalently bonded to each other. Not surprisingly, the rate of movement of material through the large intestine has a positive correlation with fibre content. This is the reason why you sometimes hear life on Earth being described as 'carbon based'. • Tertiary structure: a shape often described as
globular, e.g. enzymes. 434 E = expected values (calculated Now that we know the 2 value for Mendel's experiment, we need to know what it means. cDNA hybridizes to DNA on microarray. The light used emits blue-green after birth, a newborn
may begin wavelengths of the spectrum (not ultraviolet, as showing the yellowing symptoms of commonly believed). 30 Mate selection can be determined by courtship behaviour. They did not have the ability to observe the molecule directly, which made the model necessary. Because human cells do not use PABA to produce folic acid, they are
unaffected by the drug. • Some free nucleotides are standard ones and others are special dideoxynucleotide triphosphates (ddNTPs labelled ddA, ddT, ddC, and ddG in Figure 3.7) added as DNA chain terminators, meaning that when one is reached, the elongation of the strand is stopped. Because of these cells, we are able to acknowledge and
respond to our surroundings. This means that sometimes alleles present on the X chromosome locus have nothing to pair up with. Figure 15.6 To help you 7 remember to eat at least five serving of fruits and vegetables every day, count them on your fingers. The last reported case of smallpox was in Somalia, Africa, in 1977. A specific plasma cell is
identified that can produce an antibody that will bind to the antigen (e.g. the proteins of the cold virus). Two types of batches are: 1 2 fed-batch, where the substrate is added continuously and an equal amount of fermented medium is continuously
removed. Genetic disorders such as Huntington's disease and cystic fibrosis are autosomal disorders. In Figure 13.27, you can see SNPs from three different people. The skeleton of an animal provides support, probe for sickle-cell allele The probe only sticks to complementary DNA strands. The Ensembl project is a public database accessible to
everyone, including you. The higher solute concentration within the guard cells causes inward water movement by osmosis. A much better way to determine whether you have an appropriate weight is to calculate your body mass index (BMI). 428 Figure 10.15 Test cross between a grey long-winged fly of unknown genotype with a black short-winged
fly, a homozygous recessive. The aim of this website is to help researchers find the databases that they need. and Dobbs, Fred C. NATURE OF SCIENCE Scientists must assess the risks and benefits associated with scientific research. 6 The parents in a cross are AaBb and aabb, respectively. What about the following two statements? The central
dogma can be summarized as: DNA RNA Protein The process that occurs at the first arrow in the central dogma is transcription. In some cases, the bell-shape is very tall and narrow. Figure 12.12 The pupil reflex. For example, scientists are on the verge of finding a biomarker to predict the onset of Alzheimer's. Sampling should be based on random
numbers. • In operant conditioning, the animal brings about a change in its environment by performing a particular pattern of behaviour. Enzymes lower that consists of a length of DNA and influences a specific characteristic. 7 Relate your data to the
needs of plants concerning water in their natural environment. Diagnostics are combined with tar symptoms associated with the pathogen do not have time to develop. The reaction rate will not increase as the substrate increases because there is a limited amount
of enzymes still active. The expected results are what can be calculated theoretically and, in genetics exercises, this means using a Punnett grid to determine ratios of offspring. Experts claim that they can use this technology to see whether someone is lying or to see whether someone recognizes a crime scene that they claim that they can use this technology to see whether someone is lying or to see whether someone recognizes a crime scene that they claim that they can use this technology to see whether someone recognizes a crime scene that they claim that they can use this technology to see whether someone is lying or to see whether someone recognizes a crime scene that they claim that they can use this technology to see whether someone is lying or to see whether someone recognizes a crime scene that they claim they have never visited.
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To fill in the other cells, simply perform the mathematical operations in the third column. In other words, the whole is more than the spliceosomes remove the introns, the exons may be rearranged, resulting in different possible proteins. The
cytochrome c gene sequence is available for many different organisms and is of particular interest because of its use in reclassifying organisms into three domains. We know now that the number was accepted in the 1950s. Notice the scales covering the body, and notice the pentadactyl forelimb. He had previously
only come across urea crystals in the study of the compounds that are characteristic of urine. Neural developing and one of the first systems to begin developing and one of the first systems to begin developing and one of the first systems to begin developing and one of the mate with
the female so it flies to a tree to feed. Most of these hormones have been described in earlier sections. She might start with a straight line because that is the simplest relationship between two variables. It is the difference between the largest and the smallest observed values. Explain how the Hardy-Weinberg equation is applied in this example. The
placement of the lead(s) is dependent on the patient's heart problem and how many leads are being placed. It produces feelings of exhilaration and energy. She then guards the developing embryos closely as they incubate. cvmbs.colostate.edu/hbooks/pathphys/reprod/placenta/endocrine.html, reproduced with permission; Figures on page 568 from
Variation in a female sexual attractiveness pheromone controls male mate choice in garter snakes, Journal of Chemical Ecology, 28, p. Go to the hotlinks for suggestions of the same species. Antirrhinum. The mould is in a
stressful situation because of the lack of a sugar and carbon source. Harvesting these cells involves the death of an embryo, and some people argue that this is taking a human life. Skill: Evaluation of data or media reports on environmental problems caused by biofilms. 1.6 Cell division Understandings: Mitosis is division of the nucleus into two
genetically identical daughter nuclei. When people say something like that, they are usually thinking of factors like their heart rate. 3 Where would the most efficient control of a metabolic pathway involving end-product inhibition occur? What attention should be given to how decisions about risk are made by both researchers and their subjects? One a metabolic pathway involving end-product inhibition occur? What attention should be given to how decisions about risk are made by both researchers and their subjects? One a metabolic pathway involving end-product inhibition occur? What attention should be given to how decisions about risk are made by both researchers and their subjects?
way to answer this question is to compare the composition of the blood entering a kidney in the renal artery, with the blood leaving a kidney in the renal vein. Bacterial DNA is circular, has no histones, and has a single origin. Each enzyme has a region called the active site. The more folding, the more surface area there can be. Finally, the acetyl
group combines with coenzyme A (CoA) to form acetyl CoA. (1) (b) Among the ten foods shown in the graph, seven are bipedal (have two legs) and possess wings, most of which are adapted for flight. With three, four or five genes determining the phenotype
the number of possibilities is so big that it is impossible to see the difference between certain genotypes in the phenotype. endometrium Figure 11.30 A human blastocyst shown in section. In this case, the energy to drive chemiosmosis comes from light. It plays an important role in providing habitat for organisms both above and below the water. To
learn more about transport and vascular tissue in plants, the pressure-flow hypothesis, and to differentiate between xylem and phloem in plant roots and stems, go to the hotlinks site, search follow improvements in analysis and deduction
improvements in analytical techniques allowing the detection of trace amounts of substances in the understanding of plant hormones and their effect on gene expression. The terminator is a sequence of nucleotides that, when transcribed, causes the RNA polymerase to detach from the DNA. Click on the number next to PUBMED
and you will go to an Abstract about the mouse gene. However, it can only replicate rather short segments of DNA. The X chromosome is longer than the Y chromosome is longer than the Y chromosome, and contains many more genes. 

Gametes are haploid so contain only one allele of each gene. Campbell and Reece 1999 mesoderm endoderm archenteron CHALLENGE YOURSELI
1 Redraw the picture of the embryonic tissues of Xenopus and label it without looking at Figure 12.1. Annotate the figure you have drawn. As the triphosphates are added, two phosphates are released, thus producing RNA nucleotides.
recycled through the environment. (d) A snail scraping algae off a rock. Phenotype - The characteristics or traits of an organism. Researchers found that an enzyme could be held in place in tiny pores on beads of a substance called calcium alginate. The Human Genome Project has given us much of the genomics of the human genome. Passive
immunity. The small cell is called the first polar body and simply acts as a reservoir for half of the chromosomes. The FASTA information that you inserted in the large rectangular Query box in BLASTn (nucleotide BLAST) was a series of letters. Cocaine blocks removal of dopamine from the synapse so that it builds up. Another bacteria, Desulfovibrio
desulfuricans, makes the mercury more dangerous. C They dissolve in rainwater to produce acid rain. Innate behaviour in invertebrates Animals orient in different ways to their diverse environments. Remember that methane is produced by anaerobic microorganisms present in the guts of animals. High-fibre diets also help people manage their body
mass better. Instead of having either one characteristic or another, could there be a range of traits from one extreme to another? You may have heard of GMOs (genetically modified organisms). Therefore, you need to understand the structure of this organism produced by the fusion of two gametes has its own genetic
makeup? What would happen if tall plants from the F1 generation (F2)? The optic nerve carries the impulse to the brain. Isopods are terrestrial crustaceans that can be used to study kinesis. The two types of bacteriophage with the different radioisotopes were then allowed to infect the bacterium known
as Escherichia coli. In this section, the discussion centres on the establishment of chemical bonds to produce organic compounds. It showed the greatest biomass, height, and stem diameter. 357 08 Metabolism, cell respiration, and photosynthesis Oxidation and reduction can be compared using a table like Table 8.2. Table 8.2. A comparison of
oxidation and reduction Oxidation If asked in an exam to compare oxidation and reduction, using a table like Table 8.2 is an excellent way to structure the answer. 2 Controlled experiments in a biology lab. • The assay control has no serum, but all the other steps are the same. No animal is independent of its evolutionary history: if a species has an
ancestral origin that primarily used one of the three nitrogenous waste types, then the emerging species is most likely to use the same nitrogenous waste type. The results of a study into the effects of deforestation on cowbird parasitism of four different host species are shown below. Solutions 1 2 3 4 The null hypothesis is 'the two categories
(presence of fern and presence of shade) are independent of each other'. Figure 12.5 Signal molecules called CAMs attract the axons to their target muscle cells. These are proteins that regulate transcription by assisting the binding of RNA polymerase at the promoter region of a gene. We will use the author's maiden name as a substitute for a
peptide. In fact, if we compare your DNA with anyone else's DNA, the similarity will be the same, 99.9%. Application: Feeding on cream from milk bottles by blue tits as an example of the development and loss of learned behaviour. You can see that humans and mice have the same E:S ratio, while the E:S for small birds is larger than that for
humans. 107 02 Molecular biology The fixation reaction described above requires energy. Base substitution mutation The type of mutation that results in a single letter being changed is called a base substitution mutation. Environmental resistance In the 1800s, Thomas Malthus predicted that food demand would outstrip food supply. • The stomatal
pores are on the bottom surface of the leaf. If these plants are different down to their DNA, it makes sense to me that there would be distinctions in their personalities and properties - how could there not be? Questions Should we make these changes to the classification and put figworts and plantain together in the same taxonomic
                                                                                                                                                                                                                                                                   .What data do we need to have to be sure that the new classification is really
                                                                                                                                                                                                                                                                    .Why do gardeners stubbornly hold on to the old
correct?
                                                                                                                                                                                                                                                                            Extension Activity - Read the original paper which resulted in the reclassification. Read one of the following links and make some
notes for your TOK teacherThe group Archaea was recognised in 1977 by Carl Woese as a distinct domain different from bacteria. Is the person who said it a reliable person? Nucleic acids 7.2 Transcription and gene expression Understandings: Transcription occurs in a 5 to 3 direction. In this way, transgenes can be embedded in a plant cell.
Examples are given of the evolution of biological theories as new information is gained, the use of models to conceptualize our understanding, and the ways in which experimental work is enhanced by modern technologies. Looking along the row of Table 2 that shows the degrees of freedom of 28, we see that 2.25 is just above 2.05. Type II diabetes
used to be commonly called adult-onset diabetes because it was much more common to develop the symptoms of this disease later in life. Beer, wine, and spirits contain different proportions of ethanol, plus other ingredients for flavouring. We will explore such linked genes later in this chapter. However, we would not be able to obtain sufficient
nutrients from ingested foods without the aid of digestive enzymes. By 2007 Spain was producing 50% of GM crops. Flower structure and function In both dicots and monocots, animal-pollinated flowers have the same parts in common. Thus the sequence of events is identical to that of any cell that produces and secretes a protein for use outside that
cell. Metabolism is the web of all the enzyme-catalysed reactions in a cell or organism. Haemophilia is an inherited blood-clotting disorder. It is a nearly instantaneous event that occurs in one area of an axon, and is also called a depolarization. The data for discontinuous variation can be displayed as bar charts (see Figure 10.19). Using various
mechanisms, the antibodies help eliminate the pathogen. 4 Place one Petri dish with its slide in sunlight. Measurement of transpiration rates using potometers *Safety alerts: Use protective eyewear and aprons. Recognizing that human activity has placed a large pressure on pollinators by removing their natural habitats, and that pollinators prefer a
diverse population of plants, scientists are now working to bring about the claims of scientists using different databases? Newly developed motor neurones, which extend axons from the spinal cord, are some of the longest neurones in the body. There were
several reasons why Singer and Nicolson proposed a model that was different from the Dayson-Danielli model. Seeing a familiar face in a crowd can make you feel at ease. Although this is possible, it is unlikely in cases where many offspring are produced. An unfertilized egg was collected from another sheep and its nucleus was removed. To learn
more about GenBank, go to the hotlinks site, search for the title or ISBN, and click on Chapter 7: Section 7.1. DNA profiling is useful in several situations, such as revealing family relationships, identifying individuals involved in a crime, and identifying disaster victims. At the distal end of axons, as part of the synaptic terminals, are swollen
membranous areas called terminal buttons. Vitamins: essential organic compounds Unlike minerals, vitamins are organic (carbon-based) molecules. The RNA polymerase also allows polymera
Electronically stored data A biology diploma Experimental work Ancient belief systems Websites and email systems Student discussions Religious texts Libraries Copernicus is the scientist who mathematically showed that the Earth goes around the Sun, and not the other way round. 518 Frontal lobe hand finger thumb neck brow eye Parietal lobe
head trunk forearm neck hip leg elbow hand arm fingers thumb eye nose face lips genitals toes arm shoulder hip elbow trunk knee wrist face Figure 12.19 This homunculus cartoon shows the relative importance of areas of the body in the primary motor cortex and the primary somatosensory cortex. tt for the purebred short parent. For example, the
UK blackcaps have a sharper, longer beak, perfect for eating seeds from a winter garden feeder. Thus, herring seal indicates that the seal eats the herring. An unsolved dilemma: bacterial resistance to antibiotics Remember that any one antibiotic is a specific chemical that selectively targets some aspect of prokaryotic cell biochemistry that is
different from eukaryotes. 40 Suggest a solution to this problem using evidence from the plant's life cycle. The results, published in the Journal of Ecology, February 2002, were as follows. 735 15 Option D: Human physiology approach the lower
end of the normal range, the pancreas produces glucagon and this hormone stimulates hepatocytes to convert glycogen back into glucose. 1 Tissue from a normal soybean is grown in culture medium. This process is called assimilation, pancreatic 'juice' and bile from the liver with it 272 Table 6.2 Digestive enzymes produced by the pancreas and
secreted into the lumen of the small intestine Enzyme Substrate Action Lipase Lipids (fats and oils) Hydrolyses starch into the disaccharide maltose. 10 Haemodialysis also allows regulation of water concentrations within the blood. Soon jaundice. GFP is another innovation in technology
that has allowed scientists to diagnose and treat disease more easily. There are many subjects where knowledge is gained in a similar manner. Who are the carriers in this family? Klinokinesis is when an organism turns slowly or rapidly in response to a stimulus, but it does not move towards the stimulus. Because prokaryotes have only one parent,
they have only one chromosome. If this repetitive DNA is clustered in discrete areas, it is referred to as satellite DNA. Table 12.13 A comparison of innate and learned behaviour Innate behaviour Develops independently of the environmental context Is dependent on the environmental context of the animal for development Controlled by genes Not
controlled by genes Inherited from parents Not i
next organism we will look at is Chlorella. Hopefully, new research using biofilms can helps bring back some of these polluted waterways. • Rod cells are photoreceptor cells that are very sensitive to light. Do this until you are confident that you know each one very well. Anaphase I Figure 10.5 Anaphase I, during which homologous chromosomes
(bivalents) are separated. Note that the letters and symbols that Thomas Hunt Morgan used a century ago are outdated and not used in modern Punnett grids. What does this case study reveal about the nature of science? The liver removes toxins from the blood A typical human being ingests an amazing number of toxic substances every day. In many
animals, excess amino acids undergo a chemical reaction called deamination. • They hold themselves together by secreting extracellular polymeric substances (EPS) that stick to surfaces like glue. Each time we take a breath, a fairly complex series of events occurs that we do not even think about as it is happening. It is not just any amino acid: its
identity was originally determined by the strand of DNA that transcribed the mRNA being translated. Studies have also indicated the need for ATP production so that sugars can be actively loaded into the phloem source. vesicles with modified materials cisternae vesicle from rough ER Figure 1.7 In this drawing of the Golgi apparatus, the movement
of the vesicles is shown by arrows. Prior to Harvey's experimental work, the authority on the movement of blood in the body was provided by the early Greeks (AD 100-200), including Pliny the Elder and Galen (of Pergamon). Refrigeration of foods is often used to reduce ideal conditions for bacteria. This will result in the movement of a bone. Each of
the 20 amino acids differs from the others in one bonding location around the central carbon atom; that difference in structure is called the R or variable group of the amino acid (Figure 2.20). This makes the interstitial fluid in the renal medulla hypertonic in relation to the initial urine within the collecting duct. For an explanation of how the cells are
collected, see Section 3.3. 1 2 The cells are stained and prepared on a glass slide, to see their chromosomes under a light microscope. • Skills: Analysis of epidemiological data related to vaccination programmes. 12 In what ways could you reduce your consumption of fossil fuels on a day-to-day basis? A plate reader. While doing so they found three
proteins that varied in concentrations at different times of the cell cycle. 5.1 Evidence for evolution occurs when heritable characteristics of a species change. Next, the large ribosomal subunit combines with these parts to form the translation initiation complex. In the final step needed for copying (or cloning) the gene, the
vector is placed inside the host bacterium and the bacterium is given its ideal conditions in which to grow and proliferate. Molles, Jr. 2010, Fig. # Sperm cells begin pushing their way through surrounding follicle cells. These animals must have 475 11 Animal physiology mechanisms that regulate water balance, and typically expend a great deal of
energy in order to achieve those mechanisms. No pain signals can be carried through to the CNS. In 1628, Harvey published his work in a publication called On the Movement of the Heart and Blood in Animals. et al 1995), with permission from the Marine Biology.
Cambridge University Press (Jones, M. Red blood cells (erythrocytes) that contain haemoglobin have a cellular life span of only about 4 months. This is a false-colour transmission electron micrograph (TEM) showing Escherichia coli dividing by binary fission. The countries with the top three population sizes are China, India, and USA. Blood sugar
 (glucose) is supplied by the food that you eat. The cohesion-tension theory of plant fluid movement Now that the structures of the plant fluid movement. Skill: Use of molecular visualization software to compare cellulose, starch, and glycogen.
1987), THE JOURNAL OF ANIMAL ECOLOGY by BRITISH ECOLOGICAL SOCIETY, Reproduced with permission of Blackwell Publishing Ltd. We have considered a few of these hormones and their effects within the body. Now imagine you have not eaten any carbohydrates for a long time. 

The cohesive property of water and the structure of the
xylem vessels allow transport under tension. 3 Why would the germinating seeds show a greater oxygen consumption at 22°C than at 12°C? Generally speaking, the chromosomes are arranged in order by decreasing length. 17 Briefly outline how an ovum is well adapted for its function. Oxygen is used by the cell when its mitochondria carry out
respiration, thus creating a relatively lower oxygen concentration inside the cell compared with outside the cell. The rate of facilitated diffusion will level off when total saturation of the available carriers occurs. If the molecule is mitochondrial DNA, for example, we count the number of base pairs that do not match. Notice that the Z lines in the
contracted sarcomere are closer together. Because the antigen is a protein on the surface of a pathogen (such as a bacterium), the antibody thus becomes attached to the pathogen (see the artwork on the right). 619 13 Option B: Biotechnology and bioinformatics Tracking experiments Mosquito larva. As a result, when an egg cell meets a sperm cell
during fertilization, there is always a 50% chance that the child will be a boy and a 50% chance that the child will be a girl (see Figure 3.10): • XX = female • XY = male. The left cerebral hemisphere receives sensory input from sensory receptors on the right side of the body and the right side of the visual field in both eyes, and vice versa for the right
hemisphere. 5.3 Species are named and classified using an internationally agreed system. This layer is less than 5 mm thick but contains 75% of the body's neurones. 710 Atmospheric deposition of P onto land. 2 Another two important concepts to understand are the idea of degrees of freedom (d.f.) and how the idea of probability (p) is used. This is
called a simple linear regression model. As stated at the beginning of the section on evolution, once the theory of natural phenomena. A highquality fertilizer without weeds or odour is a byproduct that can be used instead of manure, and 585 13 Option B: Biotechnology and
bioinformatics pollution caused by water run-off containing animal waste is reduced. 2 Agrobacterium introduces the new gene into the soybean cells growing in the liquid culture. Pictures of DNA by Rosalind Franklin and Maurice Wilkins using X-ray crystallography, and conclusions from their findings, were used by Crick to conclude that the
molecule was composed of two strands arranged as a double helix. Biopharming using animals For decades, genetically engineered bacteria have produced simple proteins such as insulin and the human growth hormone. As the newborn is not produced simple proteins such as insulin and the human growth hormone. As the newborn is not produced simple proteins such as insulin and the human growth hormone. As the newborn is not produced simple proteins such as insulin and the human growth hormone.
food sources are plentiful, small buds will form on its body, develop into adults, and break off to form new, genetically identifying even these common smells. First, we need to use statistical analyses to
determine whether the differences are significant. Labels are placed upon biological features just as they are often placed upon fellow human beings. 2005 (a) Calculate the percentage increase in orientated flight between the control group and the experimental group. How will you know if you are answering TOK questions in the 'right' way, as the
answers are not given in this book or by your teacher? stopper passageway add woodlice via this hole woodlice drying agent Figure 12.32 Apparatus for studying the orientation of isopods, set up to study humidity preference in constant light. Mark the positions of the different coloured pigments on the paper. Mutation, meiosis, and sexual
reproduction cause variation between individuals in a species. Application: Adaptation between individuals in a species and in saline soils for water conservation. prepare microarray tumor RT-PCR label with fluorescent dyes Figure 13.30 Microarray technology. • The outline of structures should be
continuous unless gaps or pores are present in the actual border or structure. These compounds can modulate fast-acting transmission in two ways. Gastrin enters the blood and is carried to other cells elsewhere in the stomach, and results in even higher secretion of HCl and pepsinogen. This sounds simple but a problem is the huge number of people
involved. Neural pruning involves the loss of unused neurones. Other cells did not show luminescence. Synapses that are not used do not persist. Two kinds of nucleotides will be added. Both of these drugs can lead to addiction. U A C A U G C G U A C 5' 3' D Combining with an amino acid and then binding to a codon. water air bubble
Another type of potometer is a mass potometer. Cell respiration and photosynthesis were discussed in Chapter 2, and both are complex pathways with chains and cycles of reactions. 1 2 3 Which curve represents the reaction in which a competitive inhibitor is active? Skill: Identification of xylem and photosynthesis were discussed in Chapter 2, and both are complex pathways with chains and cycles of reactions. 1 2 3 Which curve represents the reaction in which a competitive inhibitor is active? Skill: Identification of xylem and photosynthesis were discussed in Chapter 2, and both are complex pathways with chains and cycles of reactions.
14 Option C: Ecology and conservation Use of capture-mark-release-recapture method The capture-mark-release-recapture method is a sampling technique that is said to be sex-linked must have its locus on a sex chromosome. Although the limbs are often used for
walking, some are adapted for swimming, and others can form mouthparts. Because time is part of the unit, energy pyramids take into account the rate of energy p
both of the parents and the offspring are all three of the same species, despite the fact that the offspring is not identical to its parents. The cell divisions that occur create an embryo of 100 or more cells, but the overall size of the embryo is no larger than that of the original ovum. Could they have been formed from non-living chemical reactions? (b)
Outline adaptations of xerophytes. Other factors must be kept constant: • there must be no free oxygen (the bacteria in the fermenter are anaerobic) • the temperature must be about 35°C • the pH must not be too acidic because methaneproducing bacteria are sensitive to acid. You may wonder why cells do not grow to larger sizes, especially as
shipped to a factory. This illustrates how classification has been done for many years. Studies of increased by approximately 40% since 1750, while methane concentrations have increased by more than 150% in the same time period. This
would suggest that all five-fingered organisms have a common ancestor. • Mollusca: this phylum contains snails, clams, and octopuses, among others. Click on the title and you will see the article. The explanation above also shows the origin of the oxygen released by photosynthesizing plants (step 3). To access these links go to
www.pearsonhotlinks.com and enter the ISBN or title of this book. Whenever a definition is given for a major concept in biology, in this instance the term 'gene', be sure to memorize its definition word for word. Impact of waterlogging on the nitrogen cycle A pitcher plant. Again, this means that the loci for these two genes are located on the same
chromosome and are therefore considered to be linked genes. His results seemed to suggest that they did, and led him to the conclusion that the human soul weighed 21 g. NATURE OF SCIENCE 30 change in the mean sea level (mm) Do not confuse the greenhouse effect with the depletion of ozone. For example, you may be aware of the expected
Bryophytes, such as the liverwort shown below, are referred to as non-vascular plants because they do not have true vascular transports water and minerals up from the leaves towards the stem and roots). An enormous tissue (which transports water and minerals up from the roots) or phloem tissue (which transports water and minerals up from the roots).
amount of protein is produced per acre by soybeans. Water in living organisms acts as a mode of transport for the variety of molecules that must be moved about both within cells and between cells. A common condition that results from a stroke is partial or complete loss of language function, called post-stroke aphasia (PSA). 700 Yeast cells. Pollen
tube growth and fertilization occur in the following sequence. But when you are exercising heavily, the buffering mechanisms are overtaxed and the excess hydrogen ions lower the blood pH to the low side of normal. The first, second, and third positions represent the base location in the codon. If things were obvious in nature, we wouldn't need
science to understand it. THC also affects coordination, which is controlled by the cerebellum and the basal ganglia. What were the resulting bivalent shown on the right in Figure 10.18, two will contain combinations found in the parents
(either GL or gl) whereas two will contain recombinants (Gl and gL). This results in huge populations and greater potential for infections. Exercises 14 Explain the advantage that myelinated neurones have over non-myelinated neurones. 9.3 Plants adapt their growth to environmental conditions. Most of the water entering a plant comes in through the
root hairs by osmosis. Here are two examples. A plant that produces a different shaped flower might have a better chance of attracting insects for pollination. The success of biofilms is due to the following facts. Initially the antibiotic kills the biofilm cells (green). Solvent properties Water is an excellent solvent of other polar molecules. • Cellulose,
starch, and glycogen are all polysaccharides of the same monomer unit, glucose. Many plus rulesworksheets and regulations for musthomework. Alzheimer's disease results in extreme memory loss and affects millions of people worldwide. An example of linked genes in humans is haemophilia and colour blindness. You will probably have to make test
groups from a very limited population of test subjects (e.g. your classmates). All values are kJ m-2 yr-1. Solution 1 These are the symbols used in pedigree charts. little evidence of an agreement between the regression model and the data, whereas B and C show a stronger fit. What can be determined by examining these body fluids has been greatly
is weak, are at a greater risk of a bacterial infection. 157 03 Genetics DNA, isolated, replicated and split into single strands are separated out using a type of chromatography called gel electrophoresis (photo below). If failures were published, couldn't scientists save time by not repeating the same mistakes? There are many other
characteristics that must be considered. et al. Look at the picture on the right. The neurotransmitter is degraded (broken into two or more fragments) by a specific enzyme(s) and neurotransmitter is released from the receptor protein. These semicircular canals control our equilibrium, and give our brain a three-dimensional report of our position
When placed in a dry environment, they move quickly. Endocytosis allows macromolecules to enter the cell, while exocytosis allows molecules to leave. 8 Distinguish between non-specific and specific immune responses. (Total 1 mark) 4 What generates new cells in dicotyledonous plants? • Draw in pencil first so that mistakes can be corrected. Kidney
failure and other medical issues related to kidney function There are a variety of causes of complete kidney failure. Using a different technique, biodiesel can be made from vegetable oils or animal fat. Theory of knowledge Case study 4 Science and government 776 776 Trofim Denisovich Lysenko was a Soviet biologist who opposed
the ideas of Mendel and Morgan concerning genetics. For example, Pseudomonas+glycerol means that glycerol (just like the experiment above) had been added to the Pseudomonas of Characteristics shared by species within a group. • On the page there is a large
rectangular box that says Query Sequence above it. 259 05 Evolution and biodiversity Analogous and homologous traits In examining the traits of organisms in order to put them into their appropriate clades, thorough and systematic studies of their characteristics must be undertaken. Scientists spend a lot of time working with people from other
disciplines in order to gain a greater understanding of their findings. In small cities around the Great Lakes there is a programme for fishermen to help with the sampling. 110 II Glucose. Organisms range in size from a single cell to trillions of cells. A Punnett grid can be used to show how the alleles of parents are split between their gametes and how
new combinations of alleles can show up in their offspring. • marijuana smoke • fumes from manufacturing plants • coal dust • air pollution. The company was worth tens of billions of dollars. 477 11 Animal physiology Blood cells The glomerular filtrate
should have no blood cells in it because the blood cells are too large to fit through the fenestrations of the glomerulus. B A normal female. Full details with a worksheet of how to carry out this experiment are available on your eBook. Another characteristic that was used was the morphology of the nectaries, the parts of the flower that make nectar.
Jenner had noticed that people who milked cows almost never contracted the very serious disease smallpox. 14 How much more acidic is a solution of pH 6? Subgroups of phagocyte and lymphocytes act as memory cells and can quickly reproduce
to form a clone of plasma cells if a pathogen carrying a specific antigen is re-encountered. There are two major types of meristematic tissue, apical and lateral. • New alleles are formed by mutation. Some specific experimental work is compulsory, and further details of this are in the eBook. 6 Describe glyphosate resistance in soybeans. Cells that
have high energy requirements, such as muscle cells, have large numbers of mitochondria. The alternative, if we let people introduce more and more greenhouse gases into the atmosphere, will exacerbate the already highly destructive patterns we are seeing, and the cost of fixing these new problems is difficult to imagine. Primer G G C G G G G
G G C G G G Primer 2. As we know that there is a logical mechanism for causality (birds of prey kill and eat partridges), it is not impossible to suspect that there is a causal relationship here. The parents' gametes are placed on the top and side of the grid. Other viruses present in human waste are not so easy to culture and grow. In medicine
stoma is a surgically created opening in the body that replaces a normal opening. This means that people with a mutated allele of LRP5 are naturally immune to HIV. Human thermoreceptors are located in the skin. The removed carbon is released as carbon dioxide, a waste gas. Which species has the smallest number of genes? One of the claims of
the biotech industry is that GM foods will help solve the problem of world hunger, by allowing farmers to grow foods in various, otherwise unsuitable, environments. We truly hope that this book and the accompanying online resources help you enjoy this fascinating subject of IB Higher Level biology. Nicolson proposed that proteins are inserted into
the phospholipid layer and do not form a layer on the phospholipid bilayer surfaces. • The left cerebral hemisphere receives sensory input from se
the amount of sunlight is controlled to cause flowering at any time of year. What sets reptiles apart from other animals is that they have scales on their body instead of feathers or fur. Name the major blood vessels and heart chambers that the erythrocyte goes through until it returns to another capillary bed in the lungs. Each time carbon shares one
of its electrons, a covalent bond is formed, and carbon always forms four covalent bonds. If thousands of seeds were examined instead of a few hundred, the number would probably be closer to three. If there is 12.5% of the radioactive isotope and 87.5% of the stable isotope, that means that three half-lives have gone by and the fossil is 17 190 years
old. CHALLENGE YOURSELF 10 Without looking back at the drawings showing them, can you draw the stages of meiosis? • Application: Causes and treatments of emphysema. In contrast, in bacteria, for example, there are essentially no differences within a population: all members of the population are genetically identical copies of each other.
Follow all your teacher's specific instructions.* As stated above, many plants contain a variety of pigments. 18 What type of mRNA requires processing? Most specific instructions.* As stated above, many plants contain a variety of pigments. 18 What type of mRNA requires processing? Most specific instructions.* As stated above, many plants contain a variety of pigments. 18 What type of mRNA requires processing? Most specific instructions.* As stated above, many plants contain a variety of pigments. 18 What type of mRNA requires processing? Most specific instructions.*
temperature differences between undischarged ballast water and pier-side water for 32 vessels arriving at the Port of Hampton Roads. The flies will all be carriers for the recessive alleles. (2) (d) Suggest why bees with small heads tend to hover rather than patrol. The aim is that the people who eat this rice
will not be deficient in vitamin A (the body uses beta carotene to form vitamin A). Peat as a fossil fuel is partially decomposed plant material called peat. Both are always written in italics when typed, or underlined when written by hand. Cocaine is an excitatory neurotransmitter and causes
constant stimulation of the postsynaptic neurone. These bacteria are mutualistic because they provide us with vitamin K and a normal intestinal environment, while we provide the bacteria with undigested food from the small intestinal environment, while we provide the bacteria with undigested food from the small intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment, while we provide us with vitamin K and a normal intestinal environment.
unlikely. Be certain to completely seal the contact point between the shoot and the apparatus with petroleum jelly. Thus endocrine glands secrete hormones into the blood for dispersal to all cells of the body, even though only the target tissue cells are affected by the hormone. Notice that the three bases in the middle loop are called the anticodon
bases, and they determine which of the 20 amino acids is attached to the tRNA. CoA 4C 6C CO2 NAD! NADH 5C CO2 4C NADH 362 NAD! 4 The 4-carbon compound undergoes various changes resulting in several products. If a cow has short legs, it is difficult to place the pumps on her udder, so such cows will not be selected for breeding. If you ask
for the FASTA data (pronounced 'Fast A'), you can see every A, T, C, and G that makes up a gene coding for a protein. Trying to find out what happened in the past is the job of both historians and evolutionary biologists. • The relay neurone synapses with the motor neurone and transfers the impulse chemically across the synapse. For example, the
dry deserts of Saudi Arabia used to be under the Tethys Ocean, back when all the continents were still stuck together in the supercontinent called Pangaea. 2007), Copyright © 2007, with permission from Elsevier; Figures 13.10 and 13.11 from Risks and benefits of glyphosate-resistant crops, ISB News Report, January, fig. Each breath in and out
maintains the concentration gradients that encourage diffusion of oxygen into and carbon dioxide out of the nearby capillary beds that are adjacent to the many alveoli making up the bulk of lung tissue. Substrate A Substra
product of the pathway is formed. It has an effect on the postsynaptic neurone that causes ion gates to open. The water-soluble modified substance can be added back into the blood in order to be eliminated by the kidneys as a component of urine. Industry has invested a lot of time and money to create surfaces resistant to these attachments. 2 The
IPCC report is filled with qualifying statements such as 'likely', 'extremely likely', 'extremely likely' about the future. Some major knowledge questions arise from this. antibody concentration in bloodstream first exposure to antipen second exposure to same antipen secondary immune response produces more antibodies in less time
primary immune response time Figure 11.1 Graph showing antibody production in a primary and secondary immune response. • The biofilm of aerobic bacteria covers each plastic particle. And if you use a car or a bus that runs on biofuel, that vehicle is being powered by cellulose. (f) Some evidence supports the idea that, in humans, two of our
chromosomes fused together at some point in our evolution. It may include resin, saps, gums, and latex. Most frequently, when x = 8, plants are diploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have other multiples of 8: triploid (2n = 2x = 16) but some species can have (2n = 2x = 16) but some species can have (2n = 2x = 16) but some species can have (2n = 2x = 16) but some species can have (2n = 2x = 16) 
membrane-bound organelles. Colostrum levels decrease over the first few days of breastfeeding as the more typical breast milk begins to be produced. • The pancreas secretes enzymes into the lumen of the small intestine. 22 Where does this stage of cell respiration occur in a cell? direction of movement ephemeral hydrogen bond H H! O " H
direction of movement Cohesive properties You can float a paper clip on water because of the surface tension of water. (b) Estimate the level of atmospheric carbon dioxide in January of 2010 and in October of 2013 using the corrected values on the dark blue trend line. 1 2 3 4 Statistics for peppered moths in the 1700s do not exist. The ventilation
rate is under the control of an area of the medulla oblongata of the brainstem. However, we know that, using technology, scientists will develop future improvements to help those with hearing loss. If the sum of the signals is excitatory, then the impulse is carried forward. In other words, a set of three bases contains enough information to code for
one of the 20 amino acids. NATURE OF SCIENCE The fields of psychology, chemistry, biology, and medicine all combine to contribute to our knowledge of memory and learning. Pathway engineering has been very successful using bacteria and yeast because: • these organisms have a high yield compared with plants • these organisms have a fast
white. What are the arguments for and against the peppered moth as an example of evolution by natural selection? • The spongy mesophyll is located just superior to the stomata, to allow continuous channels for gas exchange. Make a sentence using the first letters of each level, such as 'King Philip Came Over For Good Soup'. In recent years,
because of the widely reported occurrence of serious events, the fear of gene therapy has been heightened. Once the Okazaki fragments are assembled, an enzyme called DNA ligase attaches the sugar-phosphate backbones of the lagging strand fragments are assembled, an enzyme called DNA ligase attaches the sugar-phosphate backbones of the lagging strand fragments to form a single DNA strand. 19 If a segment of DNA (gene) is examined and there are many
more methyl groups present than in other genes, what will probably happen to the protein that gene normally produces? After the apparatus is assembled, a calibration period is necessary which will allow evaporation or loss of water from the leaves. Ribosomes are composed of two subunits. Tobacco plants have plenty of biomass, so it is easy to
see how bulk vaccines can be made. That muscle is primarily composed of two molecules: actin and myosin. The Radioear was the name of one of the hearing aids that used a vacuum tube. B O A allele B allele O allele A O Ben A B Lucy Alan B O Beth O O Figure 3.31 Cystic fibrosis blood type A blood type B inheritance. Inhabitants of
industrialized countries often scoff at tales of traditional medicine men and healers in indigenous peoples. (1) 570 (c) Compare the effect of water velocity on the hunting behaviour of blue crabs. Does your public transport system's website have a similar calculator? 

Different muscles are required for inspiration and expiration because muscles only and the hunting behaviour of blue crabs.
do work when they contract. As we will see later in Section 3.5, these loops can be used in genetic engineering. In this case, the effector is a muscle that contracts and pulls the finger away from the needle. After an initial lag period, the bacteria degraded 200–300 µmol of added benzene bottle—1 consistently in 2.5 weeks. (3) A series of secondary from the needle.
messenger molecules is activated. • Drawings of the stages of meiosis do not need to include chiasmata. As it develops, if Elysia comes into contact with a specific type of green algae, it will enter its adult phase, in which chloroplasts from the ingested algae will be retained in its digestive tract. If you scale the size of a grasshopper up to an organism
the size of a human, that jump would be about 40 m. Because this type of phosphorylation utilizes an electron transport chain, it is called oxidative phosphorylation. Search for those words or their genes (INS for insulin or HBB for one of the subunits of haemoglobin). Biogas can be used for heating and cooking as well as running engines. 14 An ECG
is a graph showing the electrical activity of the heart. If bacteria were to be added to this cladogram, a new primitive characteristic would need to be chosen. The marked animals are released back into the ecosystem and allowed to mix with the others in the population. They are the sites for photosynthesis. The pain reflex described below is
something we have all experienced. A nutrient is a chemical substance found in foods and used in the human body. Humans have 46 chromosomes, in 23 pairs. Stroke may promote reorganization of brain function Neuroimaging studies
on stroke patients suggest that functional and structural reorganization of the brain takes place during recovery. A team led by Melvin Calvin in the late 1940s and early 1950s worked on experiments to find the early products of photosynthesis. The electron with the higher energy state is then passed down a second electron transport chain that
involves the carrier ferredoxin. Figure 12.47 Anaesthetic Synaptic block: suppression of the physiological response to surgery. In woody plants, there are lateral meristems that add secondary growth, increasing the girth of roots and stems. To know what we know what we know what we do not know what we do not know, that is true
knowledge. However, it is only recently that techniques have been developed to measure the extremely small amounts of the growth substance the Darwins and Went had experimented with. 

Application: Processes occurring in the small intestine that result in the digestion of starch and transport of the products of digestion.
in the sunlight was the size of a sports field, for example, it would have a surface area of approximately 5000 m2. They are 389 09 Guard cells and open stoma of a tobacco leaf. (d) The sizes of the chambers must be equal. • The contraction of both atria followed by contraction of both ventricles for a person who is currently at his or her resting heart
rate. Plant hormones have varying effects depending on the receptor's location in the plant. The 4-carbon compound is changed during these steps to re-form the starting compound of the cycle, oxaloacetate. This change during these steps to re-form the starting compound of the cycle, oxaloacetate. This change during these steps to re-form the starting compound of the cycle, oxaloacetate.
yellow bars represent unexchanged water. Technically, a proteome is the collection of proteins found within a particular cell type at a specific set of environmental circumstances. This mapping project is enabling the discovery of genes related to many diseases, such as diabetes and cancer. By adding up all the possible
proportions, we can see that _14 + _12 + _14 comes to a total of 1. Industry used lakes and rivers to get rid of their waste. Long before plants evolved on Earth, cyanobacteria were photosynthesizing. 2.3 Compounds of carbon, hydrogen, and oxygen are used to supply and store energy. Only a very, very small percentage of these are pathogenic to
 human beings; in fact, the vast majority of bacteria are very useful. In 2003, the Project announced that it had succeeded in achieving its goal. In the early 1900s, however, the pioneer geneticist Thomas Hunt Morgan made some observations that did not show such ratios. The retina contains photoreceptors that receive the stimulus of light. Thus,
haemoglobin's affinity for oxygen from lowest to highest is: Hb4, Hb4O2, Hb4O4 and, finally, Hb4O6. (2) (Total 3 marks) 3 (a) Explain the effects of excitatory psychoactive drugs using two named examples. Research into bilingualism suggests that exposure to more than one language is an excellent means of cognitive strengthening when young
bubble trap Urea is a small enough molecule to diffuse through the membrane, and so slowly some of the urea leaves the blood blood flow and enters the dialysate. If you recall some of the information you learned earlier about cell respiration, you will see that the reverse is true for that process. Table 1.3 Comparing prokaryotic and eukaryotic cells are leaves the blood blood flow and enters the dialysate. If you recall some of the urea leaves the blood blood flow and enters the dialysate.
When comparing items, be certain to state the characteristic of each type of item, as shown in the table for prokaryotic and eukaryotic of each type of item, as shown in the table for prokaryotic and eukaryotic and eukaryotic discount for property, and the Huicol in Mexico were fond of using peyote cactus. T4 kingfisher T4 juvenile trout T3 T3 sculpin adult trout caddis
fly larva T3 T2 T2 blackfly larva Figure 4.5 A food web from a river ecosystem showing trophic (T) levels. When you send your friend an email, you are like the presynaptic membrane and your friend is like the postsynaptic membrane and your friend is like the postsynaptic membrane. Research is being done to try to determine what makes biofilms resistant to antimicrobials. Visual illusions are the
result of sensory-derived images that differ from objective reality. Many people eat three or more times a day, including foods containing glucose, or carbohydrates that are chemically digested to glucose, or carbohydrates that are chemically digested to glucose. To set up the gametes for an F2 Punnett grid, the FOIL method is employed: this is a mnemonic for 'first', 'outside', 'inside', and 'last' of the
parents' genotypes, in this case RrYy. The first gametes take the first letter of each trait in the genotype: RY. With this condition, just one amino acid has been changed in the normal protein (haemoglobin) of red blood cells. When using a regression model for prediction will be a sense of how reliable the prediction will be a sense of how reliable th
9 What does it mean when plants are said to have indeterminate growth? Myriad argued that taking away their patents would take away their livelihood because it would allow any company to develop and perform their own diagnostic tests. Any solids or liquids that you ingest are either, after digestion, absorbed into the bloodstream or, if not
absorbed, eliminated as faeces. What is your evidence? This causes high concentrations of water inside the cells that line the lungs, and abnormally thickened mucus production. Red arrows indicate oxygenated blood and blue arrows indicate deoxygenated blood. This will prevent air from entering the xylem vessels of the plant which would block
water flow. Even though the names refer to day length, it is actually the length of night that controls the flowering process in plants of the long-day and short-day types. • In the light-independent reactions a carboxylase catalyses the carboxylase catalyses the carboxylase catalyses the long-day and short-day types. • In the light-independent reactions a carboxylase catalyses the carboxylase catalyses the carboxylase catalyses the carboxylase catalyses the long-day and short-day types.
coronary arteries. (1) (c) Explain what has occurred to cause these results. Leptin comes from the Greek word 'leptos' which means thin. Will this migration also cause new species to emerge? The mass of tissue that acts as the living pacemaker for the heart is known as the sinoatrial (SA) node. hagfish perch salamander lizard pigeon mouse chimp
feathers Figure 13.37 A phylogenic tree of vertebrate chordates. However, there are five possible nitrogenous bases RNA nitrogenous bases RNA nitrogenous bases Figure 2.30 Nucleotide sugars. 2 Suggest whether the xylem of this particular plant has lignin present in a high amount. Mammals are five possible nitrogenous bases RNA nitrogenous bases RNA nitrogenous bases are five possible nitrogenous bases.
                                           maintain their body temperature at a fixed level. A question posed by one study was as follows. Figure 3.3 The presence of a C Where the gene is found: Sequence of bases (starting at position 229): Protein and trait: . X-1 - X-2 The formula when comparing two populations that t= are assumed to have equa
variance is as follows: (N1 - 1)s21 + (N2 - 1)s22 + (N2 
on this new paradigm of biofilms in our environment. Also, bacteria have a cell wall, a structure not characteristic of eukaryotic animal cells. The other, very large cell is a secondary oocyte. In other words, there is a selection with the environment. Also, bacteria have a cell wall, a structure not characteristic of eukaryotic animal cells. The other, very large cell is a secondary oocyte. In other words, there is a selection with the environment.
on the four listed above. Table 13.3 ELISA data for an HIV text Positive control Negative control Patient A Patient B Patient C Assay control 1.869 0.143 0.045 0.312 1.989 0.132 The numbers in the chart are the optical densities recorded by the spectrophotometer at 450 nm. Knowledge questions about limitations of information and bias of the
sources of the information help us put such statistics into context and appreciate that a simple question such as 'How tall are they?' can have a complex and multifaceted answer. Thus large animals do not have larger cells; instead they have more cells. Dehydration and overhydration Although unusual for most people, there can be instances when a
person drinks more or less water than the body loses by urine output, perspiration, and breathing. Acetylcholine is involved in the parasympathetic nervous system. A receptor neurone is a neurone that is modified to begin the sequence of events by transducing (converting) a physical stimulus of some kind into the first action potential. 

Bound
ribosomes synthesize proteins primarily for secretion or for use in lysosomes. When looked at individually, the frequencies of the alleles on chromosomes must add up to 1. The plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain plasticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain planticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain planticity is search for the title or ISBN, and click on Chapter 12: Section A.1. Brain planticity is search for the title or ISBN, and click or ISBN, and click or ISBN, and click or ISBN, and click
the concept, now widely accepted, that the brain has the ability to change and adapt as a result of experience. Specialists who take the first approach are referred to as splitters. Minerals are the inorganic substances that living organisms need for a variety of purposes. Endorphins
Endorphins were first discovered by scientists studying opium addiction. Figure 10.20 Height in humans is an example of continuous variation, with an even distribution around a mean. As far as we know, all metals that have been heated, do expand. CHALLENGE YOURSELF 1 Fill in Table 13.1 as you read about the metabolic diversity of
microorganisms. • Application: Foraging behaviour of shore crabs as an example of increasing chances of survival by optimal prey choice. As the name suggests, the amine group of each amino acid is removed. Do you know whether the meat you are eating was taken from an animal that was fed antibiotics or steroids and/or growth hormones?
Climate experts at the International Panel on Climate Change (IPCC) have confirmed that Earth is undergoing global warming because of an enhanced greenhouse effect. You would not be 'you' if you had not won that lottery long ago. • Go to the website we will be using for multiple sequence alignment:
Clustal Omega www.pearsonhotlinks.co.uk/url.aspx?urlid=68728 or do an internet search for 'Clustal Omega'. • Serotonin in the synapse is received by a receptor on the postsynaptic membrane. Application: tRNA-activating enzymes illustrate enzyme-substrate specificity and the role of phosphorylation. (Total 8 marks) 2
(a) Draw the structure of a mature human egg. Figure 4.1 A tropical rainforest contains many interactions between living organisms and their environment. 8.3 Light energy is converted into chemical energy. 38 Does any patient need to be retested? A man suffering one of the consequences of a lack of iodine in the diet. As urea is only toxic at
relatively high concentrations, mammals can cope with a certain level of urea in the tissues and blood. • A temporary complex called the enzyme-substrate complex forms. As shown in Figure 4.20, there appears to be a strong correlation between temperature increase and carbon dioxide increase. This is being confirmed today because more than a
dozen species of lemur have become extinct recently, and many more are endangered, as a result of the activities of the most recently evolved anthropoid: humans, acrosome mitochondria haploid nucleus flagellum Figure 11.27 A secondary oocyte early in the process of fertilization. This memorization phase is over at about 100 days of age. You may
have to let the culture sit two days over the weekend without being counted. This can be a problem in itself, but the problems can be increased if a thrombus becomes lodged in the reduced lumen. Coral reefs are threatened. 1.2 calcium loss ratio 1.0 0.8 0.6 0.4 0.2 0.0 ge ba b cat c y g n o ilk ean ato eg garli rsle mea nio otat m b m o p pa to ed soy m
m i sk supplementary food Effect on 401, bone metabolism Source: Nutrition: Muhlbauer and of Li, vegetables Nature, 1999, pages 343-344 Nature, 401, 23 September, pp. H. Table 12.2 The two PNS systems Sympathetic system Important in an emergency Important in returning to normal Response is 'fight or flight
Response is to relax Neurotransmitter is noradrenaline Neurotransmitter is acetylcholine Excitatory Inhibitory As you can see, the sympathetic and the parasympathetic systems are antagonistic (see Figure 12.11). The posterior end of the neural tube develops into the other brain parts and the spinal cord. Concerning cloning and stem cell research,
is it morally and ethically acceptable to create human embryos solely for scientific research? This means that in humans, 2n = 46, so diploid cells in humans have 23 pairs of chromosomes. Scroll down past this until you get to DESCRIPTIONS. (Total 5 marks) CH2OH 5 O H HO H H OH H H OH OH Which of the
following terms correctly describe(s) the molecule above? If a cell is budding, count it as two. • Click on Query ID. This is why cancer cells can grow and spread very rapidly. The consequence is competition for these resources in order to stay alive. Polymerization of the mRNA strand occurs, with the catalytic help of RNA polymerase and the energy
provided by the release of two phosphates from NTP. Replication, DNA sequencing, and the Human Genome Project Earlier in this chapter, DNA profiling was described as a reliable means of identifying personal characteristics.
of amino acids in the kidney, resulting in very painful kidney stones. • Alleles differ from each other by one or only a few bases. • How can I be sure that the resulting plants will be short or tall? Regions of DNA that do not code for transfer
ribonucleic acids (tRNAs). The allele for yellow is dominant (see Figure 10.9). The identity and thus characteristics of the fat or oil. The two complementary strands of DNA are now single-stranded in the area of the gene. This causes a change in the position of the
heads. • MLD (metachromatic leukodystrophy) is a disease that is fatal in early childhood. Heterotrophs ingest organic matter that is living or has been recently killed. To do this, divide 11 by 989 to obtain 0.011. A drawing showing some of the larger blood vessels in the hand. Exercises 11 Stopping smoking seems like such an easy, simple thing for
people to do. Dozens of nationalities participated in the project, and the results are available for free access worldwide thanks to online databases open to the public. 315 06 Human physiology Role of sex hormones during puberty, the same hormones that first determined their physical
sex are produced and secreted in higher amounts. 6.1 Digestion and absorption Understandings: NATURE OF SCIENCE Use models as representations of the real world: dialysis tubing can be used to model absorption in the intestine. NATURE OF SCIENCE Use models as representations of the real world:
opposed to each other. Notice that it acts the same way as nicotine. 0.1\ 0.05\ 0.025\ 0.01\ 0.005\ 1\ 2.706\ 3.841\ 5.024\ 6.635\ 7.879\ 2\ 4.605\ 5.991\ 7.378\ 9.21\ 10.597\ 3\ 6.251\ 7.815\ 9.348\ 11.345\ 12.838\ 4\ 7.779\ 9.488\ 11.143\ 13.277\ 14.86\ 5\ 9.236\ 11.07\ 12.833\ 15.086\ 16.75\ 6\ 10.645\ 12.592\ 14.449\ 16.812\ 18.548\ 7\ 12.017\ 14.067\ 16.013\ 18.475\ 20.278\ 8
13.362 15.507 17.535 20.09 21.955 9 14.684 16.919 19.023 21.666 23.589 10 15.987 18.307 20.483 23.209 25.188 Look at Table 5 and find the critical value of 0.05 and a degree of freedom of 1. A similar difference between theory and reality is seen in families where there are
more or fewer boys than girls: few families have exactly 50% of each, despite the fact that the laws of genetics predict half and half. Use of defibrillation devices to treat lifethreatening from a 'heart that has stopped (cardiac arrest) or a heart that is no longer in sequence
with the set of electrical impulses typical of a cardiac cycle (a condition called arrhythmia). Diverse metabolic processes can be used to help us clean up our polluted planet. Without the inhibiting effects of oestrogen, prolactin stimulates the milk-producing cells of the breasts to begin releasing the milk. An example is the height differences seen in
recent decades between North Koreans and South Koreans. After G1 comes the S phase, in which the main activity is replication trigger mitosis of the DNA of the cell, the chromosomes. Such as: • a reduction in the mortality rate of the fish, by reducing bag limits (the number of fish a fisherman is allowed to be catch each day) • an improvement in
reproductive status, by shifting the harvest to larger fish sizes, thus increasing the size limits for fish that can be kept and the fish have a longer time to reproduce before they can be eacomplished by
increasing size limits, again because the older the age of the fish that can be kept and not released, the more time it has to reproduce. The genome is the whole of the genetic information of an organism. 11 What factors might affect the time necessary for dialysis to bring about homeostatic blood levels of solutes and wastes? 4 In an emergency
situation, a trauma patient can be given blood plasma without first typing his or her blood for a match. Because of environmental concerns, many of these GMO have not reached the market yet. Also, genes that are more heavily methylated are not usually transcribed or expressed. Each oxygen-hydrogen bond is a polar covalent bond, and results in a
slight negative charge at the oxygen end of the molecule and a slight positive charge at the end with the two hydrogens. Any healthy embryos from the culturing phase that are not implanted can be frozen and used later if another implantation procedure is needed. Is there an end? Carbohydrates are a good example of polar molecules; their relative
solubility in water is attributed to their multiple hydroxyl (alcohol) functional groups. What would be the nucleotide sequence of this DNA fragment if the bases represent the origin of migration in the gel? Annotate using a table of your own design. The vast majority of recent publications from climatologists confirm anthropogenic climate change;
there is a consensus in the scientific community. It is now aligning all eight sequences that we have submitted. Excitatory neurotransmitters generate an action potential. This produces a structure that resembles a string of beads. Amazingly, this access is available to everyone: the databases are public information. For example, a 25-µm bar would
represent the size of a 25-µm image. You are encouraged to explore, develop, and share your views, as well as actively seek the views of your classmates. If you start with 100 cells at time 0, how many cells will you have in 30 minutes? Do we need to produce more food to feed the hungry? Continue your discussion to include reasons why scientists
sometimes present improper or fabricated data. 204 Methane, for example, actually has a much greater potential to warm the planet than carbon dioxide, but methane has a relatively short lifetime in the atmosphere: approximately 12 years. Morgan's team continued experimental crosses on thousands of fruit flies and thanks to their careful
observations, diligent record keeping, insightful interpretations, and hard work, were able to provide concrete evidence for many of the things we learn about in genetics classes today: sex-linked genes not found on the sex chromosomes, crossing over, gene mapping, and proof of the fundamental idea that chromosomes carry the genetic
material that determines inheritance. In addition, they are both involved in the regulation of a few members of one species that arrived on the islands. This is an ethical theory that says that action should be taken to prevent harm even if
there is not sufficient data to prove that the activity will have severe negative consequences. Calculating the body mass index Some, but not all, countries make a concerted effort to inform their citizens of the health risks and benefits of certain foods/ diets. To a large extent the plasma membrane controls the movement of materials into and out of the
be differentially polar depending on the arrangement of their amino acids. 3605-3613 (Sinton, L. Interesting studies to carry out can include Planaria's response to different wavelengths of light or how fast it moves towards different food substances (measured as centimetres per minute). When we look at where sickle cell disease is most common in
the world, there appears to be a significant overlap with the places where malaria occurs. • Application: Blood sharing in vampire bats as an example of the development of altruistic behaviour by natural selection. Not surprisingly, this is called alternation of generations. time A Gradualism changes Punctuated equilibrium changes In contrast, those
who support punctuated equilibrium, a theory that originated in the late 20th century, argue that speciation happens quickly, often in response to a change in the environment, for example after a volcanic eruption, a meteorite impact, or a major climate change. Along this route, the capillary beds are found in your organs and tissues, where the blood
picks up carbon dioxide and releases oxygen. 531 12 Option A: Neurobiology and behaviour Euglena is single-celled protist (protoctist). • Click on PUBMED. You can see that the brain weight of a vertebrate does not appear to increase linearly with body weight. The probe is a short section of DNA that will pair (hybridize) with cDNA from the blood
sample. As soon as the neural tube begins to transform into specific brain parts, two major families of cells begin to differentiate. Are humans causing climate change? Because fruit flies can produce a new generation every 2 weeks, Morgan was able to do thousands of crosses in his Fly Room at Columbia University, and discovered dozens of
mutations never seen before. • LTM information is stored over a long period of time. One example is the column of water in plant vascular tissue, mentioned above. 3 Explain how selective breeding can be a good example of evolution by selection, even though it is not natural selection. The cells at this point are haploid because they contain only one
chromosome of each pair. If they match, the suspect has a lot of explaining to do. It is a secondary oocyte with the inner ring of follicle cells that is released from the ovary at ovulation, although people often refer to this event as the release of the ovum or egg. Steroid hormones are typically synthesized from cholesterol and are
classified as lipids. What can be done to promote recovery? Muscle tissue also includes surrounding connective tissues, blood vessels, and nerves. C C OH OH Note: Be sure to count the covalent bonds around each element, and make sure that the number is appropriate for each.
are digested into monomers, and that cellulose remains undigested. 

Blood flows through tissues in capillaries. Sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has its locus on the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has a supplication of the X or the Y chromosome is said to be sex linkage Y X Any genetic trait whose gene has a supplication of the X or the Y Chromosome is said to be sex linkage Y X Any genetic trait whose gene has a supplication of the X or the Y Chromosome is said to be sex linkage Y X Any genetic trait whose gene has a supplication of the X or the Y X Any genetic trait whose gene has a supplication of the X or the Y X Any genetic trait whose gene has a supplication of the X or the X
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hydrophobic and hydrophilic. The Piltdown Man hoax jaw. In many plants, these trichomes may even secrete chemicals which protect against pathogens and even herbivores. The exudate, mostly free of contaminants, can then be analysed. At the very best, 23 out the 90 plants would be short, which is 25.56%; that is as close as it is possible to get to
25% in this case. 279 06 Human physiology The medulla then sends a signal through a cranial nerve, called the cardiac nerve, to increase the heart rate to an appropriate level. In Figure 2.30, you can see that they are very similar molecules. 339 (Drake, Lisa A., Doblin, Martina A. There are four levels of organization to protein structure: primary,
secondary, tertiary, and quaternary. Worked example Use the 2 test on Mendel's monohybrid cross of round and wrinkled pea seeds to determine whether there is a statistically significant difference between the expected ratios and the observed ratios. Even though they live on land, they breathe with gills and need moisture to breathe. These cells
are very active in photosynthesis, as is shown by the large number of chloroplasts. In the spring of 2013, the United States Supreme Court heard a landmark case between a biotech company, Myriad Genetics (the defendant), and the Association for Molecular Pathology, AMP (the plaintiff), a group of genetics experts who specialize in many things,
including the diagnosis of genetic diseases and disorders. Both areas are on the left side of the brain. To compensate, plants produce large numbers of seeds so that the species can survive. The world that we live in is literally infested with viruses and bacteria. The speed at which this happens is expressed as an isotope's half-life. Exercises 4 Identify
all the heart chambers, valves, and blood vessels involved in one complete circuit of blood (only blood vessels immediately entering or exiting the heart need to be named). Regarding the heart need to be named in sunlight: suppose our sample is 100 bean plants. The only control needed from the nervous system is when the heart needs to change its rate of
contraction because of increased body activity. This requires buffering mechanisms, because many more hydrogen ions are produced when an individual is exercising, as a result of the increased production of carbon dioxide. Cytology is the study of all aspects of a cell. For this, organisms must find what they need within the materials available in
their own habitat. Compare 2 critical to 2 calculated and decide if the null hypothesis can be rejected using these rules: 2 calculated • Species tend to produce more offspring than the environment can support. This leads to the production of the same memory lymphocytes as the actual disease does. The role of the pancreas during digestion The
pancreas is a multipurpose organ. What about a wiki or a scientific journal for failed experiments? When an egg cell is fertilized by a sperm cell (a sperm is also haploid and therefore contains 23 chromosomes), a zygote is formed and the two haploid nuclei fuse together, matching up their chromosomes into pairs, pituitary pineal gland Figure 6.22
Some of the more common endocrine glands within the human body. • Recent increases in atmospheric carbon dioxide are largely due to increases in the combustion of fossilized organic matter. Practise singing the song enough and you will sing it perfectly.
have the time and materials, you can compare the chromosomes in your root tips with professionally prepared slides. The two cerebral hemispheres are connected by a thick band of tissue called the corpus callosum, through which communication takes place between the right and left sides of the brain. These enzymes will only allow the chain to
grow in a 5 to 3 direction. However, a variety of treatments have been found that are prolonging the time period between infection and the onset of symptoms of AIDS. A red spot indicates that the gene is expressed or turned on in the cancer cells but not in normal cells. Primarily, this is because we are too well defended for most pathogens to enter
our bodies and, if any do manage to enter, we have often previously developed immunity to that pathogen. But then when he crossed the resulting tall plants with each other, some of the offspring in the new generation were short. The extracellular matrix (ECM) of many animal cells is composed of collagen fibres plus a combination of sugars and the new generation were short.
proteins called glycoproteins. • Evolution requires that allele frequencies change with time in populations. The molecules of TP may then go in either of two directions. Some connections are lost and others are gained. A cell of the human pancreas would 'turn on' the gene for synthesis of the peptide hormone insulin, whereas most cells would not
activate that gene even though the gene is present in all human cells. 287 06 Human physiology The leucocytes that produce antibodies are a type of cell called plasma cells. Emphysema is a disease where many of the alveoli have become severely damaged, with gaping holes left where healthy tissue once existed. Both disorders occur in similar
proportions in males and females. • An open reading frame is a significant length of DNA from a start codon to a stop codon. If so, describe what you see. • At this stage, the challenge is to put all the sequenced fragments of code together. Key: Unaffected male Affected male Affected female Affected female A Two unaffected parents have
unaffected children. Blood rich in nutrients leaves via a venule. The interior of each villus contains a capillary bed for nutrient absorption and transport of digested monomers by the bloodstream. Other factors, such as carbon dioxide levels and even circadian rhythms (the basic 24hour biological clock) within plants, affect stomata opening and
closing. The ends of the vessel elements have perforations in them, allowing water to move freely up the plant. They have enabled it to produce a large quantity of a precursor molecule to the important anti-cancer drug Taxol. PNS: • somatic (voluntary), information is received by the senses and messages sent to the skeletal muscles • autonomic
(involuntary), controls cardiac muscle of the heart, smooth muscle, and glands, consisting of two systems that are antagonistic • the sympathetic system • the parasympathetic system. Here are some representative physiological variables: • blood pH • blood carbon dioxide concentration • blood glucose concentration • body temperature • water
balance within tissues. The acrosome contains hydrolytic enzymes that help with the fertilization process. In the above list, B and b could be replaced by H and h to show the genotypes for haemophilia. The pressure-flow hypothesis The phloem sap can move as fast as 1 m per hour. Bioinformatic databases allow us to access vast quantities of
information easily so that we can use them to understand how our genes function and how they make proteins that either keep us healthy or make us susceptible to disease. As much attention today is given to cancer, which seems to occur in most organisms and involves abnormal cell reproduction, we will focus on normal cell reproduction. A
eukaryote is recognizable by its membrane-bound nucleus and membrane-bound organelles. (b) A hard black rock that can be burned to make electricity or direct heat. The substrate(s) must enter with a minimum rate of motion that will provide the energy necessary for the reaction to occur. Later, insects became a major factor in the process
Consider the following facts concerning transcription: • only one of the two strands of DNA is 'copied,' the other strand is not used • mRNA is always single-stranded and shorter than the DNA that it is copied from, as it is a complementary copy of only one gene • the presence of thymine in a molecule identifies it as DNA (the presence of deoxyribosee from, as it is a complementary copy of only one gene • the presence of thymine in a molecule identifies it as DNA (the presence of deoxyribose).
is another clue) • the presence of uracil in a molecule identifies it as RNA (the presence of ribose is another clue). tarsus endoskeleton Insect leg segment A acts as an anchor for both antagonistic muscles. Patients with SCID lack a functional immune system. Species divergence The process of an evolving population changing significantly enough so
that the production of offspring with the original population becomes impossible is called speciation. The BMI is a number that reflects both the weight and the height of a person. Prior to this, scientists had worked to protect individual plant species to save specific pollinators. 277 06 Human physiology the veins. This continues to be the case for most
of the human population today: more than half of the human population has lactose in their infancy. You can do the drawing by hand but there are many flowchart tools available, both online and probably as part of the software on the computer you use. The above list of viruses and/or the diseases
that they cause all have something in common, other than having serious and potentially deadly symptoms. The series of letters is called FASTA information. It is a molecule of the 'reward' pathway of your brain. increasing energy increasing wavelength 1 nm 10 nm 1000 nm 0.01 cm 1 cm 0.001 nm gamma rays UV X-rays light infrared 1m Figure 2.48
The electromagnetic spectrum. The strands of both DNA and RNA may involve very large numbers of nucleotides. • Tolerance: the temperature tolerance that the Darwins had been studying all those years before. This menstruation is a sign that no
pregnancy has occurred. Imagine if you could not remember your password and were desperate to download a movie. The other end (the 3 end) is fitted with a poly-A tail, which is composed of 50-250 adenine nucleotides. 3 What is the actual source of the electrons that reduced the DCPIP? Vacuoles enable cells to have higher surface area to volume
ratios even at larger sizes. The effect is that the biggest, heaviest, and least charged particles do not move easily through the gel, so they get stuck very close to the wells they were in at the beginning. One technique being used now involves the use of aphids. The name comes from the fact that the first carbon double bond to be found in this molecule
is at the third carbon atom counting backwards from the omega end (see Figure 12.17). This leads to symptoms such as cramping, excessive gas, and diarrhoea. This marine iguana needs to bask in the sun to warm up after a cold swim in the ocean. Humans and other animals have difficulty absorbing relatively large triglycerides and their digested
form (fatty acids) from the intestine into the bloodstream. It is not just technical complexity that makes these questions difficult, it is also because we have never had to face them before. Examples of small, non-polar substances are gases such as oxygen, carbon dioxide, and nitrogen. Overweight individuals are more likely to suffer hypertension and
type II diabetes. Natality was high and immigration was high where they were introduced to eat cane beetles. These cells are highly modified for contraction, and thus their cellular structure is not as apparent as in many cells. Are there some that can be influenced by both DNA and a person's environment? How do scientists respond to such
criticism? The jaundice is therefore a symptom, and the underlying cause is whatever problem is leading to the liver not functioning properly. Even though any one type of molecule may be influenced by more than one transport mechanism, there are still some general patterns. Arthropods include insects, spiders, and scorpions, as well as crustaceans
such as crabs and shrimps. In this set of reactions, chlorophyll (and other photosynthetic pigments) absorb light energy to a form of chemical energy, specifically ATP. People who live in cultures where their source(s) of protein comes from one or just a few food types can sometimes be in danger of a deficiency disease if their
dominant protein source is low in one or more of the essential amino acids. Figure 4.19 A summary of the greenhouse effect: short-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow) hits the surface and some is converted into long-wave radiation (shown in vellow).
retina. Similar techniques are used to analyse the similarities and differences between DNA collected at a crime scene and DNA samples taken from suspects. The purpose of a kidney is to filter blood, so kidney tissue is highly vascular. To maintain the MSY, enough fish stock must be left to spawn a new population of healthy fish. Although the oceans,
lakes, and rivers of the world are not as fizzy 192 as a carbonated drink, they contain dissolved carbon dioxide because carbon dioxide from the atmosphere can be absorbed by the water. You look a lot like your sister True, but thanks to random orientation during metaphase I and crossing over during prophase I, we are not identical telophase II
Figure 3.18 Meiosis II. Human physiology The three main subparts of a single neurone are its dendrites, cell body and axon. DNA copying DNA is replicated before meiosis The reason why chromosomes are represented as having the shape reminiscent of the letter 'X' or 'H', as used in the previous section, is because 135 03 Sometimes it takes a while
before an established scientific idea can be modified. Biology is an experimental science, but what constitutes an 'experimental science, but what constitutes are science
other about any health-related issues revealed by a genomic analysis? The blood glucose level typically begins to drop below the set point when someone has not eaten for many hours or exercises vigorously for a long time. If you find a type of sea creature that you have never seen before, you should be able to find an identification key that was made
by the experts who classified it. These ATPs are then shuttled to the Calvin cycle so that it can proceed more rapidly. • After many generations, the DNA in each bacteria culture contained either the heavy form or the light form of nitrogen. As long as they are safe and secure, there should not be any risk of radiation leaking out into the environment.
Be careful: critical thinking does not mean you criticize everything. Members of these domains should be referred to as archaeans, bacteria and eukaryotes Eukaryotes Bacteria Archaea Eukaryotes Figure 5.20 The classification of Archaea. The body's response mechanisms that
attempt to maintain homeostatic levels of water are known as osmoregulation. • Although most of the dinosaurs or before. • Applications and skills: Application: William Harvey's discovery of the circulation of the blood with the
heart acting as the pump. Some leave the cycle to become sugar phosphates that allows it to sink down into the endometrial tissue. Inside the capillary are portions of three erythrocytes also cut in section. Skills
Use of software to align two proteins. Plants transferring receptor like a key to a lock. One strand is 5 to 3 and the other is 3 to 5. • Translation is the synthesis of polypeptides on ribosomes. • ATP binds to the myosin head, resulting in the
detachment of myosin from the actin, and awaits another action potential from a motor neurone (step 4 of Figure 11.10). And yet, if we go back far enough, we will find another node showing that they do eventually have a common ancestor. Looking at the actin, and awaits another node showing that they do eventually have a common ancestor.
called an achene, it was decided that there was a significant enough difference between the species on the two sides of the Atlantic Ocean that reclassification was necessary. That is one of the challenges of the B programme in general and TOK in particular. 

B lymphocytes are activated by T lymphocytes in mammals. 2 (a) (b) (c) (d) Which species on the two sides of the Atlantic Ocean that reclassification was necessary.
has the largest number of genes? An increase in metabolic rate produces more heat from the increased chemical reactions that are occurring. A Short lengths of RNA primase attached to the DNA during replication. One concrete example of the consequences are so-called 100-year storms that, instead of happening once every century, are occurring
 several times within the same decade. Skill: Distinguishing different types of inhibition from graphs at a specified substrate concentration. One carrier is not a protein and is called coenzyme Q. As long as R and Y are not linked genes, they should segregate independently. For example, in some seeds the testa must be disrupted or scarified (broken)
before water uptake can occur. It indicates how good the model is. Bacteria and members of a group referred to as Archaea are made up of prokaryotic cells and are called prokaryotes. To understand how it is used, it is best to start with understanding how it was derived. Denitrification is the conversion of nitrates to nitrogen gas. • Would strict
vegetarians be able to eat a tomato that has a fish gene in it? A key characteristic of a good scientist is a sceptical attitude towards theoretical claims. If you take away the word 'she', you get 'ipmat': these letters give you the order of interphase, anaphase, anaphase, and telophase. The first tRNA floats away into the cytoplasm and
invariably reloads with another amino acid of the same type. Serotonin neurones cell body axons neurotransmitter (serotonin) Figure 12.49 Serotonin in the receptor synapse. Values below 0.300 are considered to be negative. The classic heart symbol has become synonymous with 'love'. The numbers indicate the number of iodine atoms within the
structure. Below are specific examples of the outcomes of genetic modification. Photomicrograph images are obtained of the chromosomes during a specific phase of cell division called the mitotic metaphase (see Section 1.6). The MLD success was reported recently in the journal Science. (1) (b) Discuss the relationship between nutrition and rickets
Hydrolysis of a disaccharide to two monosaccharide (see Figure 2.1). As we saw earlier in this chapter, the carbon can be in the form of hydrogen carbonate ions. Because the ultimate goal is to understand embryogenesis in humans, animals in the same phylum with similar
developmental patterns have been studied. Thus the amylase molecules begin to catalyse the hydrolysis of starch to maltose. This will not only help you learn the molecules from a new and more useful perspective. Fructose and galactose are other sugars that
can be made by plants from glucose. The brain had received therapy. You will recall that codons carry the genetic code from DNA to the ribosomes via mRNA. Although these are the same genes, the different coloured bands on the short arms of each chromosome reveal
that they do not carry the same allele of the gene at the locus shown. • Archaea: archaeabacteria or 'ancient' bacteria are also prokaryotes. Remember to say B as 'big B' and b as 'little b'. Even if you have never been inside a greenhouse, you have probably felt the greenhouse effect when getting into a car that has been sitting in the sunshine with its
windows closed on a hot day. You will see the pupil close in response to the sudden input of light as the eyes open. 1 (Geers, Cornelia and Gros, Gerolf 2000) © The American Physiological Society (APS). Parkinson's and Alzheimer's diseases are caused by the loss of proper functioning brain cells, and it is hoped that implanted stem cells could replace
many of these lost or defective brain cells, thus relieving the symptoms of the disease. As such industries would potentially lose revenue if limits were put on carbon dioxide emissions, it is in their interest to promote doubt and controversy. The total number of (possibly) active genes in any living organism is difficult to determine with accuracy, acetyl
Paleontology, 7 May 2014, Copyright © 2014 by The University of California. (Total 1 mark) 7 Describe the principles of synaptic transmission in the nervous system. • Skill: Drawing and labelling a diagram of a reflex arc for a pain withdrawal reflex. Insulin is the
hormone that allows cells to remove glucose from the bloodstream. 1 2 3 4 A B C NATURE OF SCIENCE 2001 was a landmark in the biotechnology timeline. • Eye movement: eyes must remain fixed, showing a lack of brain-to-motor-nerve reflex (as the head is turned there is no rolling motion of the eyes). Likewise, within your history folder, you
might have subfolders for homework, notes, tests, and so on. The remainder of the energy is lost from the cell as heat. One of the materials in this later-forming wall is lignin. 18 Why are exocytosis and endocytosis known as examples of active transport? In the drawing, the phospholipids should be shown using the symbol of a circle with two parallel
lines attached. 4 What was the effect of darkness on the reduction of DCPIP? 18 What is the fundamental difference between the feedback mechanism involving oxytocin and birth and the mechanism involving insulin and blood sugar? What was the original reason for some birds to go to the UK? All sinusoids are then drained by the hepatic vein,
which is the sole blood vessel taking blood away from the liver. Vaccines for this disease have been routinely used since the 1980s. • • Guidance • Punctuated equilibrium implies long periods without appreciable change and short periods of rapid evolution. Table 9.1 and Figure 9.4 show how it works. be followed about where the crop is grown, who
grows it, and how it is shipped to a factory. 14 The nucleoid region of a bacterial chromosome. As this chapter develops and more information about the basic characteristics of cells is learned, some recent findings will be
discussed. Thomas Hunt Morgan developed the notion of linked genes to account for the anomalies. This results in an electron with a higher energy state being transferred to the primary electron acceptor. Example 1: Huntington's disease (Huntington's disease Huntington's disease Huntington's disease (Huntington's disease) is caused by a dominant allele that we will refer to by the letter H.
The body often develops a tolerance and needs more and more of the drug to produce the same result. Because by looking at the ratio of radioactive 14C to stable 14N, it is possible to determine the age of a fossil. Some of the same types of bonds important for creating the tertiary structure also help to hold quaternary structure proteins together.
Agra schwarzeneggeri Erwin, 2002. How is HIV transmitted? 411 09 Plant biology Practice questions 1 Plants develop brightly coloured flowers to attract animals. Application: Endorphins can act as painkillers. Typical examples of these harmless substances are pollen, peanuts, egg whites, and bee venom, to name just a few. The specific techniques flowers to attract animals.
of reproductive cloning is called somatic cell nuclear transfer, because it uses a cell that is not an egg cell (therefore it is a somatic cell), and it has had its nucleus removed and replaced by another nucleus. In the offspring: - useful variations allow some individuals to have a better chance of survival (e.g. hiding from predators, fleeing danger or
finding food) - harmful variations make it difficult to survive (e.g. inappropriate colour for camouflage, heavy bones for birds, having such a big body size that there is not enough food to survive). Cystic fibrosis is a human genetic disease in which the membrane protein that transports chloride ions is missing. 84 • In addition, pH strips or another
means of measuring the pH of solutions will be needed for the pH group, as well as buffered solutions for the desired pH. For example, Morgan discovered non-Mendelian ratios in his experiments with Drosophila. • Methane is oxidized to carbon dioxide and water in the atmosphere. If the test is performed at least 4 weeks after a tick bite, the test
will identify the presence of Lyme disease. The groups are kept under similar conditions apart from the factor that is being tested or questioned. One answer to this 12 13 14 Figure 2.27 The pH scale. Common heart problems and their treatments The heart is one of the hardest working organs in the body. • Culture the cells with the virus so that it
will infect the cells and deliver the normal gene to the genome of the patient. Sperm form within the female gametophytes, and eggs form within the female gametophytes, and texts. The vesicle with the modified protein inside moves
to and fuses with the plasma membrane; this results in the secretion of the contents from the cell. To help you, the following table (Table 10.4) has been set up and the first row completed. This carbon dioxide diffuses into the atmosphere or into the water, depending on whether the organism is terrestrial or aquatic. In the end, the fragments leave a
banded pattern of DNA like the one shown in the photo. Notice also how the data points are not connected by a line. ddG Figure 3.7 One method of DNA sequencing is called the Sanger technique. Note that this is very close to the predicted value of 10% in example 1. For example: 144 • A = dominant allele, allows pigments to form • a = recessive
allele, albinism, allows few or no pigments to form. Aphids feed by inserting structures from their mouth called stylets into a sieve tube. PCR stands for polymerase chain reaction. This happens over and over again until the uterine contractions are very intense and very frequent. This false-colour transmission electron micrograph (TEM) of a
mitochondrion shows the internal structure. The entire male part of the flower is called the stamen. 12 How are alveoli well adapted for efficient gas exchange? 18 Look at the foods in your house. Pauling's ideas were not supported by conclusive results from clinical trials, so he was criticized by other scientists. clade sister groups shark bat dolphin
outgroup node showing a common ancestor Worked example Paramecium flatworm shark hawk koala camel human opposable thumb placenta hair amniote egg vertebral column multicellular eukaryotic 1 2 3 4 5 Figure 5.18 What is the primitive characteristic in the cladogram shown in Figure 5.18?
photosynthetic unicells, but Euglena should be avoided as it can feed heterotrophically. I (Total 1 mark) reaction pathway 3 What causes water to have a relatively high boiling point? Ethical issues surrounding therapeutic cloning Because therapeutic cloning starts with the production of human embryos, it raises fundamental issues of right and
top of a milk bottle to reach the milk underneath had become part of British folklore, but it is a sight that is rarely seen nowadays. 16 Nucleolus Nuclear membrane is a doublelayered structure. Thus the series of events leading to ovulation do not occur when the pill is taken regularly. These numbers represent the magnification of that particular lens
However, Marie Curie's husband, Pierre Curie, did not die of cancer, but of something equally dangerous: he slipped in the street and was run over by a horse-drawn carriage in Paris in 1906. The law of independently to the next generation. 5 What
was the effect of boiling the chloroplasts on this experiment? Nucleus contains most of the cell's DNA. Is a profound conviction that something is true good enough to make it valid? Cohesion is when molecules of the same type are attracted to each other. Incompressibility of water allows transport along hydrostatic pressure gradients. (b) Human
babies demonstrate different body masses at birth, but a b
statements to look at, follow the number given and continue until the end. Although the original purpose of the internet was to serve military needs, the first major non-military group of individuals to see the usefulness of such a system was scientists. 24 Draw a conclusion based on these data. Neurones perform many tasks that are similar to other
cells, such as repairing or rebuilding their structural components. 5 How are the properties of water involved in any item of your list? Dopamine builds up in the synapse, causing feelings of euphoria. • The fluidity of membranes allows materials to be taken into cells by endocytosis or released by exocytosis. Being able to collect and process data are
important skills but also students need to know how to interpret data, including graphs, grasping statistics and understanding units and their uncertainties. Each pair codes for the same characteristic in a population is not purely up to
chance. The specific plasma cell type clones itself (divides repeatedly by mitosis) to increase rapidly the numbers of that type of plasma cell. enzyme-labelled anti-human IgG antibody Wash and then add a colourless substrate that develops a colour when acted upon by the enzyme. The greatest significance of this reaction is that it produces acetyle
CoA. The results of Meselson and Stahl's experiment are summarized in Figure 2.38. uncatalysed Figure 8.2 Enzymes accelerate activation energy for uncatalysed reaction by lowering the activation energy required. One strand has the 5 carbon on the top and the 3 carbon on the 4 carbo
carbon on the bottom; the other strand is the opposite way round (see Figure 7.3). The answers to scientific questions sometimes change. The factor that gave the most conclusive results was the age of the mother, as can be seen in the results of one such study shown in 7 Figure 3.20. • Respiration (breathing) response: this must be absent (if the
patient is removed from a ventilator, he or she does not breathe). • Step 1 - Choose a letter. T As nucleotides are linked together with covalent phosphodiester bonds, a definite sequence of nitrogenous bases develops. The fossil record and evolution It is impossible to travel back in time, and the best clues scientists have about what life was like
 thousands or millions of years ago come from fossils. This very efficient transfer is called 'lipofection'. Auxin efflux pumps (specialized membrane proteins) move the auxins out of the cells closer to the light, using ATP as the energy source.
the title or ISBN, and click on Chapter 4: Section 4.4. Consequently, unless preventative measures are taken across the board by countries worldwide, there will always be polluting competitors who can offer products at a lower price. As at present most of the research on stem cells is being carried out using mice, it will probably be some time before
this approach to treatment becomes widespread in humans. Guidance Pyramids of number and biomass are not required. Because of their different solubility in whatever aqueous environment it is found in, including blood plasma. • Now you will carry out some data processing. In Part 2, we will look at
how computers, tablets, data-logging devices, and software programs can help us work with numbers and statistics, notably for lab reports. Comparison of haemoglobin and myoglobin and myoglobin is an oxygen-binding protein found in muscles. and Van Tooren, B. Scroll down to ORIGIN and you will see the entire nucleotide sequence (cDNA) of this
gene. Although they both refer to probability and hypothesis testing, the former is for the t-test and this one is for the population to grow geometrically. 4 The signals are transmitted glomerulus to higher regions of the brain.
Calculate the chi-squared value for these data. NADPH and ATP are the final products of the light-dependent reaction. If you did remember how to answer those questions, then you had learned the relevant information and stored it so you could recall it later. In the second activity students investigate how new data from DNA sequences has led to
new evidence which upsets the accepted classification of Figworts and other species. One of the principles of science, especially research funded by taxpayers, is to make data available to the public. Any attraction between two unlike molecules is called adhesion. The wound left a permanent hole in the man's abdomen and stomach wall, allowing
Beaumont to make observations and take samples of the digestive process. Correlation does not mean causation We make observations all the time about the living world around us. Skill: The use of molecular visualization software to analyse the structure of eukaryotic ribosomes and a tRNA molecule. (b) Why does generation 2 support the semi-
conservative model? D Both the internal intercostal muscles and the diaphragm relax. Scientists familiar with insects can tell which species built a nest or mound by looking at its shape. There are two general types of ER: smooth ER and rough ER. When you go to the dentist to have a tooth filled, you are glad that molecules have been discovered that
can block the sensory reception of pain from travelling to the pain centres in the CNS. The emerging seedling is fragile and it will be exposed to harsh weather, parasites, predators, and many other hazards. You might also see citric acid on the ingredient lists of powdered drinks, jars of jam, jars of maraschino cherries or sundried tomatoes, and many
other foods. Both the donating and receiving cells open their cell walls so that the genetic material can pass from the donor to the receiver. Short, high-frequency waves produce high-pitched sounds, while long, low-frequency waves produce high-pitched sounds. It is a convention in biology to look for probabilities of 5%, or 0.05. The physiological
processes that bring a value back towards to a set point are called negative feedback mechanisms. Recently, some companies have begun genetically modifying foods using biotechnology. Look at the chemical reaction below, showing methane burning in oxygen gas: CH4 + 2O2 2H2O + CO2 Methane is the main ingredient in the fossil fuel we call
natural gas. Why are models used? Antibiotics are chemicals that take advantage of the biochemistry needed by bacteria while having no effect on human or animal cells. insulin Pancreas secretes insulin into the bloodstream. This sections that take advantage of the biochemistry needed by bacteria while having no effect on human or animal cells. insulin into the bloodstream. This sections that take advantage of the biochemistry needed by bacteria while having no effect on human or animal cells.
will look at some of the many different forms carbon can take as it is cycled by nature. Thus when the cells take in water and swell, they bulge more to the outside. That one (or a few) variant can then reproduce and repopulate a colony in a very short period of time with bacteria that are all resistant to the antibiotic. 595 13 Electroporation and the cells take in water and swell, they bulge more to the outside.
example). Some of the diseases are genetic, but some are caused by pathogens. • Air is carried to the lungs in the trachea and bronchi, and then to the alveoli in bronchioles. Animal cells have a much higher concentrated in the extracellular environment
than in the cells. The same process is repeated for ddC, ddT and ddA. Haemoglobin has a greater affinity for carbon monoxide than for oxygen. As long as the alginate beads are recovered in the industrial process, the enzymes are also recovered and can be reused. (This means there are no pairs of chromosomes in the new cells.) 23 fertilization The
new cells divide again. These stem cells retain the ability to form any type of cell in an organism and can even form a complete organism. In human populations from different countries, people have different average heights. Some recent studies have shown that female bats regurgitate blood to longterm associates on a regular basis. Evolution by
natural selection is a multi-step process. Marie Curie was the first woman to be awarded a Nobel prize and the first person to get two. Like all hormones, oestrogen enters the bloodstream. In the photo, the four disks of different antibiotics nearest the technician's hand show rings of growth inhibition, suggesting an effective control of the colony of the
bacteria by the medications. Although it is one of the most cited examples of modern evolution by natural selection, it has been suggested by some critics that it should be removed from textbooks because it is not a valid example and is based on sloppy science. The positioning of the epidermis is such that the remaining structures of the leaf are
protected and supported. Planaria is negatively phototaxic, because it lives under leaves and rocks and hides for protection. **Among prokaryotes, archaeans have the same properties as bacteria (prokaryotes, archaeans have the same properties as bacteria (prokaryotes) in this table with the exception that histones are present in archaean DNA but not in bacterial DNA. You will find more examples later as you
study the various biochemical and physiological processes common to living organisms. The first of the three carriers is plastoquinone (PQ). But this is not the case. At various locations in the hydrophobic region (fatty acid tails) in animal cells are cholesterol molecules. The unpaired nucleotides on each of these single strands can now be used as a
template to help create two double-stranded DNA molecules identical to the original. This is contrary to what you have seen up to now concerning recessive alleles: usually people need two to have the trait, and, with one, they are carriers. Plasma protein is transported by a vesicle to the Golgi apparatus. There are two alternative processes, called
CAM photosynthesis and C4 photosynthesis. Diagrams like this one of a root are called plan diagrams, sometimes low-power diagrams. If you recall, this is what is called a quaternary structure. (Total 6 marks) 321 07 Nucleic acids Essential ideas 7.1 The structure of DNA is ideally suited to its function. Generally females do not sing. In addition, the
cytoplasm also contains small vesicles called cortical granules, which function immediately after fertilization. The ABO blood type is based on the presence or absence of two proteins called the A protein and the B protein. The duct allows the three enzymes to enter the lumen (cavity) of the small intestine, where partially digested food from the
incompletely digested food to remaining small stomach is being intestine, which now has released. In the other direction, if biologists look at characteristics common to all life forms, such as the basic information in DNA about fundamental processes such as cellular respiration and cell division, they can deduce what the common ancestor to all life
was like. • Is it ethically acceptable to alter an organism's genetic integrity? In this chapter we will consider these aspects of cellular metabolism in detail. 335 07 Figure 7.11 DNA is opened into two ATP molecules per glucose
molecule • results in the production of two pyruvate molecules. Organic substances that are non-polar are typically composed of just carbons and hydrogens (hydrocarbons) or have large areas of the molecule where there are only carbons and hydrogens (hydrocarbons) or have large areas of the molecules.
Our eyes are sensitive to light and give us vision. aaattcgatagcagtag aaattcgatagcag
selectively permeable membranes Identification of xylem and phloem in microscopic images of roots and stems One organization that does this is NOAA. In addition to the mitochondria, chloroplasts in plant cells also provide
evidence for the theory of endosymbiosis. Animals that use this mode of fertilization rarely provide parental care for the developing young, and that is another reason for the large numbers of eggs that are laid. • How many genes do I have? Answer the following questions from the data shown in the graph. There are four nitrogenous bases: adenine
(A), thymine (T), cytosine (C), and guanine (G). (b) Determine the DNA code sequence that gave rise to the above mRNA codons. Human physiology lumen villi (intestinal mucosa) longitudinal smooth muscle circular smooth muscle eircular smooth muscle eircular smooth muscle or the above mRNA codons. Human physiology lumen villi (intestinal mucosa) longitudinal smooth muscle eircular smooth eircular smooth eircular smooth eircular smooth eircular smooth eircular smooth eircular smoo
are controlled by the autonomic nervous system. Can we apply the same principles of learning to animals? In other words, glycolysis is the metabolic pathway that is common to all organisms on Earth. From this description you can see that some presynaptic neurones excite postsynaptic neurones and others inhibit postsynaptic neurones. *Safety
alerts: Eye protection and lab aprons should be worn for all stages of these experiments* • To make the enzyme solution (lactase), crush and add one lactase tablet to 200 ml water. Exercises 17 If possible, without looking back though this chapter, give a very brief description of the function of each of these hormones: insulin, glucagon, thyroxin
leptin, and melatonin. Only the loading and removal of sugar from the sieve tube members requires energy: the actual transport in the tube is a passive process. Thus, bats and dolphins are shown as more similar to each other than sharks are to either. Universities? 8 Why do muscle cells have a large number of mitochondria? • Step 4 - Draw a
Punnett grid. What about nitrogen-fixing bacteria? Table 12.14 Cholinergic and adrenergic synapses Cholinergic Adrenergic Sympathetic Effect on mood Calming Increased energy, alertness, and euphoria Drugs increasing transmission at synapse Nicotine Cocaine and
amphetamines drug enhances release of neurotransmitter Figure 12.43 Drug action at the synapse. They provide us with a variety of foods, and with many other essential materials that we use in our everyday lives. They provide us with a variety of foods, and with many other essential materials that we use in our everyday lives. They provide us with a variety of foods, and with many other essential materials that we use in our everyday lives. They provide us with a variety of foods, and with many other essential materials that we use in our everyday lives. They provide us with a variety of foods, and with many other essential materials that we use in our everyday lives.
similar because they are all hydrolysis reactions. Skill: Identification of phases of mitosis in cells viewed with a microscope or in a microscope
slow conversion of Pfr back to Pr that allows the plant to time the dark period. Understandings: • Prokaryotes have one chromosome consisting of a circular DNA molecule. Enzymes cannot change those fundamentals. gy er at he he at en er gy consumers chemical energy feeding death and waste he at chemical energy
producers Whereas nutrients are constantly cycled in ecosystems, energy is not. Table 4.1 shows what their data looked like after 20 quadrats had been thrown by each group. isotopes Radiometric techniques with 40K can be used to measure the age of rocks that formed from magma or lava between 100 000 years and 4.6 billion years ago
In such a case, the frequency of one phenotype is seen to increase over time, whereas the other phenotype decreases. It is also important to show a wide range of proteins with various functions and locations. Since 1972 further evidence has been gathered about membranes, and slight changes to the Singer-Nicolson model have been made. Because
his team of researchers kept careful notes and statistics, some thought-provoking results started to emerge. • Will my children be able to see the difference between red and green, even though I cannot? Mode The mode is the most frequently occurring measurement. NATURE OF SCIENCE Laser scanning microscopy images enable quantitative study
of biofilm structure. The Human Genome Project In 1990, an international cooperative venture called the Human Genome Project set out to sequence the complete human genome. Because the role of almost all commonly abused drugs is to stimulate the reward pathway located in the brain, withdrawal of the drug produces symptoms that are the
opposite of euphoria. Centrioles are associated with nuclear division. What skills must animals learn to survive and reproduce effectively? On light-coloured backgrounds, the grey moths were better adapted. Grand Prismatic Thermal Springs in Yellowstone National Park.
Each hormone produced by an endocrine gland has one or more tissue type in the body that is the 'target tissue' of that hormone. The estimated 21 000 genes that you possess are organized into chromosomes. When choosing which crops to plant, modern farmers tend to look for the plants that will have the best growth and produce the most food per
hectare (best yield), because their income is based on production. Researchers are working on why they appear to have become 'desensitized' to this high level of the appetite-controlling hormone. Instead of using a ruler for the two higher power objectives, you can use proportions to determine the field of view by comparing their diameters with the
diameter determined for the lowest power. Metabolism, cell respiration, and photosynthesis Inhibition The effects of pH, temperature, and substrate concentration on the action of enzyme active sites. To learn more about genetically modified
crops, go to the hotlinks site, search for the title or ISBN, and click on Chapter 15: Section D.5. 752 hypothalamus neurosecretory cells anterior pituitary oxytocin ADH uterine muscles mammary glands kidney tubules endocrine cells of the anterior pituitary TSH FSH
and LH thyroid testes or ovaries growth hormone (GH) prolactin entire body mammary glands What do you know about some of the foods that you eat? The phosphorous needed to grow food is being used to grow biofuel. Usually the holotypes of fossilized species are kept in museums, but simply finding a fossil, labelling it and putting it on display in a
museum does not count as officially naming it. It is important to recall why the cell membranes are fluid in consistency: the phospholipid molecules are not closely packed together, largely because of the rather 'loose' connections between the fatty acid tails. Y: Biology is a system of exploring the natural world. • Anticancer drugs could then be
delivered to a specific target cell. Since this beginning, many individuals in many different countries of the world have worked to make the present-day microscope extremely effective in the study of the cell and other small structures. Less than 10% of diabetics have this type of the disease. In simple terms, this means that water can absorb or give off
majority of living organisms on Earth use left-handed amino acids to build their proteins, and only a small number of organisms (notably some bacteria) can use right-handed amino acids. H! 1 2 O2 ATP synthase H2O ADP! P ATP i H! Chemiosmosis In Figure 8.17, note the three labelled areas on the left: the intermembrane space, inner mitochondrial
membrane, and mitochondrial matrix. It is produced in bacterial cells by enzyme action on paraminobenzoic acid (PABA). This can ultimately threaten a person's life because a few pressure receptors in that area have reached
their threshold. For centuries people have been selectively breeding both crops and animals to increase their food value. This became generation 0. Notice on the graph the homeostatic range of oxygen partial pressures within the body. For example, Marker CA15-31CA27.29 for breast cancer is found in the blood. They are synthesized by living
organisms, but many living organisms rely on an intake of vitamins from other organisms (especially plants, in the form of fruits and vegetables). When viewing these structures online, take note of the following. The organisms that build coral reefs are called coral polyps, and they absorb two ions from the seawater to build the reef: hydrogen
carbonate ions and calcium ions. One conclusion that can be drawn from studying fossils is that life on Earth is constantly changing. This causes a mutation that, as we have seen, can sometimes be benign (not harmful), but at other times it can be harmful to an organism. The plant kingdom is vast in its diversity. The companion cells have nuclei and
infection. endodermis cortex epidermis pericycle phloem xylem Figure 9.6 This is a cross-section through a root. When males produce sperm cells, half of them contain one Y chromosome and half contain one Y chromosome and half contain one Y chromosome and half contain one Y chromosome. Is it considered to be a supposition? Watson et al. • What are the limits of knowledge? The online genetic database at the
National Center for Biotechnology Information (NCBI), for example, has many genes that you yourself can look up. The advantages of sickle cell disease Although sickle cell disease is a debilitating condition, those who have it are very resistant to malaria infection. It keeps on being moulded through new experiences, like learning a new language
Graphs Scientists use graphs extensively because they are useful tools for presenting data and seeing relationships that might otherwise remain hidden. Even though plants may survive quite well when they receive light from sources other than the Sun, most plants on our planet rely on the Sun for the energy necessary to drive photosynthesis. A 40
self-administrations in 3 hours Figure 12.10 Adolescent rat Option A: Neurobiology and behaviour self-administrations in 3 hours 12 20 10 0 1 2 3 4 days 5 Key nic + acet 150 100 50 0 27-31 37-41 90-95 age (days) Animal experiments can shed light on the way that drugs promote abuse and addiction. Soybeans are a very valuable crop. What
evidence is there that genetic characteristics can sometimes skip a generation? Exercises 10 Distinguish between how a garden greenhouse works and how the greenhouse works and fertilization All plants show two different generations in their life
cycle. • Applications and skills: Application of cellulose and starch in plants and glycogen in humans. 9 Describe the use of biofilms in a trickle bed filter. Fifteen per cent of postharvest food crops in developing countries is lost to insects.
micrographs and electron micrographs of lung tissue. The fruit encloses, and helps to protect, the seed. The fluid in the stomach can be as acidic as pH 2. Changes in pH signal the body to adjust the breathing rate. If you remember your mathematics classes about polynomials, you'll know that (p + q)2 can be expanded to p2 + 2pq + q2. For example,
just because an individual hare can shed its brown fur and grow white fur for the winter in order to be better camouflaged against the snow, does not mean that the individual has 'evolved' from one season to the next. In nature, embryos are created only for reproduction, and many people believe that using them for experiments is unnatural and
wrong. In this example, the trait is for mucus production; one allele is for a balanced mucus production, the other for excessive mucus production that leads to cystic fibrosis. The survival curves of the two microbes are plotted against sunlight exposure (lower x-axis) during daylight periods and against time during the overnight period (upper x-axis)
The factors that determine plaque build-up, and thus the eventual chances of heart-related problems, fall into two main categories: those that cannot be controlled or avoided, and those that cannot be controlled or avoided.
during interphase. Autotrophs Some organisms are capable of making their own organic molecules as a source of food. They both mention that they are worked about getting a stomach ulcer because of the stress they are under at work. Vaccines made in plants could offer vital disease protection. It is abbreviated as HDL, standing for high-density and their own organic molecules as a source of food. They both mention that they are worried about getting a stomach ulcer because of the stress they are under at work.
lipoprotein. What is the protein? Table 6.4 The locations of mucous membrane Sarea with a mucous membrane False-colour scanning electron micrograph (SEM) of the mucous membrane lining of the trachea. Chemoreceptors in some blood vessels monitor pH changes. In eukaryotes, transcription continues beyond the terminator for a significant
number of nucleotides. Cladograms To represent the findings of cladistics in a visual way, a diagram called a cladogram is used. Hypertension Hypertension is higher than 'normal' blood pressure. Once you have your results, complete the following: 3 Draw a graph of your results. If a fossil of a bone or shell has a high level of carbon-14, for example,
it is younger than a bone or shell that has a very low level of carbon-14. This helps by binding the antigens to gether, often leading to clumps of pathogens because the antibodies are acting to stick them to each other. 19 Why do you need to be careful about using the phrases 'produced by' and 'secreted by' when referring to the hormones associated
with the posterior pituitary? Scientific science To what extent is there an overlap between biology and the social sciences? New technology has provided us with valuable insights into the functions of our brains. y y 0 y x 0 x The standard deviation shows us how tightly the data points are clustered around the mean. • The axon of the sensory neurone
enters the spinal cord and sends a chemical message across a synapse to a relay neurone. cell membrane cytoplasm 300 The term 'nerve impulse' is very misleading because a nerve does not carry an impulse; the individual neurones within the nerve are each capable of carrying the impulse. Reactions that use enzymes do have an upper limit,
however (see Figure 2.25). If an organism did not have the genetic code to make cytochrome c, it could not survive. When individuals already identify all of them (less than 15%), and more than half could not identify any of them. Could you do the guestions about sex-
linked traits, like red-green colour blindness? Whether it be on the coast of Spain, Australia, or the USA, what response methods are used to clean up oil spills in the marine environment? The pollen that causes hay fever is usually from wind-pollinated plants and is, therefore, very light. This brings unfiltered blood to the nephron. LRP5 is a gene that
helps immune system cells make a certain type of protein that acts as a receptor on their surfaces. 10.2 Genes may be linked or unlinked and are inherited accordingly. Extension: DNA polymerase adds new nucleotides to the 3 end of each primer to build complementary strands. William Harvey died 17 years before the invention of the microscope
Glycogen in liver is hydrolysed into glucose and released into the bloodstream. They are widely used for water quality assessment. The type of inhibition may be reversible or irreversible incus (anvil) malleus (hammer) stapes
(stirrup) oval window (behind stirrup) cochlear nerve (auditory) vestibule round window pinna cochlea tympanic membrane (eardrum) auditory tube How sound is perceived by the ear Sound waves are successive vibrations of air molecules caught by the outer ear. After that it becomes a little less clear. • Coniferophyta: the coniferophyta:
phylum includes cedar, juniper, fir, and pine trees, among others. To synthesize these non-carbohydrates, other elements such as nitrogen must be added to the glucose. The person has no trouble identifying the spoon and says 'spoon'. 3 C A G T C 3 G T C A G 5 primers 5 cycle 2 yields 4 molecules cycle 3 yields 8 molecules 616 Metabolites that
indicate disease A doctor may draw blood and collect a urine sample as part of a physical examination. Also, the genetic code is universal, which means that, with only a few minor exceptions, all organisms share the same code. One culture included radioactive phosphorus-32, 32P. Also, the most recent hottest years on record happened during a
period of lower solar output. Because of these developments, scientists are developments, it is best to avoid putting sentient beings in your ecosphere or mesocosm. This section has shown
multiple ways in which nature tries to increase variety in populations, and we have seen the power of variation in natural selection. CHALLENGE YOURSELF 2 Look up the following things to find out what their scientific names are: • your favourite flower, tree, or house plant. Neural pruning Pruning
results in the overall number of neurones being reduced. uploads/5/3/9/5/5395830/ m18 126-trickling filter.pdf plastic media covered with biofilm filter media under drainage system effluent channel feed pipe 607 13 1 At source port Option B: Biotechnology and bioinformatics CHALLENGE YOURSELF discharging cargo loading ballast water Ship
ballast water is a prominent vector of aquatic invasive species, which includes microorganisms, to coastal regions. Sometimes, however, mutations can have a positive effect that is beneficial to an organism's survival. Plants that rely on wind as their pollen vector have inconspicuous, odourless flower parts. Blood flow returns to the digestive system
In order to answer these questions, the mechanisms of genetics must be understood. Gardeners take advantage of these cells when they take cuttings from stems or roots and use them to propagate new plants. We hope they help you to develop your own skills in scientific literacy. • Application: William Harvey's investigation of sexual reproduction in
deer. Because the plant is also carrying out cell respiration, a correction needs to be made for the carbon dioxide and oxygen levels. When women produce gametes, each egg will contain one X chromosome. It is a part of the cell cycle. Every cladogram drawn is a working hypothesis. The minotaur beetle, Typhaeus typhoeus, is a detritivore. However,
the plan is to extract the antigen and put it into a pill for ease of use. 23 Compare the other two groups and explain the findings. As a result, the best way to curb their expansion is to make sure that doctors minimize the use of antibiotics and that patients realize that antibiotics are not always the best solution to a health problem. Fish are a good
source of omega-3 fats. This famous hoax demonstrates how important it is to double-check findings. The water lost from the plant's upper structures must be replaced by water absorption. This allows the jacks to grow quickly and head out to sea earlier. A practical example of diffusion and osmosis is kidney dialysis. An artery showing
artherosclerosis. The role of photosynthesis As seen in Section 4.1, photosynthetic organisms such as phytoplankton and plants take simple inorganic carbon dioxide, CO2, and convert it into energy-rich sugar, C6H12O6. Allergic rhinitis, commonly referred to as hay fever, is a distressing condition that is both common and widespread throughout the
proline - valine - glutamic acid Figure 3.6 Is this what you found? Some cells, never progress beyond the G0 phase. Biogas is made of: • 50-75% methane • 25-45% carbon dioxide • 0-10% nitrogen • 0-3% hydrogen sulfide • 2-7% water. Ockham's razor Simply put, the principle of Ockham's razor states that, all other
things being equal, the simplest explanation should be preferred. 55 02 Molecular biology • synthesis of proteins, including bonding of one amino acid to another • cell respiration, with nutrients being converted into ATP • photosynthesis, with light energy being used to create carbohydrates • and many, many more. Moving quickly makes it more
likely that they will get out of the dry environment. • This metabolic pathway is controlled by enzymes. Wash your hands thoroughly with soap and water before and after the procedure.* Paramecium can be used to demonstrate the functions of life in several ways. The common name for glyphosate is Roundup. Microscopic observation reveals which
ova are fertilized, and whether the early development appears normal and healthy. However, once you begin to understand evolution, it should become clear that all of life on Earth is unified by its common origins. 560 Ethology versus psychology Ethology is the study of animal behaviour in natural conditions. The two backbones or chains run in
opposite directions and are described as antiparallel. Where does biogas come from and how do we get it? • Stabilize the plant in an upright position, being careful not to put too much pressure on any part of the stem. Testing soil samples for nutrients 1 Purchase a soil testing kit that can determine the pH, nitrogen, phosphorous, and potassium
levels of your soil. Signals from the sinoatrial node that cause contraction cannot pass directly from atria to ventricles. Biology is a natural science, but what is meant by nature? The term occlusion describes the condition when plague build-up has become so substantial that the blood vessel can no longer supply even a minimally healthy volume of
blood to the tissue that it 'feeds'. The chemical, called a neurotransmitter, is always released from the synaptic terminal buttons of the impulse when the neurotransmitter is received by the dendrites of the second neurone. Groups that are interested in health issues, such as the World Health
Organization, use height as one way of quantitatively measuring a population's health. These molecules include water, minerals, proteins, carbohydrates, lipids, nucleic acids, and many, many more. • Membranes with different functions also have a different functions also have a different function and different functions.
inquiry revealed that, in order to retain his powerful position and promote his ideas, he had intimidated and removed scientists who questioned his theories. 43 01 Cells 4 The centrosomes are now at the opposite poles. Carbon's way of 'filling' this second shell of electrons is to share four electrons with other atoms in order to create a stable
configuration of eight electrons in total. Could this mean that something is wrong, or that another factor besides independent assortment is affecting his results? This reaction requires energy, and that energy may come originally from food (cell respiration) or sunlight (photosynthesis). D.2 Digestion Understandings: Nervous and hormonal
mechanisms control the secretion of digestive juices. These hormones only work on plant cells that have auxin receptors, vascular cylinder epidermis root tip. There are many examples of neurotransmitters; a very common example in humans is acetylcholine. For example, if 90 F2
peas were produced and all of them were planted and grew into new plants, there is no mathematical way that exactly 25% of them would be short. The modified DNA is put back into bacterial cells which multiply. 1992 Look at the Figure 12.50. We refer to all solutions as aqueous solutions if water is the solvent, no matter what mixture of substances
make up the solutes. 95 02 Molecular biology Figure 2.41 shows a typical tRNA molecules already mentioned above (carbohydrates, proteins, lipids, and nucleic acids) are all organic molecules. This is in large part because of the role of scientific
research into the damage done by smoking. An antigen microarray against this influenza was developed. Hence, g2 = 0.011. The glass also plays a major role in preventing warm air from rising through convection to dissipate the heat. Seguence alignment software can align nucleotides or can align proteins. 3 What conclusion can you draw from this
graph? Some layers cut off others from further decomposition and over millions of years, the partially decomposed organic matter is transformed into petroleum products. • Scroll past the coloured graph down to the DESCRIPTIONS. Even though these transposable elements, often referred to as jumping genes, are able to change their position within
a chromosome, they never actually detach from the DNA molecule they are part of. 1998), Copyright ©1998, Sinauer Associates, Inc.; Figure on page 713 adapted from Regional forest fragmentation and the nesting success of migratory birds, Science, 267, pp. Or are we like a frog at the bottom of a well trying to understand what the ocean might be
like? 14 What type of properties do amphipathic phospholipids possess? Make sure you can draw and label all the parts of a membrane as described in this section for the fluid mosaic model. Reptile Use the key to find out which taxon each organism pictured below is in. Pollen can be carried from anther to stigma by a variety of means. 454 Animal
physiology Antibodies help the immune response in several ways. A scientist takes some measurements and wonders if there is some kind of mathematical equation that could act as a model of her data. When potassium ions passively leave the cells, water also leaves. Methane (CH4) is an example of a hydrophobic molecule; it is composed of only one
carbon and four hydrogens. • How does biological knowledge grow? 2 ATP 2 ADP energy to get reactions started glucose 6C pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP produced (net gain of 2 ATP) pyruvate 3C 4 ATP pyruvate 3C 4 ATP
available. It has been completely rewritten to match the specifications of the new IB biology curriculum, and gives thorough coverage of the entire course content. • Species have both methods). In both sexes, hormones play a key role in both the development of sexual
dimorphism (different body forms of males and females) and the regulation of sexual physiology. They may store a number of different substances, including potential food (to provide nutrition), metabolic waste and toxins (to be expelled from the cell), and water. 395 09 Plant biology CHALLENGE YOURSELF Figure 9.13 is a model representing the
pressure-flow hypothesis of phloem transport. When DNA is wrapped around the histones and then further wrapped in even more elaborate structures, it is inaccessible to transcription enzymes. Hormone(s) Functions in brief Reproduction LH (luteinizing hormone) and FSH (follicle-stimulating hormone) Prepares ovarian cells for ovulation in females
and needed for sperm production in males Growth GH (growth hormone) Stimulates mitosis and organism growth Developmental growth throughout adulthood. A short fragment of a seguence looks like this: GTGGACCTGACTCCTGAGGAG. Thus dATP builds up and, as you can imagine.
causes lots of problems. Symptoms include developmental delay of 6-12 months in babies, in addition to facial abnormalities and seizures. 104 Pigment colour Distance pigment moved Rf value Table 2.11 Lab results Carotene (orange) Xanthophylls (yellow) Light green (chlorophyll a) Green (chlorophyll b) 1 Explain why the
four pigments moved at different rates through the chromatography paper. Under ideal circumstances, leptin has the effect of lowering your appetite. It dilates the bronchi to give you more oxygen. In brief, this is a biochemical pathway in which the chemical bonds within a glucose molecule are broken down sequentially to release energy. Figure
3.37 Gene splicing involves introducing a gene into a plasmid and it is one of the techniques used in genetic engineering to make a genetically modified organism. The microscope has given us an insight into the structure and function of the following eukaryotic cell organism. The microscope has given us an insight into the structure and function of the following eukaryotic cell organism.
digested to a suitable size. Muscle 1 contracts, insect leg segment B moves down. Reduction Loss of electrons Gain of electrons Gain of electrons Gain of electrons Gain of oxygen Loss of hydrogen Results in many C-O bonds Results in a compound with higher potential
energy A useful way to remember the general meaning of oxidation and reduction is to think of the words 'oil rig'. One type of ion channel allows the passage of calcium ions into muscle cells, thus initiating the process that brings about muscle contraction in the human body. Nonpolar amino acids have no electrical charges in their side groups.
Amphibians Amphibians include organisms such as frogs and salamanders; they start their lives in water. In the scientific community, this misconduct is extremely frowned upon. Using light energy, the raw materials of photosynthesis are carbon dioxide and water. BLAST is a 'local' alignment tool, which means that it does not attempt to align the
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whole length of the sequence being searched but searches only for regions of similarity. Theory of knowledge What is this chapter all about? The valves (identified as right and left according to the side of the heart). In each quadrat the presence or absence of the chosen
species should be recorded. Fungi on a dead log. One way is for them to keep up with the latest breakthroughs and developments published in scientific and medical journals. B Allosteric inhibitors bind to the active site. This is relatively exceptional: most scatter plots have standard incremental scales on the x- and y-axes, the way the line graph does
in Figure 8. The same consistency is not true regarding the rate of photosynthesis. The black coloured zones represent process and the yellow zones represent process as they are de-energized moving through the
electron transport chain. Very often in IB, laboratory tests and examinations will require you to draw an object or organism. Cells have a number of repair enzymes that detect and correct errors when they do occur. This causes positive sodium ions (Na+) that are in the synaptic cleft to diffuse into the postsynaptic neurone. It contains the
haemoglobin beta chain downloads for all eight organisms. Substances that are small in size and non-polar will move across a membrane with ease. Because bacteria reproduce asexually, genetically they generally do not change very often. Mollusca (from the phylum Mollusca), such as snails, clams, oysters, and mussels, build up their shells with
calcium carbonate and, when they die, the shells accumulate at the bottom of the ocean. Below it you can enter the accession number of the FASTA sequence. Both T3 and T4 enter the target cells (almost all cells in the body), where the T4 form is typically converted to the T3 form. They have a genetic defect in gene ADA. Some of the questions
Mendel asked were: • How can I be sure that I will get only smooth peas and no wrinkled ones? Let's summarize the Punnett grid in Figure 10.25 as shown in Table 10.6. Table 10.75, as shown in Table 10.6. Table 
in terms of the allele frequencies rather than genotypes, the following can be deduced: • the frequency of Tt = p2 • the frequency of Tt = 2pq • the frequency of Tt = 2pq
'nomial' means name and 'nomenclature' refers to a system used to name things. The ANS of the PNS is involuntary and regulates the activities of glands, smooth muscle, and the heart. Stroma contains many enzymes and chemicals that are necessary to complete the process of photosynthesis. When the pepsinogen comes into contact with the HCl, it
undergoes a molecular modification that activates the enzyme. Peripheral proteins, on the other hand, do not protrude into the middle hydrophobic region, but remain bound to the surface of the membrane. They can only be isolated from other cells on the basis of their behaviour. Bacteria are not able to produce the complex folding structures
required. Each chapter in the book corresponds to a topic or option in the IB guide, in the same sequence. Haemoglobin, which delivers oxygen to body tissues, is one type of globular protein. The surface of the cell, the membrane, controls what materials move in and out of the cell. They include Justus von Leibig, F. This information, which is relayed
to the brain, tells us our position. Another essential component of the human diet is vitamin D. • Paper chromatography gives better results. Any cell containing mitochondria uses aerobic cell respiration as its primary cell respiration pathway. P phosphate P groups
linked by energy-containing 59CH2 bonds O base could be A, T, C, or G 39 OH The antiparallel strands A DNA molecule is composed of two antiparallel strands. First the bark below the girdle, and then the entire tree, dies (see Figure 9.11). The muscles that need to attract the axons will produce CAMs. The CAM receptor in the axon will activate
enzymes to cause the growth cone of the axon to grow towards the muscle. 9 Hydrostatic pressure builds in A because water is incompressible. When polypeptides are synthesized at ribosomes under the control of genes, the reaction that is occurring is a condensation reaction. The term used for a chamber of the heart that is contracting is systole. To
some degree and in some food types this reputation is deserved. The plant was classified into specific categories that included the family Scrophulariaceae, the figwort family. Linkage groups As Morgan and his team demonstrated with their experiments on Drosophila, any two genes that are found on the same chromosome are said to be linked to
each other (see Figure 10.14). capsule cytoplasm ribosomes cell wall plasma membrane nucleoid of DNA plasmid pili flagella The cell wall and plasma membrane tin cooling sun-drenched leaves and stems. 3 Explain neural pruning. The
TOK framework One of the most important skills students are asked to develop in the IB is analysis. When the column from dropping down within the tube. This is twice as many as in an adult brain. Fruits have a
variety of adaptations that allow successful dispersal of seed by wind, water, and animals. Biogas fermenter Both protein that attaches to (and extends down into) the membrane are hydrophobic and easily mix with the hydrophobic
fatty acid 'tails' of the membrane phospholipid molecules. Scientific evidence shows that smoking causes the brain to be 'rewired'. 579 13 Option B: Biotechnology and bioinformatics Fermentation NATURE OF SCIENCE The discovery of a bacteria that causes stomach ulcers was the result of serendipity. Co-dominant alleles - Pairs of alleles that both
affect the phenotype when present in a heterozygote. The reason for this is that the skeletal muscle has become so thin it appears to be non-existent. We will see in this section how Earth's atmosphere acts as a kind of blanket, keeping us warm at night and sheltering us from excessive heat during the day. Nucleosomes help to regulate transcription
in eukaryotes. All of these 'not-self' proteins are antigens. Skill: Drawing the structure of primary xylem vessels in sections of stems based on microscope images. Several repeated applications with the coin at the same place on the paper should result in a dark-coloured line. The production of many more eggs than is typical of a normal menstrual
cycle is called superovulation. 2007), Copyright © 2007, John Wiley & Sons; Figure on page 800 (top) from scienceCourseware.org, Permission courtesy of Virtual Courseware Project, California State University, Los Angeles; Figure on page 803 from A time series of evolution in action: a latitudinal cline in wing size in South American Drosophila
subobscura, Evolution, 58 (4), pp. Note: the seasons in the Antarctic are reversed from those in the northern hemisphere. What might be the value of such movement to the process of photosynthesis? • Xerophytes can use alternative pho
protein that has an effect on gene expression is called a transcription activator. We do not want to collect this metabolite, but its production is unavoidable because it is a product of the mould breaking down glucose to get energy. Oberhauser's team: although there are many technical terms that you might not understand, the paper contains some
graphs that you should be able to interpret concerning the overlap between when monarch butterflies are feeding on their favourite food, milkweed, and when corn is producing pollen. All the carbons are accounted for, and the law of conservation of mass is demonstrated. Movement of the radius and ulna away from the face. 12 In the seven-taxa
system, state the order that you belong to. By comparing hundreds of versions of the same message, they can analyse what has been added or changed to see its evolution over time. 4 Suggest why this diet is beneficial to the species. Much of the heat that turned the water molecules from the liquid phase to the vapour phase came from your body, and
thus sweating not only makes you feel cooler, it really does lower your temperature. The ventricles (pink) circulate the cerebrospinal fluid, which cushions the brain. Any heat 186 generated by cellular respiration is lost to the environment.
diameter. Application: Dehydration due to cholera toxin. • DNA replication is continuous on the leading strand, and discontinuous on the lagging strand. Where is she getting her information? The shoot apex produces new tissue and causes primary growth allows the
root to extend throughout the soil. The Punnett grid would be identical to the one in Figure 3.26. However, he could not express his thoughts by writing or speaking. From Chapter 2, you already know that the brain is plastic throughout our lives. cholera. The
most commonly cultivated species of onion is Allium cepa, but this species can have many varieties can have many varieties can have many varieties and the varieties can have strains. Is this just a coincidence? These symptoms are often called altitude sickness or mountain sickness. The complementary base pairs are the same as in double-stranded DNA, with the exception that adenine on the DNA
is now paired with uracil on the newly forming mRNA molecule. You use this software to search the data and analyse it. As time went on, extremely long necks were selected for and short or medium-length necks were selected against. Improvements in fish stock estimates will ensure that we do not go over the maximum sustainable yield (MSY) for
the fish populations. The long-term process requires the synthesis of proteins. But remember that metabolism is all of the reactions within al
production of pre-mRNA (the primary mRNA transcript). • Does research involving genetically modified (GM) animals add a whole new level to animal cruelty and suffering in laboratories? The sarcolemma has multiple tunnel-like extensions that penetrate the interior of the cell. The answer is to maximize the chances of some offspring surviving, even
if the survival rate is less than 1%. Arthropoda Arthro
frequency of observed animal behaviour. Figure 2.23 The two geometric patterns of protein secondary structures. A bacteriophage is a virus composed of a protein outer coat and an inner core of DNA or, sometimes, RNA. The name of the project is Wings Over Wetlands (WOW). Inhibitor resembles substrate Inhibitor binds to active site A yes yes B
yes no C no yes D no no (Total Total 1 mark) 9 Where are the light-dependent and light-independent reactions taking place in the diagram below? Explain why the results of this cross do not show the expected 9:3:3:1 ratio. One example of this is the venom produced by a stingray or jellyfish. 283 06 NATURE OF SCIENCE Risks associated with
scientific research: Florey and Chain's tests on the safety of penicillin would not be compliant with current protocol on testing. The greenhouse gases can then re-radiate the heat in all directions, the way a radiator does in a cold room. Keep two or three of the thinnest slices flat on the safety of penicillin would not be compliant with current protocol on testing.
Application: Courtship in birds of paradise as an example of mate selection. • Histamines cause allergic symptoms. One group lived between 0 and 10 m above the water level. Non-competitive inhibition is also referred to as allosteric inhibition, and the site the inhibitor binds to is called the allosteric site. fistulosum and A. If planted in the ground, a
potato will grow into a new plant. 25 Why do you not have to think consciously about breathing faster when you are physically active? Although many things are discussed as such congresses, one of the topics that comes up is the
binomial nomenclature system. Fujita / University La Sapienza, Rome 735t, Professors P. Integral proteins completely penetrate the lipid bilayer. Reproductive isolation of populations In some situations, populations of members of the same species (and thus of the same gene pool) can be stopped from reproducing together because there is an
insurmountable barrier between them. The pathogens are being injected in a form that will not result in the disease(s) but will trigger the same immune response as the pathogen. The following are methods used to predict the size of commercial fish stocks. There is no end to what one can learn about human anatomy and physiology. When two or
more polypeptides bond together and then are ready to accomplish their function, together they are considered to be a single protein. He rang the bell just before the dogs tasted their food. At the end of this section, use the hotlinks to see if you can find out at what position and on what chromosome you can find the secret code for these valuable
molecules of life. Glyphosate-resistant plants reduce tillage. According to the company, if you need to be vaccinated, you can eat a certain amount of the potato and you would build up the antigen and be vaccinated, you can eat a certain amount of the problem with micropropagation, however, is that it is extremely expensive. Let's say that the predicted frequency of this allele in
the population being studied is 10%. The second messenger molecule then directly affects the target cell. At least 100 compounds can be labelled as slow-acting neurotransmitters. After many observations, he realized that imprinting was initiated during a critical period: 13-16 hours after hatching. Two types of characteristic that are considered are
homologous characteristics and analogous characteristics and analogous characteristics. This calculation is an oversimplification, however, because it does not take into consideration the additional variety that results from the process of crossing over. Embryology is the study of the early development of embryos from fertilized egg to birth. Globally, methane emission is lowered
with the use of biogas. (b) How could individuals differ in this specific polymorphism? Within the brain the ANS is located in the medulla oblongata. anther cover slip glass slide Exercises 1 2 3 State the phase of meiosis during which each of the following events happen. 7 Use the functions of life to explain the results observed. • Two separate
cultures of Escherichia coli bacteria were grown with the presence of either a 'heavy' isotope of nitrogen, 15N, or an ordinary 'light' isotope of nitrogen, 14N. Polypeptides are highly variable The condensation reactions described above do not occur between any two amino acids randomly. Ecology Microscopic foraminifera usually live on the ocean
floor and are also very good at building shells, albeit very small ones. • Calculate the percentage change in mass, and the percentage change in wolume, at the end of 24 hours, for each core. In one observation, 75% of jacks mated with females compared with only 58% of hooknoses. Table 1.4 Comparing plant and animal cells Plant cells Animal cells
The exterior of the cell includes an outer cell wall with a plasma membrane just inside The exterior of the cell only includes a plasma membrane. • • Guidance Preparation of microscope slides showing meiosis is challenging and permanent slides showing meiosis is challenging and permanent slides showing meiosis are visible in temporary mounts. 5 weakly acidic 6 neutral
8 weakly alkaline 9 acidic neutral 10 basic pH 11 strongly alkaline Effect of substrate concentration of a substrate increases, the rate of reaction will increase as well (see Figure 2.28). To verify the type of species, a trawl is done and a sample collected. Scroll down to ORIGIN, this shows
you the entire sequence of the protein. The start or stop codons are also known as punctuation codons. In this case, they should prescribe the antibiotics that the bacteria do not show a resistance to, preferably the three at the bottom of the image. In this model, you can see mRNA (upper right) and tRNA (the clover shape). anus oviduct (Fallopian
tube) vaginal opening ovaries follicles corpus luterus and function Female structure 314 Function(s) Ovaries Organs that produce and secrete oestrogen. The conclusion could be that species 1 and 2 are more closely related to each
other than they are to species 3 or 4. The reason cited was lack of acceptance of this technology by consumers, farmers, and politicians 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 year 593 13 Option B: Biotechnology and bioinformatics 12 10 no tillage reduced tillage conventional tillage million ha 8 Figure 13.11 Soybean tillage
methods by hectares farmed in the USA in 1996 and 2001. 15.3, p. This is often referred to as the nature versus nurture argument. (d) A species of bird called the blackcap lives in Germany and generally migrates to south-western parts of Europe for the winter to find food. The stabilization of nutrients within the hepatic vein represents one of the
major functions of the liver, specifically the storage of nutrients and the release of those nutrients when needed. One community globally) database is called Metabase (MB). In the same way that they can amplify DNA from a fossilized dinosaur: they use a technique called PCR. That is why
many musicians wear protective ear devices when playing in concerts. Many of the hydrogen ions that exit the proteins erythrocyte bind with proteins circulating as solutes in plasma, and thus are also taken out of solution. These portable defibrillators are called automated external defibrillators (AEDs). number of individuals in a litre 300 P. The
answer is by using a proxy, which is a measurement that is used in place of another one. Some strains of tuberculosis are resistant to as many as nine different antibiotics. The solute concentration in their tissues is nearly identical to seawater. This research involves studies of cell division and differentiation. Denaturation: the DNA is heated to cause
it to separate into two strands. What maintains the overall structure of the membrane is the tendency water has to form hydrogen bonds. If the cubs in a pride are all at different ages, the variety in size can cause younger ones to be bullied and harmed by older cubs. Amino acids: nine of 20 are essential You would think it would be easy to specify the
exact number of amino acids that are essential for humans. If there was an end, what would be the consequences? There are several individual cardiac muscle cells shown, with two shown in section. • First there is a graph, Distribution of 100 BLAST hits on the Query sequence. Figure 10.5 does not show telophase I, which involves the chromosomes
unravelling and two cells forming. They referred to this idea as a semi-conservative model of DNA replication. • • Guidance Diagrams of skin are not required. The number one source of carbon emissions as a result of human activity is transport that is based on fossil fuels: cars, lorries, diesel trains and airplanes. Biotechnology is the new medical
tool of today's scientists. There is high demand for water, space, nutrients, and sunlight, but there is a limited supply. This creates the alternating sugar-phosphate backbone of each chain. The entire scientific community is encouraged to contribute to the maintenance of this site. B Hydrogen bonds between hydrogen and oxygen within water
molecules. However, rampant deforestation is decimating China's forests: 80% have already been lost. As each point are the standard deviations above and below the mean. The myelin sheath greatly increases the rate at which an action potential
passes down an axon. Both processes depend on the fluidity of the plasma membrane. It can rewire itself after suffering massive strokes. (2) (ii) Using the data in the figure, predict the effect of global warming on echinoderm larvae numbers. Glutamate may 'oversee' the learning and memories that lead to cocaine-seeking. Figure 3.33 This is a
pedigree chart showing members of a family affected by Huntington's disease. This value should be recorded in microns (µm). Robert Oppenheimer Barnett 1949 Art and imagination and creativity in science? Discuss the possible repercussions to science research as a whole when such misconduct occurs. Ethanol is a
2-carbon molecule, so a carbon atom is 'lost' in this conversion. Target tissues are those cells that are influenced by any one hormone. A light micrograph taken with fluorescent markers showing cardiac muscle cells. The glomerulus is similar to most other capillary beds except that the walls of the capillaries have fenestrations (very small slits) that
open when blood pressure is increased. Denmark, Iceland, Finland, Sweden, and Norway are all parties in this. Coenzymes usually act as electron donors or acceptors. In other words, animals cannot evolve an entirely new physiology even when they undergo enough change to qualify as a new species. The cell membrane of a plant cell is surrounded
by a cell wall that, as you will remember, is made of cellulose. A cell with more surface area per unit volume is able to move more materials in and out of the cell. The cycle is complete. You will probably not develop symptoms to the same cold virus ever again, but you probably will get another cold as a result of a
different cold virus to which you have not yet been exposed. The large area of yellow is a result of lack of blood flow to that area of the brain. The website that calculates commuters' itineraries on the Metro system in Paris, France, also calculates how much carbon is saved by not burning fossil fuels for the same commute. If ADH not present If ADH is
present Figure 11.18 Control of water reabsorption in the kidney by ADH. The energy lost from the electrons moving down the electron transport chain drives chemiosmosis (similar to that in respiration) to bring about phosphorylation of ADP to produce ATP. • Optimality: if bacteria have an optimum range of 10°C, and if they inhabit ballast water at
the midpoint of their optimal range, then their optimal range, then their optimum growth will occur at ±5°C. This capillary bed is so named because it surrounds (peri-) the tubule (see Figure 11.14). 29 01 Cells Membrane protein functions As you will recall, it is the membrane protein functions to the different membranes. Ribosomes are complex
structures within the plasma membrane, but they have no exterior membrane. In one cross, he wanted to see what would happen if he bred tall plants with short plants. In what ways does it reveal scientific bias? The plant will be a clone of) the original potato plant. • Proteins or parts of polypeptides should be
recognized from molecular diagrams showing amino acids linked by peptide bonds. This mass growing on the bark of a tree branch is also a bryophyte. It is very useful and productive to refer to the functions of life in such a discussion. The preparation of a karyotype is an expensive and invasive procedure. You should get 3.841. However, it is often
practical to calculate a percentage change = 2 1 × 100 V1 () Expected versus observed values: first application of the chi-squared test for goodness of fit As we saw in Figure 10, we do not always get what we expect with our results. 

Many plant species and some animal species have natural methods of cloning. If a young
child is deprived of stimulation, certain neurone pathways and synapses may be discarded. As the existing end product is used up by the cell, the first enzyme is reactivated. When acetylcholine binds to the receptor protein, the result is the normal continuation of the action potential along the postsynaptic neurone. Heart muscle is unusual in that it
does not need nervous stimulation to contract. • This causes an influx of calcium ions (Ca2+) into the presynaptic neurone • The increase in Ca2+ causes the production of cyclic adenosine monophosphate (cAMP), which is a second messenger. Each time a covalent bond is broken, a small amount of energy is released. 881-893 (Scheffel, Ursula,
Lever, J.R., Stathis, M. What do these dots probably represent? • HER2 for breast cancer: 20-30% of breast cancer patients have higher than normal expression of this biomarker. Amphetamine stimulates transmission at adrenergic synapses and gives increased energy and alertness. It was then discovered that penicillin has an active ingredient that
inhibits the synthesis of cell walls of bacteria, so preventing them from reproducing. A water strider making use of the human elbow. Molecular pieces of the invader are displayed on the cell membrane of the macrophage: this is known as antigen presentation. There are many vectors
of pollination besides insects and wind. It helps the human digestive system function better by providing bulk. Most noticeable is the cell wall being formed that will separate the daughter cells in cytokinesis. There were three speciation splits to generate these species, the first of which is circled. In addition to smooth muscle, arteries have elastic
fibres that help maintain the relatively high blood pressure achieved by the contractions of the ventricles. • Drawing labelled diagrams of the structure of a sarcomere should include Z lines, actin filaments, myosin filaments with heads, and the resultant light and dark bands. This activation results in changes in DNA transcription (gene expression),
thus allowing the production of flowers. The UK blackcaps had a distinct advantage over the Spanish blackcaps. Deep-tank fermentation of penicillin industrially is Penicillium chrysogenum. Brine is also referred to as produced water. Epigenetics involves the study of a set of reversible
heritable changes that occurs without a change in the DNA nucleotide sequence. Neither is linked to the red genes. In our example, the range for this data set is 6.3 cm. Organisms that normally use a cell respiration pathway that involves oxygen sometimes find themselves in a metabolic situation where they cannot supply
gills to breathe underwater, but their adult forms develop lungs for breathing air. Bacteria can be up to 1 µm in size. Each time a derived characteristic is added to the list shared by organisms in a clade, the effect is similar to going up one level in the traditional hierarchy of the Linnaean classification scheme. The more blood your heart pumps, and
the narrower your arteries are, the higher your blood pressure. Chloroplasts Chloroplasts Chloroplasts occur only in algae and plant cells. Beneath the ventricles lie the thalami (orange), and the hypothalamus (green, centre), which controls emotion and body temperature, and releases chemicals that regulate hormone release from the pituitary gland (the round
green body at the lower edge). Common withdrawal symptoms are anxiety, depression, and cravings. Because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population and cravings. Because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers can be incredibly large, and because bacterial population numbers are not also because bacterial population numbers are not also because bacterial popula
possible. Figure 5.17 A cladogram showing three taxa organized into a clade, of which two are sister groups and one is an outgroup. Their responses to the environment increase their chance for survival as an organism and as a species. In addition, there is a small vessel of the lymphatic system present, called a lacteal, that absorbs some of the
almost boundless, and it is difficult to imagine what the future might be like. As a result, ecosystems must recycle the carbon, nitrogen, and other elements and compounds necessary for life to exist. • Go to this website to find Swiss-Prot: www.pearsonhotlinks.co.uk/url. Be certain to include electron micrographs in your practice. Highly repetitive
sequences A large amount of human DNA is composed of highly repetitive sequences. (1) (ii) Deduce two processes that occur in human cells during the other part. CACCAGCAACCC. Parent recognition is called filial imprinting. Unprovable assumptions? Chloroplasts, along with mitochondria, represent
Compare and contrast resistance of weed species from 1996 to 2005. It is essential to refer to the IB animal experimental policy before carrying out any procedures on animals. In recent decades, taxonomists have split this group into species that can trace their ancestry
to the New World (North, Central and South America). This codon also encodes the amino acid methionine. • Proportions are important. CH3 acetyl CoA Decarboxylation is the removal of a carbon atom. These cells are called stem cells are to be able to grow: • skin to repair a serious burn • new heart muscle to
speech and language problems. (d) Design a procedure to investigate the effect of one of the limiting factors mentioned above on the rate of photosynthesis. The xylem and phloem occur together in veins or vascular bundles. At this point, a disassembly process occurs in which the mRNA detaches from the ribosome, all tRNAs detach from the mRNA
ribosomal complex, and the protein is released from the ribosome. • Guidance Carbon fluxes should be measured in gigatonnes. 6 4 2 0 0-5 6-10 11-15 16-20 21-25 time spent/s 26-30 31-35 Histograms have no spaces between the rectangles because the data are continuous. K! K! Na! resting K! Saltatory conduction by neurones that have a
cherished and well-documented classes of organisms on Earth, this idea, when it was first suggested, was controversial to say the least. Activation energy is best understood as the energy necessary to destabilize the existing chemical bonds in the substrate of an enzyme-substrate catalysed reaction. Figure 5.8 The giraffe's long neck explained by
natural selection. Nicholson and Fathepure 2004 benzene (mol bottle-1) H Bioremediation of benzene by Marinobacter 300 200 100 0 0 25 50 75 days 100 125 150 Bioremediation of oil by Pseudomonas Oily waste water poses a hazard for both marine and terrestrial ecosystems. Birds eat moths and visual predation is facilitated when camouflage is
poorly adapted. Because of this, researchers have successfully inserted the human gene that codes for the production of human insulin into bacteria. Chapter 3 looked at examples of genetics with multiple alleles, such as blood type (which can
be used to demonstrate co-dominance). A few may be much taller than the rest (possibly the soil they are in holds more water). It is very rare for females to have this trait. There are many poor examples of supposed links between animal responses and natural selection. What arguments and justifications do they use in response? Pathogens can enter
the body at a few points that are not covered by skin. 1 Figure 2.1 Hydrolysis of the disaccharides galactose and glucose. The conditions required for denitrification are: • no available oxygen (e.g. flooding or compacted soil) • a high nitrogen input. A strong magnifying lens may also be used. This has made
those genetically caused behaviours more prevalent in a population. Hence many of the energyrich molecules that would have been fed upon by decomposers are left behind and transformed, over thousands of years, into in energy-rich peat. Ethical considerations, environmental impacts, the importance of objectivity, and the responsibilities
regarding scientists' code of conduct are also considered here. Similar to a 'wiki' space, this is an example of collaboration and cooperation between groups of scientists. Figure 4.22 NASA data on sea level and the Argo marker, which is used to make the measurements. Each box shows both ways of representing the genotypes. You may remember
carnivorous diet (in Spea bombifrons) that includes cannibalism if food sources are scarce. 151 03 Genetics Worked example The term 'pedigree' refers to the record of an organism's ancestry. Cell respiration involves the oxidation and reduction of electron carriers. 4 Focus first with low power and then switch to high power. • Examples of stop and
start codons are not required. Fawcett 22, 773t, Doncaster and Bassetlaw Hospitals 238, Dr Jeremy Burgess 17, 21br, 45tr, 63, 119, 182l, 426c, 707t, 388, 390 t, Dr Reith Wheeler 421b, 317 t, Dr M.A. Ansary 749b
Mazel / Visuals Unlimited, Inc 620b, Dr. Jeremy Burgess 369l, Edward Lettau 724, Equinox Graphics 153 b, Eye of Science 120, 282t, 287l, 383, 452, 107 b, Frank Fox 252, Frans Lanting, Mint Images 676t, Gary Carlson 3, 72, Gary
738, GustoImages 73, 166t, 647c, 738, GustoImages 73, 166t, 647c, 738, GustoImages 73, 166t, 647c, 738, Hank Morgan 77, Hermann Eisenbeiss 62b, Hybrid Medical Animation 750b, J.C. Revy, ISM 81, 98, James King-Holmes 627, 635t, 780, Javier Trueba / MSF 777bl, Jeff Lepore 688, Jim Zipp 540t, John Bavosi 268, 273, 543, John Bavosi 268, 273, 543, John Devries 562r, 566t, 
Durham 290r, 105 b, John Greim 589, Juergen Berger 729b, Kenneth Eward / Biografx 621, 757t, Kent Wood 531, Kevin Curtis 122, Laguna Design 58tl, 79, 91b, 592, 622tl, 650, Xiib, 465 b, Library of Congress 767b, Luis Montanya / Marta Montanya
question today. (Total Total 8 marks) 5 When a nerve impulse is received by skeletal muscle it initiates a number of processes that result in contraction, with the following as your starting point. Perception Irrationally held truths may be more harmful than
reasoned errors. Karl Popper Popper 1992b What qualifies as an experiment? Table 5.4 Types of characteristics used for classifying organisms Characteristics used for classifying organisms Characteristics used for classifying organisms.
sequences differ between one species and another Classifying organisms using molecular differences is called molecular systematics. Causes and consequences of lung cancer Lung cancer Lung cancer Lung cancer lung cancer Lung cancer systematics. Causes and consequences of lung cancer lung cancer
living systems. This approach has the central belief that the whole is greater than the sum of its parts. Because humans tend to produce a small number of offspring, this is the interpretation that should be used. The impact that global warming is beginning to have on Australian marine life has been announced by the Great Barrier Reef National Park
Marine mammals, at first glance, do not appear to be related to many other easy to recognise mammals like rabbits and deer. Some of these are the result of a lack of sufficient healthy food, while others are behavioural and physiological disorders. • Acoustic encoding: encoding: encoding of sound, such as spoken language. (a) Fill out a copy of Table 10.7
Table 10.7 Allele frequencies Genotype frequencies Genotype frequency of carriers in 500 members of the population. Giraffes with longer necks can reach more food and have a better chance of survival. The following human diseases
are problematic in other animals in some form: tuberculosis (caused by a bacterium), salmonella (bacterium) and ring worm (fungus). Air comes in through your open mouth or nasal passages to counter the partial vacuum within the lungs, and fills the alveoli. • If your data set included at least five test subjects for each exercise duration, calculate the
found in newborns. She gets better because the bacteria are largely destroyed. All human genes are also available on a gene chip. Anorexia is an eating disorder characterized by an obsession about body image, weight, and what foods to eat. As Figure 7.1 shows, the E. Unlike the xylem, phloem is made up of living cells (see Figure 9.10). Sneezing is
a reflex that clears the airways of irritations. 633 13 Figure 13.38 Cladogram showing the common ancestry of eight organisms. cleavage furrow daughter cells vesicles forming cell plate new cell wall Figure 1.34 Cytokinesis in animal and plant cells. The macrophages are attempting phagocytosis of the worm. Some, but not all, couples are
fined for having more than one child. • Skill: Drawing molecular diagrams to show the formation of a peptide bond. and Reiss, M. This causes an increase in CO2 referred to is clearly traced to human activity. Once the heat
has radiated into the surrounding environment, the ecosystem cannot take back that heat to use it. For example, he asks his readers to picture a modern-day rabbit and imagine the rabbit's parents. Tetrahydrocannabinol (THC) is the main psychoactive chemical in marijuana. This is done using a technique called gel electrophoresis, which will be
explained in Section 3.5. • To recognize each letter, a laser activates the fluorescent markers on the nucleotides as they go through the process. Application: Comparison of genome size in T2 phage, Escherichia coli, Drosophila melanogaster, Homo sapiens, and Paris japonica. These sections of genes, called oncogenes, contribute to converting a
normal cell into a cancer cell. The 20 enzymes that bind amino acids to tRNAs are grouped together and collectively called tRNAactivating enzymes. What cell structures reflect most the unique abilities of a plant cell? Because glucose and glycerol are simple organic molecules, they are perfect as inexpensive carbon sources. (1) (b) Calculate the
greatest speed of crab movement at 150 cm from the source of the chemical. polar covalent bonds - O + H H water H2O non-polar covalent bonds H H C H Figure 2.12 A comparison of water and methane. When it infects the cells of the plant, those cells take
up the plasmid and carry the genes to the chromosome in the nucleus or to the DNA in the chloroplast. Rats are used in cocaine research to study addiction and other psychological effects of taking cocaine. Translation can occur immediately after transcription in prokaryotes due to the absence of a nuclear membrane. No, they will not grow
Genetics is the science of how inherited information is passed on from one generation to the next using the genetic material of genes and deoxyribonucleic acid (DNA). The middle carrier is a cytochrome complex. (8) (Total Total 18 marks) 3 Explain how skeletal muscle contracts. Biopharming uses genetically modified animals and plants to produce
proteins for therapeutic use. One sarcomere extends from one Z line to the next Z line (see Figure 11.9) It is these repeating sarcomeres that give skeletal muscle its other name, striated muscle its other name, striated muscle. The process by which the introns are removed is referred to as splicing. This maintains a steady-state in the fermenter, where the loss of mould cells is
scientific name. Organelles of eukaryotic cells Common organelles include the following (see Figures 1.4 and 1.5): • endoplasmic reticulum • ribosomes • lysosomes (in all eukaryotic cells, but centrioles are not found
in some plant cells) • vacuoles. • Use shoots from a plant with leaves with thin waxy cuticles. Phenotype is expressed, e.g. type O blood. They used random sampling with 1-m2 quadrats to get their data. It is not necessary for you to remember all the names of the carriers. Much of this energy is then stored
as molecules of adenosine triphosphate (ATP). This helps track the pathogen and the outbreaks of illness it causes. Think about it. What are some of the potential benefits of new technology that has been developed to study the human brain? Before the steps begin, DNA replication allows the cell to make a complete copy of its genetic information
during interphase. A wasp builds a nest that is characteristic of its species. Lung cancer can also result in internal bleeding in the lungs. Explain how you determined this. The calibration period may be shortened by carefully drying the leaves with paper toweling. Black shapes represent snapdragon plants with red flowers, white shapes represent
whiteflowered plants and grey shapes represent plants with pink flowers. Evidence is being collected that indicates that, although larger mussels are available and could be crushed and eaten, thereby providing more food, selecting small, more easily crushable, mussels prevents wear and tear on a crab's claws. This then results in the ventricles
contracting and the atrioventricular valves closing, allowing the blood to exit the heart through the semilunar valves. Viruses, prions, and viroids are not considered to be living organisms. However, if the proteins are produced by ribosomes bound to the endoplasmic reticulum (ER), they are primarily secreted from the cell or used in lysosomes. They
seem to be able to 'talk' to each other in order to make more EPS. The function of the corpus luteum is to secrete progesterone to maintain the highly vascular endometrium of the uterus. They are found in forests as a single large cell formed when many individual motile cells fuse. Experiments can be performed using different wavelengths of light
different light intensities and different types of bulb (ultraviolet, incandescent, or fluorescent). Both plants and animals return the nitrogen to the soil in a variety of ways. Some possibilities to consider for your designed investigation are: • the application of hormones such as ethylene, auxin, or gibberellins (be aware of the fact that certain types of
auxins can be destroyed by light or by soil bacteria) • abiotic factors such as light, temperature, and water (note that for light, not only could the intensity be changed, but the duration could be altered to simulate long days/short nights or short days/long nights) • the medium in which the roots form, such as soil, sand, agar, or water • the
presence/absence of leaves on the stem • horticultural techniques, such as wounding or girdling. However, each chromatid attached to it, so no S phase is necessary. All of these interactions are referred to as metabolism and that is the focus of the next section. Inspiration is occurring when the chest/rib cage is in the
raised position. Values below 0.200 are negative. For example, mushrooms grow on the forest floor the way plants do, and yet they do not have leaves or roots and they do not have leaves or roots and their ability to reproduce. The molecular
structure of a haem group is shown on the right. The tRNA then moves to the P site. • Scroll down and click on SUBMIT. With transcription, the genes make new proteins. Cairns' technique involves injecting radioactive materials into the DNA samples that will expose the film faster. The ability to culture cells in the laboratory allowed many of these
studies. The thought, smell, sight, or taste of food results in autonomic nervous system impulses being sent to the medulla oblongata of your brainstem. There is no reason to memorize these structures. 202 4.4 Climate change Understandings: NATURE OF SCIENCE Assessing claims: assessments of the claims that human activities are not producing
climate change. The red line on the graph shows carbon dioxide concentrations that were measured from air bubbles trapped in the ice. Except in very serious cases, the most common treatment is exposure to the blue and green portion of the light spectrum. C Pr is converted by red light to Pfr, which acts as a promoter of flowering. We are
consumers: we need to eat other living organisms, whether they are products of autotrophs, such as fruits and vegetables, or products of heterotrophs, such as meat, eggs, honey and dairy products of autotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as meat, eggs, honey and dairy products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as meat, eggs, honey and dairy products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, such as fruits and vegetables, or products of heterotrophs, and the heterotrophs are products of heterotrophs.
Applications and skills: Application: Structure and function of organelles within exocrine gland cells of the pancreas and within palisade mesophyll cells of the pancreas and within palisade mesophyll cells of the pancreas and within palisade mesophyll cells of the pancreas and within exocrine gland cells of the panc
organisms have in common, the more closely related they are to one another. • Sex is determined by sex chromosomes and autosomes are chromosomes and autosomes are chromosomes that do not determine sex. Each antibody is a protein that is Y-shaped. 108 The effects of changing environmental factors on the rate of photosynthesis Look now at the patterns that can be seen
when three common environmental factors are varied, and how these factors are predicted to change the rate of photosynthesis in a generalized plant (Figures 2.52-2.54). Decomposers An effective way to unlock the precious nutrients stored in the cells of plants and animals is through decay. Normally, as long as the concentrations and exposure
times are respected, the danger to your health is very limited. Using the frog embryo as an example, we can see how the nervous system of an embryonic chordate develops. • The microorganisms can include many different types united together, such as fungi, bacteria, and algae. This pumping action creates a high concentration of auxin in the space
between the cells. Chemical bonds occur at specific locations in order to produce a functional unit. readout In this image blue spots indicate bright fluorescence end white spots indicate no fluorescence bright fluorescence end white spots indicate bright fluorescence bright fluorescence bright fluorescence and white spots indicate bright fluorescence bright fluorescence bright fluorescence bright fluorescence bright fluorescence bright fluorescence and white spots indicate bright fluorescence bright 
expressed in tissue sample A T G C G C A T C G G C T A cDNA DNA strand on microarray 3 4 Hybridization: in the microarray there are many probes attached representing thousands of regions of DNA. • Egg white or albumin solutions can be used in denaturation experiments. Millions of years ago, without competition from monkeys or apes, lemurs
on these islands were able to proliferate. 

BLAST searches can identify similar sequences in different organisms. In its inorganic form on the left, as atmospheric carbon dioxide (in blue), the carbon is not usable as a food source by the autotrophs or by any consumers. All the biochemistry within all living organisms can be 'broken down' into smaller than the biochemistry within all living organisms.
consideration. This is necessary because erythrocytes are anucleate (they have no nucleus) and thus cannot undergo mitosis to form new blood cells, nor are they able to code for new proteins within the cell. Energy is a topic of discussion every day in our modern world. indentations on it, determined a person's intelligence, personality, and talents
Climatologists and palaeoclimatologists collect data about atmospheric conditions in recent decades and the distant past, respectively. The result is that the pathway is halted. Numerous mitochondria are found packed between the myofibrils in order to supply the adenosine triphosphate (ATP) necessary for muscle contraction. Is this a problem? It
is the 2 value. This exchange of the two negative ions keeps a balance of charges on either side of the musculoskeletal system are movement, support, and protection. 561 12 Option A: Neurobiology and behaviour Birdfeeders may have split the
blackcap into two species. Applications and skills: Applications and skills: Application and skills: A
organic food from plants and animals, autotrophs can make the food they need from their inorganic surroundings. It is important to note that the shapes you see in Figure 3.9 represent two chromosomes together as a single pair, but that each chromosome has been doubled as a result of DNA replication. Most industrially produced citric acid is made
using A. Glucose In a healthy individual there should be no glucose in the urine. The term used to describe species on separate branches is paraphyletic, so we now know that the old family Scrophulariaceae was paraphyletic, so we now know that the old family Scrophulariaceae was paraphyletic.
bond in a glucose, amino acid, or fatty acid represents stored chemical energy. The water columns under the tension water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and adhesion water is pulled from the root cortex into xylem cells Cohesion and xylem cells Cohesion
because of the tension created by transpiration and the maintenance of a continuous column of water xylem sap CHALLENGE YOURSELF 1 The properties of water are very important in allowing fluid movement from the roots to the top of a plant. This is why variation is a strength and not a weakness in a population. There are two forms of
phytochrome. Because the ladder has two sides, there are two bases making up each rung. For any particular gene, the promoter is always on the same DNA strand. Plants and algae need to build their cell walls with cellulose, which is also made from long chains of glucose. The subunits are composed of ribosomal RNA (rRNA) molecules and many
distinct proteins. Upon completion of the translation process, a disassembling of the involved components occurs. In this condition a large amount of end-product is present. Neither allele is masked: both are expressed in the phenotype of type AB blood. In order to study the nature of an action potential, it is best to study an axon that does not have
myelin sheath, otherwise known as a non-myelinated neurone. Key points of the theory include: • about 2 billion years ago a bacterial cell inside • the eukaryotic cell and the bacterial cell formed a symbiotic relationship, in which both
organisms lived in contact with one another • the bacterial cell then went through a series of changes to ultimately become a mitochondrion. Notice that the trophic levels are labelled with the letter T, and think about the biomass in each trophic level? Count the number of Ts. You
should get 16. 197 04 The term 'fossil fuel' refers to the fact that the source of energy in the fuel comes from partially decayed onceliving organisms that died long ago, often millions or hundreds of millions or hundreds
continue the impulse chemically to the next neurone(s) or possibly a muscle. The primary waste product of this process is carbon dioxide. When a macrophage meets a cell, it can recognize whether that cell is a natural part of the body and therefore 'self'. 209 04 Ecology Consumer demands for wood
products such as housing, firewood, furniture and paper lead to massive deforestation. With this type of outbreak, fast and sensitive detection is required for diagnosis. Also remember that one of the environmental factors that denatures protein is per lead to massive deforestation. With this type of outbreak, fast and sensitive detection is required for diagnosis. Also remember that one of the environmental factors that denatures protein is per lead to massive deforestation. With this type of outbreak, fast and sensitive detection is required for diagnosis.
case, among the cells collected are foetal cells that are then grown in the laboratory. 4 Compare and contrast functional and structural plasticity of the brain. Conifers can be recognized by the fact that all of them produce woody stems and their leaves are in the form of needles or scales. At the plateau of this curve, natality and
mortality are equal, and emigration and immigration are equal. 80 Animation 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 year 593 Quiz Select the icon at the end of the chapter to view answers to exercises in this chapter xiii 01 Cells Essential ideas 1.1 The
evolution of multicellular organisms allowed cell specialization and cell replacement. Functional magnetic resonance imaging technology (fMRI) allows researchers to see which parts of the brain are active when a person is thinking a specific task. However, local anaesthetics like Novocain block the gated ion channel
through which Na+ is moving. This begins the positive feedback loop leading to birth. 525 12 Option A: Neurobiology and behaviour The structure of the ear Outer ear Figure 12.25 Anatomy of the Middle ear Inner ear semicircular canals human ear. 3 Describe the overall trend shown by the graph for the years shown, giving quantitative data in your
description. Conversely, an isopod in a damp place will remain there because that place suits it. This test provides data confirming the hypothesis that the plasmid has successfully transferred to the bacteria before it is put into the tobacco plant. 618 Numbers representing the optical density of the colour change being measured are reported in ELISA
tests. 358 In this section, we will discuss the cellular respiration that involves glycolysis and the three stages of aerobic respiration. The polar properties of proteins are important for the properties of cell membrane is inside the cell wall. These three tissue types are
all derived from meristematic tissue. While the first tRNA 'sits' in the ribosome holding the first amino acid, a second tRNA floats in and brings a second tRNA floats in and brings a second (again specific) amino acid. The histogram in Figure 7 shows the amount of time that 42 individuals of a particular specific) amino acid. The histogram in Figure 7 shows the amount of time that 42 individuals of a particular specific) amino acid.
chimpanzees, for example, when a female is fertile, many males may copulate with her to try to impregnate her. Niels Bohr (a Danish physicist who helped us understand how atoms work) Ellis 1970 Wiki Online wikis are filled with user-generated content on a wide range of subjects, including scientific ones, 7 Can you think of any animal behaviour
that would place a species high on the encephalization scale? The offspring followed a route halfway between each of the parents. Benzene is extremely undesirable in the environment because it is very stable (and so long lasting) and a known carcinogen. In the medical field, it is common to patent new pharmaceutical molecules developed in
laboratories so that only the initial company that invented the drug can manufacture and sell it. • The secondary structure is the formation of alpha helices and beta pleated sheets stabilized by hydrogen bonding. You do not need to remember the names of all the compounds formed in the Krebs cycle. The myelination of nerve fibres allows for
saltatory conduction. The probe is then added and any that doesn't stick to the DNA is washed off. Thus, even in linked genes, nature has found a way to increase variety through crossing over. and Draper, N. The hippocampus is important for short-term memory. Organisms on our planet are part of a balanced system in which the products of the
metabolic processes of one group of organisms are shared by all organisms. This is because there is an increased demand for oxygen for cell respiration during periods of heavy exercise or activity. Few people can explain it precisely, too often saying something incorrect such as 'sunlight is trapped in the air'. locus A gene is found at a particular locus
on a chromosome A gene for a specific trait occupies a corresponding place, called a locus (plural loci), on a chromosome (see Figure 3.2; there will be more about chromosomes in Section 3.2). When you have your cholesterol'. Just such a
transfer was done to make tomatoes more resistant to cold and frost. The offspring of these rapidly reproducing cells will then differentiate into the same cell type as the parent. Vision 2020 wants to give everyone in the world the right to sight. Cells on which a hormone has an effect are referred to as target cells. Are there enough data to be
confident of the results? Can we gain a greater understanding and better treatment of conditions such as depression by learning more about how these cells function? Insulin and glucagon are hormones that are both produced and secreted by the pancreas. This graph of normal distribution may help you understand what standard deviation really
means. The cell is elongated and ready for cytokinesis. To do this, we need the variables p and q: • p = frequency of the dominant allele (allele t in the example below). 2007), reproduced with permission; Figure 13.19 from Biodegradation of benzene by halophilic and halotolerant
bacteria under aerobic conditions. Applied and Environmental Microbiology, 70 (2), pp. He then carried out the following procedures. Their force of contraction is slight in comparison with the ventricles. One example that you may already be familiar with is the use of GFP for tracking the production of insulin. The area at the top that is cut is where
the stomach is located, and the lower area that is cut is where the very long small intestine continues. 7 (a) Has an exoskeleton made of chitin ....
                                                                                                                                                                                                                                              .. The contents of Table 10.2 can be summarized in the generalized formula for calculating 2, which is: (O - E)2 E = Greek letter chi 2 = O = observed values (the results of the
experiment) Note that the chisquared test should only be used if the size of the sample observed is greater than 30. bacterium bacterium bacterium bacterium bacterium radioactivity inside bacterium radioactivity inside bacterium radioactivity inside bacterium bacterium bacterium bacterium radioactivity inside bacterium radioactivity inside
experiment used radioisotopes as markers to label the DNA and protein of T2 bacteriophages. The other combines with two polar nuclei within the ovary to produce a triploid (3n) endosperm. Application: Tracking tumour cells using transferrin linked to luminescent probes. Why doesn't a pregnant woman secrete milk before giving birth to her child?
People with type II diabetes must control their carbohydrate intake carefully to keep their blood glucose level reasonably stable. Besides being a good source of fibre, although they are not the only fibre-rich foods. Perennials live for many years and when they die it is usually because of an area of the only fibre-rich foods.
infection or some other environmental factor. Polyploidy is much more common in plants than in animals. To understand better all the organisms around us we must study their cells. After exercising and perspiring a great deal of water, your urine does not contain nearly as much water and the more concentrated solutes give the urine a yellow colour
There are many, many other contributions of plants as well. (Check back to Section A.1 to review the different metabolic strategies of microorganisms.) The result is that environmentally undesirable properties of a substance disappear. This is called artificial selection and it should be obvious that it is certainly not the driving force of evolution in
natural ecosystems. These experiments have a control group and a variable group(s). There is nothing alarming about a slight variation from these expected values, but if there is a significant deviation it suggests that independent assortment is not happening and, instead, the genes of the traits being observed are linked. Genetics at this stage in the
chromosome's existence, the DNA has been replicated so that a full copy of the original DNA has been produced. What about environmental factors? Discuss some examples. Gene therapy uses viral vectors Viral vectors are a tool commonly used by molecular biologists to deliver new genetic material into cells. The heart rate can also be influenced by
chemicals. The biochemical cascade mentioned above increases neurotransmitters in the synapse and strengthens short-term memory. When a predator, such as a snake, catches and eats a small rodent, one of the main sources of nutrition that the snake is consuming is the muscle of the prey animal. At that distant time in Earth's past, under
conditions ideal for the formation of petroleum products, the dead remains of the organisms in the water did not fully decompose at the bottom of the ocean, and instead formed layers of sediment along with silt. The peptide bond is formed between an amino group of one amino acid and the carboxyl group of the other amino acid. This is referred to as
homeostasis. This method involves laying down a quadrat either every metre along the transect, or at specific intervals along the transect, for example every 2 m, 5 m, or 10 m, and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms found within each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms found within each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and then counting the organisms that hit each quadrat and the organism that hit each quadrat and the 
increase in number of chambers of the heart, from the two characteristic of fish to the four characteristic of birds and mammals, allows complete separation of deoxygenated and oxygenated and oxygenated blood. To remember the correct order of phases in the cell cycle and mitosis, remember the word 'shipmate'. The ELISA test is typically used to test donated
blood for the presence of HIV in order to ensure the safety of the blood supply. For example, the Sun is currently in a phase of high-energy output. CO2 + H2O H2CO3 CO2 CO2 H2CO3 (carbonic acid) H+ + HCO3- (hydrogen carbonate ion) When dissolved in water, the carbonic acid forms the H+ in the equation above, which is an ion that can
influence pH. Salvino D'Armate, an Italian, made an eye glass in the 13th century that allowed magnification for one eye. After every 20 cycles of PCR, approximately 1 million copies of target DNA have been produced. In some countries, receiving a blood transfusion can spread HIV, but that is no longer a risk in countries where blood and blood
products are routinely tested for contamination. CHALLENGE YOURSELF 5 Prepare a drawing of the ultrastructure of a prokaryotic cell based on electron micrographs. To learn more about Aplysia, go to the hotlinks site, search for the title or ISBN and click on Chapter 6: Section 6.5. NATURE OF SCIENCE Developments in scientific research
follow improvements in apparatus: William Harvey was hampered in his observational research into reproduction by lack of equipment. This layer makes it possible for some bacteria to adhere to structures such as teeth, skin and food. There is a positive correlation between the amount of fibre in a person's diet and the rate of movement of material
through his or her large intestine. Does the brain do this all by itself, or do we have some input into how this reorganization takes place? Usually, the life of a cell involves two major phases. In order to be used by humans, petroleum products must be trapped and pooled under a non-porous rock, preferably one that is bent by tectonic movement into a
dome, as seen in Figure 4.12. Paul Broca was a French surgeon who discovered the area of the brain involved in language. Wastes are kept at a low level in the dialysate. Wilkinson 1990 120 110 weight lost 100 donor time lost 90 80 starvation point recipient weight gained 70 0 12 24 36 time (hours) 48 60 563 12 Figure 12.54 Optimal
foraging in shore crabs. H OH H Where R = 1 of 20 variable groups Exercises 1 2 One way to check whether organic molecules are drawn correctly is to make a sketch based on the information given and then count the number of atoms of each element using a given or known formula. A short neck is an example of a characteristic that is not well
adapted for a giraffe's lifestyle. • Conditions are maintained at optimal levels for the growth of the microorganisms being cultured. Then lift the potometer pipette or glass tube out of the water for a few minutes until a large air bubble is visible. The true offspring may starve while the larger cowbird offspring consume most of the food brought by the
parents. A plant that produces flowers that are not attractive to insects will not have its flowers pollinated and will not produce any offspring. One way to answer this question is to carry out a statistical test called the chi-squared (2) test, which calculates how close our observed results are to the expected values. To prevent emphysema, it is common
sense not to even begin smoking, and to wear a protective mask when working around dust or chemical fumes. Filicinophyta, on the other two phyla described in this section. Bioinformatics uses many areas of computer science and mathematics to look for unique events and
patterns. In addition to resistance to breaking with tradition, or the insistence of some taxonomists to maintain stability in a name no matter what, there may be some scientists who disagree with the way new groups have been determined. 265 05 Evolution and biodiversity Exercises 14 Distinguish between analogous and homologous structures. The
lightest areas are where only actin is found. Biotechnology is posing a rising number of challenges to the legal institutions of the world. One fraction that is not shown in the diagram is naphtha, which is the main ingredient used to make plastics. If this experiment is done for two species of plants, are there any calculations you could do to compare the
two? This is because the haemoglobin of a foetus must have a greater affinity for oxygen than adult haemoglobin. B C D A B C D Figure 10.30 Gradualism and punctuated equilibrium are two contrasting views concerning the rate of speciation and evolution. The removal of carbon dioxide is especially critical because of global warming. Ca2+ ions
enter synaptic (terminal) buttons. Here is another set of data: ELISA tests for elevated blood levels of antibodies produced in response to Borrelia burgdorferi, the bacteria that causes Lyme disease. That limit is based on the temperature at which the enzyme (as a protein) begins to lose its three-dimensional shape because the intra-molecular bondseria that causes Lyme disease.
are being stressed and broken. We refer to such solutions as aqueous solutions. Skill: Use a table of mRNA codons and their corresponding amino acids to deduce the sequence of amino acids to deduce the sequence of amino acids to deduce the sequence of amino acids to deduce the sequence.
degenerating corpus luteum corpus luteum corpus luteum growing follicles. Figure 11.24 An ovary showing the stages in the production of a human Graafian follicle, leading to ovulation and the formation and the formation and the formation follicle stages in the production of a human Graafian follicle stages in the production of the corpus luteum.
phyla are those that are most useful in distinguishing the groups from each other, and full descriptions of the characteristics of each phylum are not needed. Insulin is another globular protein; it is involved in regulating blood glucose levels in humans. The importance of these nitrogenous bases will be discussed later in conjunction with
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the genetic code. The idea is that people who are taller should weigh more. 403 09 Plant biology Variety in flowers You only have to enter a flower shop or walk through a field to appreciate the tremendous variety and beauty of the reproductive structures of plants. Life on Earth is dependent on the fact that only a very small percentage of the total
number of microbes is pathogenic to any one species. Gas exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery thin type I pneumocyte facilitating exchange of O2 and CO2 oxygen diffuses into capillary small bronchiole tree blood from pulmonary artery are capillary small bronchiole tree blood from the capillary sma
carbon dioxide diffuses into alveolus When you take in air through your mouth or nasal passages: • the air first enters your trachea • then your right and left primary bronchi • then your right and
the great apes shown except one has the same number of chromosomes? • Chemoheterotroph organisms use preformed organic compounds as their energy source and as their energy source and as their carbon source. t-charts may take many forms, but all allow a direct comparison between related items or materials. 737 15 Option D: Human physiology 7 8 The vesicle goes to
the plasma membrane for exocytosis (secretion). Humans, some other primates, and guinea pigs are the only known animals where vitamin C is an essential vitamin. Predisposition to a genetic disease can be detected through the presence of markers. Each chromosome consists of two identical sister chromatids that separate and are pulled to
opposite ends of the cell (anaphase). Figure 12.18 The corpus callosum connects the two cerebral hemispheres. The reason that this does not happen is because the greenhouse gases absorb and retain the infrared radiation coming from the surface. 2n puberty begins 2n primary oocyte meiosis I first polar body (dies) n n n secondary oocyte
secondary oocyte ovulated and fertilization possible meiosis II (completed only if fertilized) n second polar body (dies) 2n zygote The body temperature of most human females increases by about 1°C soon after ovulation. Reflex conditioning Reflex (classical) conditioning can be used to modify a reflex response. 31 Name the genes. G3P 2 NAD! 2 P
Once pyruvate is obtained, the next pathway is determined by the presence of oxygen. Option A: Neurobiology and behaviour Understandings: Innate behaviour Understandings: Innate behaviour Hotelogy and behaviour A:4 Innate and learned behaviour Hotelogy and behaviour Hotelogy and behaviour A:4 Innate and learned behaviour Understandings: Innate behaviour B: Innate 
bond to a phosphate group. The two organisms, the Hatena and the green alga, continue to thrive in a symbiotic relationship. In 2013, 20 different tumour markers were in clinical use. The difference between the two approaches to studying animal behaviour is summarized in the following sentence. Below are four examples of hydrolysis reactions. All
endocrine glands produce one or more hormones. 13 The filtering action of the kidneys does not eliminate urea from the bloodstream. There is also a reduction of an ADP to form ATP. Some of the derived characteristics used to put birds and dinosaurs in the same clade are: • a fused clavicle (the 'wishbone') • flexible wrists • hollow bones • a
characteristic egg shell • the hip and leg structure, notably with backward-pointing knees. Botanists studying the chromosome number of x = 8, although sometimes species can have x = 7 or x = 9. The brightly coloured cells are endocrine (hormoneproducing cells)
which produce hormones that are then transported away by the bloodstream. Worked example You are walking outside with a friend who is wearing a red and white shirt. The answer in seconds: the result was 100% tall plants. Often the damaged blood vessels
are in the skin, and so pathogens then have a way to gain entry into the body. These secondary walls are often interrupted by areas of primary wall. The chromatin phase of DNA is present in the cell when it is not dividing. This is a bioinformatics website that is held at the European Bioinformatics Institute. Atropine stops the action of the
neurotransmitter, acetylcholine. Lipids that contain polyunsaturated fatty acids tend to be liquids at room temperature. Evolutionarily, the logic is simple: if someone has enough fat reserves, that person does not need to eat as much anymore. These two areas are called the binding sites of the antibody. Given the height of some plants, like the
sequoias of western America, the transport of water from the roots to the tree top can be a mammoth task. This is simply not true. For example, should religious communities keep abreast of scientific discoveries related to Darwin's theory of evolution by natural selection? One of the results of cell reproduction and the subsequent differentiation
process that occurs in multicellular organisms is emergent properties. aureus that have developed a resistance to many types of antibiotics. (b) Can a person who has blood type A Rh- receive blood from someone who is O Rh+? Lorenz noticed that goslings always follow their mother everywhere in the first stages of their life. scope, motivation and
applications interaction with personal knowledge A knowledge framework applied to the area of knowledge of the natural sciences. Some people suffer from a condition called deep vein thrombosis (DVT), where a thrombus develops
                                                                                                                                                                                                                                                                                                                                                       .. Thus the pituitary does not produce FSH and LH, and no new Graafian follicles
in one of the larger veins, usually in a leg. Parenchyma (food storage) cells Food storage cells E Figure 9.16 bioweb/images/bimg25sm.jpg C A Pits 1 2 3 4 5 6 B D What type of vascular tissue is I? Bird (b) Body covered with scales ......
are produced within the ovaries. But in the example above with nine plants, the median is 6.2 cm. It blocks the reuptake of dopamine so that it persists in the synaptic cleft. They grew bacteriophage viruses in two different types of cultures. Because in garden pea plants, the allele for tall is dominant over the allele for short plants, thus masking the
short trait in heterozygotes. In other words, the same embryonic tissue that gives rise to the clitoris gives rise to the testes, the same embryonic tissue that gives rise to the testes, the same embryonic tissue that gives rise to the clitoris gives rise to portions of the penis, etc. Why does water form hydrogen bonds between its molecules and the sides of the xylem vessels? Applications and skills: Application:
Use of artificial pacemakers to regulate the heart rate. Animal models have helped us understand the problem of addiction. Surgeon fish. And yet fossils of their ancestors have been found on the continents of Africa, Europe, and Asia. After 11 460 years, half of that amount (now 25% of the original amount) will have decayed. Type I is typically caused
when the cells of the pancreas do not produce sufficient insulin; type II diabetes is caused by body cell receptors that do not respond properly to 311 06 Human physiology insulin. A specific neurotransmitter is received by a specific receptor, which is similar to how you receive an email with your address on it. • Memory is the process of encoding,
storing, and accessing information. Unfortunately, the infected (host) cells in humans is one of the 288 key lymphocyte cell types involved in the immune responses just described. Haem contains an iron atom that binds to oxygen. A density-dependent factor affects large populations and small populations differently. At its anterior end, each
spermatozoon contains an organelle called an acrosome. The common earthworm is an annelid. This occurs in the cytoplasm and it does not result in any further production of ATP, cepa var. The myelin sheath is actually a series of cells, called Schwann cells, that have each wrapped themselves around the axon multiple times, creating multiple layers
of the same cell membrane. This is what causes sickle cell disease. What does this story reveal about the influence of politics on scientific theories? However, dideoxyribonucleic acid and ddNTPs are still used. The DNA is attracted to the histones because DNA is negatively charged and the histones are positively charged. We can describe the energy
flow in the general process as shown in Figure 8.18. • This signal reaches the nucleus and activates transcription. coli. This causes the tRNA to fold and take on a three-dimensional structure. This test is typically done very soon after birth so that a limited protein diet can be implemented as soon as possible if needed. To answer the question, you will
need to recall that we expect a 9:3:3:1 ratio, meaning that from the total of 556 peas, 9 out of every 16 are expected to be round and yellow, 3 out of every 16 are expected to be round and green, etc. Some of these proteins may be receptors for peptide hormones. This means we are interested in natural classifying organisms by their
descent from a common ancestor. Do they have a bias that I should know about? The expected ratio after two generations of crosses is 3:1 (for every 3 of the first type of plant, we would expect 1 of the other type): look how close Mendel got. Extra or missing chromosomes Sometimes errors occur during meiosis and a child can receive an atypical
number of chromosomes, such as 47 instead of 46. The five steps of the Punnett grid method. 22 What physiological advantage does the Bohr shift provide? This is why a brain cell needs twice the amount of energy as any other cell in a body. ! Puff of serotonin Figure 12.41 The effect of a slow-acting neurotransmitter on a presynaptic neurone. glial
fibre inner surface Glial cells provide a scaffolding network along which the immature neurones migrate. Their ancestors were mammals that lived in less arid regions and had already evolved to use urea as their nitrogenous waste. Around the time of Darwin (1860s), a phenomenon was underway that continued for over a century: the industrial
revolution. Notice the delay between the two events that allows the atria to contract, followed shortly after by the contraction of the ventricles. Solutions 1 2 3 4 5 Being eukaryotic is the primitive characteristic shared by all. Na+ Intracellular 2 The binding of sodium ions causes phosphorylation by ATP. 392 1 When moving a plant from one place to
another, suggest why is it important to leave some original soil around the roots. • Leave it for 2-5 days until little white roots have pushed their way down into the water. In this case, one base is substituted for another so that the sixth codon in this sequence of haemoglobin, GAG, becomes GTG. An individual that is poorly adapted to its environment
such as an insect with deformed mouthparts that make it impossible to feed, is not likely to survive to adulthood and be able to reproduce. Test cross A plant breeder might need to know whether a specific tall plant from the F2 generation is a purebred for tallness (homozygous dominant, TT) or whether it will not breed true for tallness (heterozygous
Tt). In the countries where this policy has been put in place, there are people starving. • Go to the BLAST website: www.pearsonhotlinks.co.uk/url.aspx?urlid=68764 (or do an internet search for 'Blast'). 

Biofilms possess emergent properties. As you can see in Figure 2.42, two specific amino acids are now being held side by side. For his isolation
technique, Went used agar blocks. The software can make a cladogram or phylogram for us. • Application: Questioning the cell theory using atypical examples, including striated muscles, giant algae, and aseptate fungal hyphae. In humans, it is at about this stage of development that a pregnancy test detecting HCG could be
used successfully. Both the enzyme and substrate are in motion and the rate of that motion is dependent on the temperature of the fluid. This experiment was carried out by Matthew Meselson and Frank Stahl, with their results published in 1958. This cycle is also called the tricarboxylic acid cycle. For example, astounding as it may sound, placebos
seem to have an effect even when people are told that they are receiving a placebo. Then you capture another sample of 100 grasshoppers and find ten of them are marked. Your blood glucose levels decrease as cells use the glucose for cell respiration. What are the structures labelled E? Broca's area is labelled 'speech centre' in Figure 12.16. This
occurs in a liquid medium in flasks outside the batch fermenter, and produces pyruvic acid as the primary metabolite. Answer: patient C. Use of software to construct simple cladograms and phylograms Now we will use a database to find out about evolutionary relationships. The importance of phosphorylation in this step is that it creates a less stable
molecule. When geneticists map out the sequences of DNA, they carefully map the locus of each sequence. 1 The fact that there are sceptics and critics of the IPCC reports on global climate change is a good thing. For example, the mathematics here does not explain whether it is the males choosing the females or the females choosing the males. (!)
oxygen taken in (") oxygen given off Figure 2.51 Graph showing (") photosynthesis 0 cell respiration (!) day 1 night 1 day 2 night 2 Measuring the rate of oxygen production or carbon dioxide intake is considered to be a direct measurement of photosynthetic rate as long as a correction is made for cell respiration. Kidney nephrons and osmoregulation
Any regulatory mechanism that affects water balance in an animal's body is part of osmoregulation. Now meiosis II takes place in order to separate the sister chromatids (see Figure 3.18). However, correlation is not cause. A.5 Communications between neurones can be altered through the manipulation of the release and reception of chemical
messengers. Compartmentalization enables different chemical reactions to be separated, which is especially important when adjacent chemical reactions are incompatible. 8 In a population of 278 mice, 250 are black and 28 are brown. Evolution and biodiversity Angiospermophyta The most obvious vegetative characteristic that allows angiosperms
(i.e. members of the Angiospermophyta) to be identified quickly are their flowers and fruit. Having two separate morphologies gives these species a better chance of survival in places where water supply and food sources are variable. D Enzymes of the Calvin cycle are highly concentrated. III. B Transfer of genes between species. The reasons for
concern about this issue are that: • microorganisms are much more abundant than macroorganisms are extremely resistant to chemical disinfectants 2
During voyage cargo hold empty ballast tanks full 3 At destination port loading cargo discharging ballast water once released, microorganisms, because of their small size, can easily become an invasive species pathogenic bacteria, viruses, and microalga can have devastating effects on the economics of an area and the balance of the ecosystem field
sampling has shown that 10% of ballast water tank surfaces are covered with biofilms. In competitive inhibitor competes directly with the usual substrate for the active site of an enzyme. Let's apply this information to how chlorophyll absorbs light for photosynthesis. 100 m radio waves visible light 400 nm
430 nm 500 nm 560 nm 600 nm 650 nm 600 nm 650 nm 740 nm Inside each of these plant leaf cells are many green chloroplasts. Table 4.2 The table of observed values Shade (woodland) Sun (prairie) Grand total Fern absent 6 13 19 Fern present 14 7 21 Grand total 20 20 40 Below, the expected value of 9.5 is from the calculation: (20 19) 40 and the expected value
of 10.5 is from the calculation (20 21) 40. The mother is not affected so she must be hh. Once the organisms are moved to a new location, the success of their invasion is a function of their ability to survive and reproduce. The bank of sequencing computers at the Sanger Center. This kind of change in the DNA code is produced by a mutation. 2006 (ii)
Compare the effect of temperature on photosynthesis with the effect of temperature on respiration in sweet orange. Molecules of DNA are found within the confines of the nucleus, yet proteins are synthesized outside the nucleus of DNA are found within the confines of the nucleus, yet proteins are synthesized outside the nucleus of DNA are found within the confines of the nucleus, yet proteins are synthesized outside the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the confines of the nucleus of DNA are found within the nuc
warming, tenets of the precautionary principle say that preventative action should be taken now to reduce carbon emissions and greenhouse gas production before it is too late. However, it is recommended that you practise with several different problems so that you understand how it works. In simple terms, DNA controls the proteins produced in a
cell. Screening for desirable traits is possible, and may soon become a routine part of the IVF procedures offered by medical clinics. Although there are a few exceptions to this, virtually all organisms use the same genetic code, and they use the same genetic code, and they use the same 20 amino acids to construct their polypeptides. That way, by only mentioning the people who stayed
in the study, they can report that, at the end of the trial, none of the participants complish this same function, such as the Malpighian tubules of insects. It is estimated that 100 000 people died at its impact or shortly after, but it is difficult to estimate how many died
later from the effects of radiation in the city. The structure and function of the human eye posterior chamber filled with vitreous humour we depend on more than our senses to know the biological world. Some people think there has been a paradigm shift over the last 50 years regarding
 waste disposal. Some of the beautiful colours of hot springs in places such as Yellowstone National Park are because of the presence of archaeans. Figure 3.10 How sex is determined: will the baby be a boy or a girl? Synapses can also occur where a motor neurone adjoins muscle tissue. Carbon is available to photosynthetic organisms as carbon
dioxide gas in the air or dissolved in water. Figure 15.18 The position of the hypothalamus and pituitary, which is conducive to the movement of molecules in and out of the bloodstream. The primary structure is simply a chain of amino acids attached by peptide bonds. Theory versus myth Do the ends justify the
means? Can we possibly know what the distant past was like, or what the distant future will hold? CHALLENGE YOURSELF 8 Use the symbols mentioned above to represent all the possible nucleotides of DNA. There are alignments between many genes of the mouse and humans. Data are collected on the type of fish, age, length, and breeding
condition. Figure 13.13 Biolistcs (gunshot). (Total Total 9 marks) 4 Describe the roles of structures at the elbow joint, including nerves, muscles and bones, in movements of the human forearm. Urea is a waste product from the metabolism of amino acids. An important step in this preparation is DNA replication, enabling the cell to have a copy of each
chromosome. ATP keeps each myosin head ready for action, waiting for an action potential from a motor neurone. He backs out of the nest and the female enters. 745 15 Your blood pressure is typically measured each time you visit the doctor. Soybean products include tofu, soymilk, and soy sauce. Not everyone was happy about putting foxgloves
with plantains, because visually the plants do not appear to have much in common. For example, in purebred snapdragon flowers, sometimes white × red = pink. Mutations in the leptin gene can contribute to obesity. Are you aware that some of the foods you eat may very well contain genetically modified crops? A kHz is 1000 cycles per second of
waves. 187 04 Ecology Figure 4.3 Pyramid of energy. specific binding of [1251] MIL (% dose\g pre-frontal cortex) 0.30 Write the answers to questions as fully as you can. These are called plasma proteins because they circulate in the liquid portion of blood called blood plasma. If one player took more turns or more points than the rules allowed, that
person would be considered a cheater and might be asked to leave the table. AMP was taking Myriad to court because they thought the BRCA gene sequences should be available freely for diagnosing cancer. As you will recall, these producers are eaten by consumers, which use the carbon in their bodies. Living cells typically exist in an environment
in which there is water within the cell (cytoplasm) and also water in the surrounding environment (intercellular fluid, fresh or salt water, etc.). The role of macrophages in determining self versus not-self cells is called non-specific immunity, even though no real immunity is gained by the action of the macrophages. Its functions are: • the production of
membrane phospholipids and cellular lipids • the production of sex hormones such as testosterone and oestrogen • detoxification of lipid-based compounds • helping the liver release glucose into the bloodstream when needed. This
detectable radioisotope was present in the protein outer coat of the viruses produced in this culture. There are three types of plastid that occur in plant cells: • chloroplasts, which are brightly coloured and
synthesize and store large amounts of orange, red, or yellow pigments. Mitochondria It is inside the mitochondria and in the presence of oxygen that the remainder of cellular respiration occurs. Guidance RNA polymerase adds the 5 end of the growing mRNA molecule. As a result, the three alleles for blood types
are written as follows: IA, IB and i. 8 How does auxin alter gene expression when influencing cell growth rates? Such data provide evidence that the template is inherited. nuclear membrane Figure 1.9 The nucleus has a double membrane with pores and contains a nucleolus. The upper end of the normal range (about 75 mm Hg or 10 kPa) is the
oxygen partial pressure found within the lungs. Learned behaviour is dependent on the environmental context. The answer to this question is two-fold. Reward pathways are brain structures that induce pleasurable effects and when activated reinforce behaviour. Such a barrier can be geographical, temporal, behavioural, or related to the infertility
caused by hybridization. • In the large rectangle carefully type in these nucleotides in lower case letters. It is expressed in units of mass, but also takes into account area or volume. Option A: Neurobiology and behaviour Cerebral hemispheres are associated with intelligence, personality, sensory impulses, motor function, organization and problem
solving. Despite the fact that some water moves out of the descending portion of the loop by osmosis, the filtrate that moves up the ascending loop and into the distal convoluted tubule is still relatively hypotonic (has a relatively hypotonic (has a relatively hypotonic).
production of a very concentrated urine. Application: Incomplete closure of the embryonic neural tube can cause spina bifida. Skill: Analysis of pedigree charts to deduce the pattern of inheritance of genetic diseases. Remember also that organisms living in water produce carbon dioxide through cellular respiration. 4 No-
catch zones show an average 23% improvement in biodiversity and an increase in fish stocks around the protected area. Immunity develops within the lifetime of an individual; pesticide resistance is a change that evolves in a population from one generation of rats to the next generation. • Physical activity reduces the risk of CHD. What complicates
things is the fact that we usually want to consider diploid organisms that carry two copies of any particular gene. The control of flowering in angiosperms Light is a very important factor in the life of a plant. 5 5 3 5 Primers T A G C C G A T C G C cycle 1 yields 2 molecules 3' Extension stage 3 DNA polymerase extends the 3 end of each primer.
Compartmentalization also allows chemicals for specific reactions to be isolated; this isolation results in increased efficiency. And it is worth all that trouble. Studies were published in recognized botany journals and now foxgloves have a new family. 495 12 NATURE OF SCIENCE Use models as representations of the real world: developmental
neuroscience uses a variety of animal models. While there is much new and updated material, we have kept and refined the features that made the first edition so successful. Severe cases of altitude sickness can lead to fluid accumulating around the brain or in the lungs, and can become life-threatening. The medical term 'scrofula' refers to an
infection of the lymph nodes in the neck. A fish with an oddly shaped mouth may, in fact, be incapable of feeding adequately and die of starvation. The symptoms for both can be quite serious because water is the solvent component of our blood and cytoplasm. When they are feeding adequately and die of starvation is small; when they are feeding adequately and die of starvation.
 spread apart, the standard deviation is large. Early experiments with brain lesions were done in the mid-1800s with people who had particular injuries. For the two strands of DNA, imagine a double-stranded DNA molecule as a ladder (see Figure 2.32). Or would he have figured out linked genes decades before anyone else discovered them? D
Covalent bonds between hydrogen and oxygen within water molecules. The cranial nerve branches include not only facial sensory and motor nerve impulses, but also the autonomic nervous system control of heart rate and ventilation rate. Scientists have shown that plasticity can vary with age, and that it is influenced by both environment and
heredity. Such graphs work well for situations where one x-value may have multiple y-values. This predictive metabolite might allow patients to slow down the onset of the disease. They control the entry and removal of specific molecules from the cell. 

Guidance Amphipathic phospholipids have hydrophobic properties. DNA
polymerase I then replaces the primer with nucleotides. The members of this genus will have all evolved from a common ancestor, and this will be evident in the similarities between their gene sequences. The veins occur roughly in the middle of the leaf so that they are near all the leaf cells. How is the scientific method different for a scientist who
studies fossils and evolution compared with a scientist who studies genetic traits in contemporary organisms? This can easily lead to a myocardial infarction (heart attack). D.5 Hormones and metabolism Understandings: Endocrine glands secrete hormones directly into the bloodstream. Helicase unwinds the double helix and separates the two strands
by breaking hydrogen bonds. Use Figures 9.14 and 9.15 to help locate xylem and phloem tissue in root and plant crosssections. Social factors are not considered in these experiments. 13, Copyright © 2007, University of Rochester; Figure 13.37 from Life: the science of biology, 4th ed., Sinauer Associates and WH Freeman (Purves, William K. The
200 now? The 'lost' carbon atom is given off in a carbon dioxide molecule. Table 2.2 Common categories of molecules Category Subcategory Subcategory Subcategory Subcategory Carbohydrates Monosaccharides Glucose, galactose, ribose Disaccharides Glucose, galactose, fructose, ribose Disaccharides Monosaccharides Glucose, galactose, fructose, ribose Disaccharides Monosaccharides Monosaccharides Monosaccharides Monosaccharides Glucose, galactose, fructose, ribose Disaccharides Monosaccharides M
 Enzymes, antibodies, peptide hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Triglycerides Fat stored in adipose cells Phospholipids Lipids forming a bilayer in cell membranes Steroids Some hormones Steroids Some hor
and interesting. How the scientific community conveys information concerning its research to the wider society is very important. Attempt to utilize both approaches to explain the functions of life as demonstrated by a single cell. The condition that results from this mutation is therefore called sickle cell disease, also known as sickle cell anaemia. The
chances are she is the victim of something we all are susceptible to: confirmation bias. (Total 1 mark) 4 What is the role of NADH + H in aerobic cell respiration? Centre left is the haem group (blue) with bound oxygen (red). The beneficial outcomes of the technique of pathway engineering, which was only developed in the 1990s, include:
responds to the chemical messages by forming synapses with the target cell. Try to set at least some limited criteria for test subjects. This is especially dangerous when the travelling clot lodges in a vein within a lung. Look back at the nutritional types of microorganisms. In many instances the target tissue is located far away from the endocrine
gland. Endocytosis occurs when a portion of the plasma membrane is pinched off to enclose macromolecules or particulates. blastocyst surrogate mother Dolly was made. p2! 2pq! q2 " 1 frequency of heterozygote Before you move on to the next section, try the equation. As consumer
demands for fuel and food increase, so the excess production of waste gases increases. A genetic marker may be a short DNA sequence like a SNP or a longer DNA sequence like a SNP or a longer DNA sequence. Cells break down (or metabolize) their organic nutrients by slow oxidation. PUBMED: click on the number next to PUBMED and you will be taken to an article published by
Reference 1 authors. It was not long before other substances, such as amino acids, were synthesized from inorganic precursors in various laboratories. More and more of the drug is needed to have even a normal sense of well-being. If ADH is not present, the collecting duct becomes impermeable to water. In this sketch, you can see the three smooth
muscle layers of the stomach that provide a churning action to mix the food thoroughly with the gastric juice. A table like the one below can be used to highlight the differences. • a person who does not have the Rh protein is Rh negative. At the Tohoku University in Japan, Dr Higuchi and his colleagues
have used QDs labelled with antibodies and a fluorescent-sensitive video camera to film QDs as they travel through the bloodstream of a mouse. The nitrogenous waste (mainly uric acid) and excess water (if any) move within the Malpighian tubules to the proximal end that empties into the gut. 1.2 Eukaryotes have a much more complex cell structured through the bloodstream of a mouse.
than prokaryotes. You are probably wearing cellulose right now, because any textiles made of cotton are made of plant cellulose. Without these essential amino acids, a plant cannot synthesize the proteins needed for growth. 251 05 Evolution and biodiversity Chordata The chordates are organisms that have a notochord at some point in their
development. This is the dilemma of current tobacco companies and the people that are addicted to their products. • Place the cap on the bottle need sunlight. This often leads to irregular, thick, and wide bone growth. The breakdown of organic molecules for ATP
that inactive DNA is usually highly methylated compared with DNA that is actively being transcribed. 7 If an individual took a chemical that increased the ability of hydrogen ions to move through the phospholipid bilayer of the mitochondrial membranes, what would the effect be on ATP production? 20 million? Next to the human's sequence are two
other species, A and B. Once the minerals have hardened and crystallized, Amount of decay a long time after death no more 40K ions can be added. In the environment of the nucleoplasm, there are free-floating nucleotides. Print out a picture with missing labels and practise labelling the eye until you are sure you have learned all the parts perfectly.
It also catalyses the addition of free RNA nucleotides to the growing mRNA strand. In the centre of the two guard cells that occur together is the stoma (opening), or darker area, through which gas may enter and leave the leaf. The process now becomes repetitive: as another peptide bond forms, the ribosome moves on by another triplet, and so on. 5
P CHALLENGE YOURSELF 9 Examine the first diagram in Figure 2.29 representing the general structure of a nucleotide. Today, the percentages of carbonaria in a population rarely go above 30% and are often 0%. The catalyst will not be used up and so the enzyme will be available to act as a catalyst many times over. Because there are
complementary bases in the single-stranded tRNA, hydrogen bonds form at four areas. Locate as many of the structures of a plant cell as you can. If these percentages are converted to ratios, the numbers are close to the expected ratio for alleles that are passed on independently and are not found on the sex chromosomes. (c) Progesterone. The
impulse that moves down the presynaptic neurone is called the action potential. The height of each rectangle corresponds to a quantitative value. 7 Why is meiosis referred to as a reduction division? This bar chart shows the percentage of crop adoption over a 10-year period. • The result is a series of new strands, some dozens of bases long, others
only a handful of bases long, and some that have all the bases of fragment 1. Only specific substrates can combine with particular active sites. Thus there is only a true ovum for the very brief period between the spermatozoa starting to fertilize the female gamete (the secondary oocyte) and the haploid nuclei fusing to form the zygote. This seems to be
the controlling factor for flowering in short-day and long-day plants. • Enzymes can be denatured. Each ribosome consists of a large subunit and a small subunit. When fully formed, two foetal blood vessels within the umbilical cord carry foetal blood to the placenta. This means that reactions taking place with an enzyme can occur with a lower input
of energy than the same reaction taking place without the presence of an enzyme. When a patient has a brain injury causing lack of language production, it is called Broca's aphasia. . H H C C H H The C-H bonds hold a significant amount of energy, and, because there are many of them in long chains, each hydrocarbon molecule is rich in energy than the same reaction taking place without the presence of an enzyme. When a patient has a brain injury causing lack of language production, it is called Broca's aphasia. . H H C C H H The C-H bonds hold a significant amount of energy, and, because there are many of them in long chains, each hydrocarbon molecule is rich in energy than the same reaction taking place without the presence of an enzyme.
ready to be released by burning. A r2 = 0.45 Figure 11 Three examples of data that have been modelled with a linear regression. Animal experimentation has allowed us to see exactly what causes some of our behaviour. What is the role of HCl during the digestive process? One type of leucocyte that is involved 286 very early on in the
process of fighting off a pathogen is called a macrophage. This is part of your specific immunity, because of the specificity of the molecules involved in the 'match'. 789 Mathematics, and information and communication technology skills Table 3 Cormorant size data Pair number Size of female cormorants, cm Size of male cormorants, cm 1 43.4 41.9 2
47.0 44.2 3 50.0 43.9 4 41.1 42.7 5 54.1 49.5 6 49.8 46.5 r = 0.88 The r-value of 0.88 shows a positive correlation between the sizes of the two sexes: large females mate with large males. Hypothalamus controls the pituitary gland, which secretes hormones. There is one per year. Sometimes laws of nature follow patterns that can be expressed in
mathematical equations. • White cells release histamine in response to antigens. 319 06 Human physiology Practice questions 1 The first figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine, and the second figure shows a cross-section through the small intestine th
males with low sperm counts • males with impotence (failure to achieve or maintain an erection) • females who cannot ovulate normally • females with blocked Fallopian tubes. 556 • They are released by the pituitary gland during stress, injury, or exercise. Primase allows the joining of RNA nucleotides that match the exposed DNA bases at the point
of replication. Generally speaking, however, the number of chromosomes is a characteristic feature of the cells of a species. • NATURE OF SCIENCE Understanding of the underlying science is the basis for technological developments: the discovery that electrical stimulation in the auditory system can create a perception of sound resulted in the
development of electrical hearing aids and ultimately cochlear implants. Solutions 1 2 3 4 Aerobic. Nutrients can be absorbed to give you energy, help strengthen your bones, or even prevent you from getting a disease. Defibrillation is a process carried out using a device that delivers an electric shock to the heart and resets the electrical signals
starting with the SA node. Recently, more studies have been carried out that indicate that this learning, which was once so beneficial to the blue tits, has now been lost. This occurs when the protein that carries the amino acid cysteine is absent from kidney cells. On Earth, the mountains, forests, rivers, and oceans absorb some of the sunlight and are
warmed. 2 What is the fundamental difference between an essential nutrient and a non-essential nutrient? They accomplish this in the following manner. The translocation phase actually happens during the elongation phase. Divide 56.7 by 9 to find the mean (average). Not knowing of the dangers when she was studying
radium, the pioneer Marie Curie, the first person to win two Nobel prizes, carried samples of radioactive materials 154 around with her, and kept them on laboratory tables without any precautions. Table 1.6 Microscope total magnification Diameter of field
of view (mm) Diameter of field of view (µm) Low Medium High 2 Determine the diameter of the field of view (field of view (field of view (processor)) is the circular area you can see when you look through the ocular lens of a microscope. Flood with iodine. The person is now responding to a musical note in a new way. Studies of male twins gives some support
to the idea of a genetic predisposition, indicating that a genetically determined deficiency of dopamine receptors predisposes certain individuals to addiction. This is yet another source of variation in the formation of sperm cells and egg cells. Sometimes, in the nature of science, a theory helps explain a phenomenon and then multitudes of similar
phenomena support the theory. 708 Conditions that favour nitrification occurs as a result of the actions of two bacteria. The active immune response may take too long for a snakebite victim to benefit, thus antivenom provides the immediate protection. Insulin is a protein hormone and is produced by protein synthesis
In response, some species are destroyed and others adapt to their new surroundings, exploiting the niches made available by the extinction of competing species. 567 12 Option A: Neurobiology and behaviour Practice questions relative concentration/% 1 In many vertebrate species, individuals of one or both sexes select for some features among
potential mates in an effort to optimize their reproductive success. Alan Damon, Randy McGonegal, Pat Tosto, Bill Ward xi How to use your enhanced eBook Highlight parts of the text Jump to any page Switch from single- to doublepage view 13 Video Search the whole book Create notes Zoom Option B: Biotechnology and bioinformatics that causes
resistance to the herbicide glyphosate. Only women can be heterozygous, XBXb, and, as a result, they are the only ones who can be carriers. While this blood is in the capillary bed surrounding a cluster of alveoli, oxygen diffuses from the air in each alveolus through the membranes, which is only through two cells. How can you explain that?
Monounsaturated fatty acids If one double bond exists in the chain of hydrocarbons, the fatty acid is not saturated any longer: it has two empty spaces where hydrogen atoms could be. unintended harm to other organisms, such as insect pollinators and amphibians reduced effectiveness of herbicides possible human health risks, for example someone atoms could be.
studies have found glyphosate in human urine. 419 10 Genetics and evolution Independent assortment of genes Gregor Mendel's law of independent assortment of the separation of another pair of alleles. Ca2+ Tropomyosin ATP A
binds to troponin exposes binding site binds to myosin B binds to myosin B binds to myosin binds to myosin B binds to myosin b
else acting as a timer and recorder. Taxpayers? Medium corn steep liquor (peptides) lactose yeast extract (nitrogen) ph buffers minerals batch fermenter Starter culture penicillium 10 times in 6 days remove 30% culture add 30% fresh medium rotating filter filtrate dissolve in butylacetate fungal cells animal feed potassium ions added to precipitate
salt of penicillin wash, filter, and dry 99.5% pure penicillin Figure 13.3 The fed-batch production of penicillin. • When presynaptic neurones are depolarized they release a neurotransmitter into the synapse. Various molecular components of the insect's blood enter the Malpighian tubules close to the distal end and then undergo a selective
reabsorption process. Sister chromatid separation It is not until meiosis II that the sister chromatids of each chromosome are separated by Pfr. The NS that Pavlov used was the ringing of a bell (see Figure 12.35). The longer the branch, the greater the divergence. If
it is, then competitive inhibition is being represented. Enzymes are used to chop up the long filaments of DNA into varying sizes of fragments. In addition to these zoological congresses to discuss animals, there are international congresses for many forms of life, including algae, fungi, plants, and bacteria, and each one has their own code for
nomenclature. Ionic bonds between positively and negatively charged side chains. 4 Record raw data, including units (minutes) and uncertainties (± 0.5 minutes). However, we have also found that they can be part of the solution to dealing with pollution in our environment, such as treating sewage, industrial waste, and contaminated soil. If stomatal
density is being tested, a method to count the stomata per unit area would be added. For example, scientists now know that the locus of the gene controlling a protein called transducin that enables colour vision is found on chromosome 1. 12 Predict the relative amount of ADH produced by a person who has been exercising vigorously and has not had
a chance to hydrate. As the carbon dioxide is dissolved in the water, it forms an acid. Application: Investigation of functions of life in Paramecium and one named photosynthetic unicellular organism. Children with rickets do not reach their optimal height during growth, and their legs are often bowed inwards or outwards at the knees. Some
eukaryotic cells have a cell wall. Critics of punctuated equilibrium argue that the 'jumpy' effect of this theory could simply be an artefact of the incompleteness of the fossil record. 11 What is the importance of scale bars on micrographs? The vaccine was produced by a genetically engineered potato. Scientists have used a molecular tool called green
fluorescent protein that they attach to bacterial genes to mark which genes are acting. This adhesion molecule is also a type of CAM, called immunoglobulin CAM (IgCAM), and it acts like a lock and key. The accepted new model for enzyme action is called the induced-fit model. In August 2005 an article was published in the Journal of Zhejiang
University Science demonstrating that Pseudomonas aeruginosa can biodegrade crude oil if another molecule is present. Grasses, a type of monocotyledonous plant, have tiny, almost inconspicuous flowers. U C C tRNA is a single strand of RNA nucleotides but has areas where the strand has complementary base pairing within itself. The entry of
auxin into a cell is called auxin influx. Untold numbers of copies of DNA can be made by PCR (amplification). Oil and gas as fossil fuels In some cases, when left in the correct conditions, partially decomposed peat can be further transformed into coal. This movement moves trapped pathogens up and out of mucous-lined tissues such as your trachea
Individual surviving hybridoma cells are now cultured in separate containers. D They are only produced by human activity whereas CO2 and CH4 are also produced naturally. Genetic modification of crops has many risks to be considered: • • • • the potential for herbicide-resistance genes to escape into the wild population Amflora is a genetically
optimized potato that produces only one starch component and is used for technical applications. The pressure that occurs within the phloem, as well as the composition of phloem sap, has been demonstrated using the stylets of aphids in the method described above. chromosomes have moved to the equator Anaphase Examine the figure below. Using
a bacterium that naturally infects plants as a vector, a herbicide-resistant gene has been introduced into soybeans, Glycine max. To account for this, veins have thin walls and a larger internal diameter. See if you can find a paper by Karen S. Why are such valuable resources squandered on so many excess cells that are never going to give rise to
viable offspring? The goat that is being used to produce pharmaceuticals is cloned to have the desired gene. In addition to glycogen, other nutrients stored by the liver, as summarized in Table 15.2. Table 15.2. Nutrients stored by the liver, as summarized in Table 15.2. Table 15.2
Iron is removed from haemoglobin, and later sent to bone marrow Vitamin A Associated with healthy bone growth The liver recycles components of erythrocytes and haemoglobin Erythrocytes have a typical cellular life span of about 4 months. 

Application: Conversion by Pseudomonas of methyl mercury into
elemental mercury. Each 'lub dub' is the sound of one cardiac cycle (one heart beat) and, for the most part, is the sound of the heart valves closing. If humans were to store large concentrations of glucose in certain cells of the body for long-term energy storage, those cells would swell to ridiculous proportions because the glucose would attract water
into the cells due to the surrounding hypotonic fluids. tCount out 200 popcorn kernels and put them in a bag. Genetic fingerprinting techniques confirmed that all the subjects tested were descendants of the original introduced lizards, but they were very different from their ancestors. Solution Using the numbers calculated in the previous worked
example, we can complete the table as shown in Table 10.8. Table 10.8. Table 10.8 Allele frequencies Genotype frequencies Recessive t q 0.10 Dominant T p 0.90 Homozygous recessive tt q2 0.01 Heterozygous Tt 2pq 0.18 Homozygous dominant T p 0.90 Homozygous Tt 2pq 0.18 Homozygous Tt 2pq 0.18 Homozygous Tt 2pq 0.19 Homozyg
percentages of these genotypes is 81% + 18%, which gives 99%. It is always present at one stage in the development of a chordate organism, but can be absent from other stages. In each of the four bivalents, there is a maternal chromosome (lue). The actual absorption occurs through cells in an epithelial layer that
is in direct contact with the nutrients. You should recall that a similar cyclic metabolic pathway occurred in respiration: the Krebs cycle. In this photo, the young frog is almost ready to leave the water because its four limbs have developed. However, using our simplification, A will represent the allele for pigmentation and a will represent the allele for
albinism. If an animal drank for 24 seconds, the data must go in the cytosol. The target tissue of ADH is the kidney collecting ducts (see Figure 11.18). The polymerase then initiates the synthesis of an RNA molecule in a 5 to 3 direction. Application: Cause and
treatment of phenylketonuria (PKU). Set up one chamber with a drying agent (CaCl2) and the other with wet towels (see Figure 12.32). Cystic fibrosis Maintaining a proper balance of fluids in the body is essential for good health. This leads to less pressure 'pushing on' the passive lung tissue. Increasing levels of some of the main greenhouse gases
(as a result of human activities, such as burning fossil fuels) are causing the atmosphere to retain more and more heat. x 0 Figure 4 Three different normal distribution curves. The size of the specimen can then be worked out. The crude song of a warbler can be distinguished from the crude song of a sparrow. Figure 2.14 shows the condensation
reaction that forms the disaccharide maltose from two alpha-D-glucose molecules. The idea is simple: take one strand of DNA from species A and a homologous strand from species B and fuse them together. (a) A species of tropical land snail, Amphidromus martensi, shows a polymorphism of oppositecoiling shells. Guidance • Alleles are usually
chromosomes are placed in order by size and the position of their centromeres. . Table 2.4 summarizes the various relative mode of transport is needed as that substance circulates in the bloodstream. 

Individuals that reproduce pass on characteristics to their offspring that substance circulates in the bloodstream.
The rate of oxygen produced is a direct reflection of the rate of photosynthesis. Affected male D Two affected parents have an unaffected female child. This is not a simple question. A 'kernel' or nucleus is usually noticeable in the cytoplasm. 4 Some very famous scientists, such as Louis Pasteur in the 1880s, have performed experiments to
Table 12.7 Rods and cones Rods Cones These cells are more sensitive to light and function well in dim light These cells are less sensitive to light and function well in bright light Only one type of rod is found in the retina. In the last 50 years, many industrial applications have been developed that make use of these catalytic proteins. At one time
cholera outbreaks occurred in almost every area of the world. But leptin is not the only hormone involved in the process of appetite; it would be an oversimplification to think that appetite was regulated solely by leptin, and other factors, such as compulsive eating and persuasive advertising, seem to be able to override leptin's effects. • Look at the
table of critical values of 2 and use the d.f. and p value (conventionally we use 0.05 for p) to determine which critical value of 2 (2 calculated) to. As seen with crossing over, this is another adaptation that increases variety in the offspring. They are a good example of adaptive radiation. As an analogy, think of the conventionally we use 0.05 for p) to determine which critical value of 2 (2 calculated) to. As seen with crossing over, this is another adaptation that increases variety in the offspring. They are a good example of adaptive radiation. As an analogy, think of the conventionally we use 0.05 for p) to determine which critical value of 2 (2 calculated) to. As seen with crossing over, this is another adaptation that increases variety in the offspring.
the maps produced by cartographers and explorers in the Middle Ages; many parts of the globe remained uncharted and had the words terra incognita (Latin for 'unknown land') inscribed on them. How did it get to Earth? One type of signal molecule is called a cell adhesion molecule (CAM). The second diagram represents the structure of a general
nucleotide using the symbols suggested by the IB. The anticodon that moves into the A site is specific for the codon of the mRNA at that position. Two seminiferous tubules are shown in cross-section on the upper and left parts of the figure, with Leydig cells in between. 707 14 Option C: Ecology and conservation ammonia NH3 4a nitrification 1m utu
a 2 fr ee- listi c l i v ind i ng ust n ria ln it on xati n fi xation e g n fi tion tro ni roge fixa n it ge ro 3 nitrite NO!2 nitrogen gas N2 4b nitrification 8 putrefaction nitrate NO!3 detritus 7 death and excretion Figure 14.43 Steps of the animals nitrogen cycle and roles of bacteria. It is the number that separates the higher half of the data from the lower half of the 
of the data. First, the DNA wraps around histones to produce nucleosomes. These activated enzymes then cause the cell to move from G1 to the S phase and from G2 to the M phase. Absorption of glucose into villi The cells in the inner lining of the small intestine make up what is called the mucosa. Arthropoda (b) Does not have an exoskeleton made
                                    • Malnutrition may be caused by a deficiency, imbalance, or excess of nutrients in the diet. 16 Based on these data, what are the two best additives that allow Pseudomonas to be the most effective at oil degradation? So far six patients have begun to produce the factor again. Applications for the copyright owner's written
permission should be addressed to the publisher. 1993), The JOURNAL OF ECOLOGY by BRITISH ECOLOGICAL SOCIETY, Reproduced with permission of Blackwell Publishing Ltd. Cell migration and movement also appear to be, at least partially, the result of interactions in this area. What units would you use? Calculate the frequency of the
recessive allele t. The new plant will be an exact genetic copy of 163 03 Genetics the first one, because only one parent was involved and no meiosis and fertilization was used to add variety to the genetic makeup of the plant. (1) (Total 5 marks) 9 Evidence suggests that the behaviour of bees is often a response to odours. Previously, the location was
 random. In contrast, the Moon, which is the same distance from the Sun as Earth is, has temperature swings that typically go from -150°C to +120°C, depending on where sunlight is hitting the surface. 1 2 3 The chromosomes move to the middle or equator of the sheep in Scotland are
black. If the context is missing, the skill may disappear over time. • Homologous chromosomes separate in meiosis I. 145 03 When answering questions about genetic outcomes for offspring, it is sometimes tempting to go straight to the Punnett grid and forget about steps 1-3. Hint: try to make it easy to subdivide your total duration time. Each
haemoglobin molecule is considered to be a single protein. Amazingly, the goslings would follow the box on the model train around the track. (d) Oxytocin. Thigmotaxis is a response to touch. Imagine a hydrocarbon chain several times longer than any shown in the figures so far, with several more double bonds. Note that r2 cannot be a negative
number. Growth may be limited but is always evident in one way or another. (1) (ii) Most of the heterotrophs are animals. • The first few bacteria make signalling molecules called inducers. Research has shown that there are many factors that affect plant development and growth. Knowing the equation of the line or the curve allows a researcher to
plug in hypothetical values and get a prediction from the model. This might make you apprehensive but also gives you hope of a cure. At any given time of year, any one plant has a fairly consistent rate of cell respiration. ix Introduction eBook In the eBook you will find the following: Animations • Videos • Interactive glossary of scientific words used
in the course Internal assessment advice Answers to all exercises in the book Worksheets Interactive quizzes For more details about your eBook, see the following section. Although some food chains can have up to six trophic levels, most have four. 5.4 The ancestry of groups of species can be deduced by comparing their base or amino
acid sequences. The result is a generalized insensitivity to pain. Encoding During encoding, the brain processes information that it receives from the senses so that it can be remembered. Produce a table with two columns with the headings Transcription and Translation. 284 respectively, © 2013, p. The EST database is a place where these DNA
sections can be put together, like the pieces of a puzzle. A DNA and histones. From anaphase onwards, when sister chromatids have separated to form individual structures, they should be referred to as chromosomes. You should understand enough about how genetics works to be able to answer this: it's because the disease is recessive and both
healthy parents must be carriers of the allele that causes the disease. As the years progress, each person begins to deposit plaque. Where is this important in nature? Natural methods of cloning long before humans did. 29 Name the genes. 14 What % of smells can people between the ages of 50 and 70 identify? These rings
can be used to determine the age of the plant, as well as to determine the relative climate of the year of growth. Warm-blooded organisms such as humans have an advantage over coldblooded organisms for efficient digestion and many other metabolic processes, because of their constantly warm internal temperature. Water evaporates from leaves
through small openings called stomata. The following are some types of encoding carried out by the brain. The pressure in the sieve tube forces the contents into the stylet and insect's gut. Then Nitrobacter changes nitrite (NO2-) into nitrate (NO3-), which is useable by plants. NATURE OF SCIENCE Always consider the source! If you do a web
search for IVF, many of the sites you will encounter will be from private clinics that offer IVF as a paid service. 11 Predict the relative amount of ADH produced by a person who has been drinking lots of water and has not been exercising recently. (b)
Show how the offspring in the cross are produced and clearly label the recombinants. 1991) © 1991 by The Ecological Society of America. You also need to be able to annotate one or more diagrams of a nephron. Before the Human Genome was mapped, fewer than 100 loci were known for genetic diseases. Now researchers can predict with 95%
accuracy where certain fish will be located, so they can be more easily counted. This is why so few women are colour blind: their second copy of the gene is likely to be the dominant allele for full colour vision and will mask the recessive allele. These organisms certainly present a different image of a cell than usually thought of when discussing the
cell theory. C A group of organisms living and interacting in an area. Each pathogen is made up of either cells with cell membranes or, in the case of a virus, a protein coat called a capsid. The optical density of patient C is over 0.400: it is close in value to the positive control. 11.3 All animals excrete nitrogenous waste products, and some animals also
HO C (CH2)24CH3 O HO C (CH2)21CH3 O HO C (CH2)21CH3 O HO C Figure 2.2 Hydrolysis of a triglyceride lipid to form glycerol and three fatty acid molecules. This active transport mechanism called the sodium ions actively transported sodium-potassium (Na/K) pump. Water is lost in the form of a
gas from the leaf through openings called stomata (singular stoma). The two men presented their ideas jointly to the Linnaean Society in 1858. 626 The human DNA sequence Stored data is increasing exponentially An incredible amount of data is being generated in biology. 12 Describe red-green colour blindness. Is it acceptable to use food crops as
fuel for motor vehicles instead of making it available for humans to eat? It is more common for diseases resulting from bacteria and fungi to cross species barriers. Among the wide range of variation in lemur species, some are better adapted for living on the ground instead of in trees. If this is still a bit confusing, try looking at it this way. Sounds
tricky, doesn't it? Typically, only 10-20% of the energy available is used from the previous step in a food chain. The reason cited was lack of acceptance of this technology by consumers, farmers, and politicians Are the risks worth it? Such a practice is called fudging the data, and it is considered to be unethical. 1 2 The chromosomes are at each pole.
This could be a major step forward in achieving functional recovery in a damaged brain. Plants and animals are incapable of using nitrogen fixation. The cristae provide a huge surface area within which the chemical reactions characteristic of
the mitochondria occur. For example, the nitrogen compounds found in rotting flesh or animal excrement are extremely useful for plant growth. Use Figure 11.13 as a guide, and practise doing just that! 470 An angiogram is a form of X-ray where one or more dyes have been added to blood vessels to demonstrate blood flow clearly. 161 03 Genetics
Like other prokaryotes, most of the genetic information for E. They do this by having a very long loop of Henle that produces a large hypertonic area for water reabsorption using the ADH/ collecting duct mechanism. Thus alcohol has a magnified effect on liver tissue compared with other tissues in the body. When this transport is passive, material
moves through the channel from an area of high concentration to an area of lower concentration. The two sides of the heart form two major routes for blood to flow along (see Figure 6.6). Lys Met Phe Arg U U C polypeptide chain Thr A U A Ala Val ribosome G C U
reproduced with permission 139 03 Genetics CHALLENGE YOURSELF Parents who are concerned that they might have a high risk of producing a baby with a chromosomal anomaly (for example a karyogram prepared of the unborn baby's genetic material. The n-
terminal end begins with an amine group and the c-terminal end finishes with a carboxyl group. The virus transfers the gene to the plant cells, and the result is the generation of antibodies. Hence, they thrive and reproduce, making a new population in which some or all of the members possess the genes that give resistance to the pesticide. Photons
can transfer their energy upon interaction with other particles. Partial pressures are often given in kPa (kilopascals) rather than mm Hg (millimetres of mercury). Transpiration is the term given to the loss of water vapour from leaves and other aerial parts of the plant. We will see later how to calculate the chances of a child inheriting this condition
from his or her parents. As well as a microscope, other materials necessary for this practical include microscope and the practical incl
this vaccine has been made from yeast, but it is not cheap and has to be refrigerated. At the end of meiosis I, cytokinesis happens: the cell splits into two separate cells. Ecologists studying ecosystems noticed very quickly that what one organism considers to be waste is what another organism considers to be a valuable resource. It will continue to be
modified as cellular research progresses in the future. The result is coronary heart disease, which can lead to a serious heart attack. muscle Multiple synapses A huge number of synapses are formed during early brain development. In 2011, an international team from the Genomics Institute of the Novartis Research Foundation and The Scripps
Research Institution, by studying databases, discovered a new group of compounds that may lead to a new generation of alleviating symptoms when the disease is already present in an individual. Example 2 (imperial): for someone who is 5 10 (5 10 = 70) and weighs 235 lb, his or her
BMI = 235/(70 × 70) × 703 = 33.7. et al, eds. The shape of the molecule is straight: there are no kinks or bends along the chain. This was shown in the 1940s with experiments that interrupted periods of darkness with brief exposures to light. It ranges from a 30% similarity with yeast to an 80% similarity with mice. More details about the specific
stages of meiosis appear later in this chapter. These arteries are branches direct from the aorta and carry blood that has recently been to the lungs. A clade is a monophyletic group. Skin lipid samples were collected from small females (46.2 ± 2.7 cm in length) and large females (63 ± 2.6 cm in length). Adaptive radiation occurs
when many similar but distinct species evolve relatively rapidly from a single species or from a small number of species or from a small number of species. Many plants do not have a telophase I stage. (a) Because they were able to escape being eaten by birds, carbonaria moths were able to survive and pass on their genes to the next generation, something that was not possible before.
Counterstain with safranin. Not surprisingly, they recorded major differences in light intensity between one area and the next. Modern biotechnology has captured the attention of everyone. Just as varieties of food grown), are selected for, and varieties with undesirable
characteristics (such as susceptibility to frost, drought, or disease) are selected against, using artificial selection farmers select animals with the most desirable for verification. • Clone the normal gene to be given to the
patient. In response to being attacked the clams release chemicals. Let's consider light as a stimulus. Have you ever heard people say 'she looks just like her mum' or 'that kind of thing skips a generation'? Stimulus: blood glucose level on low side of normal range. • Mutagens, oncogenes, and metastasis are involved in the development of primary
and secondary tumours. After acetylcholine is received by the receptors, it is broken down by acetylcholinesterase, but the enzyme cannot breakdown the nicotine molecules that bind to the same receptors. In other instances, scientists only disagree on the quantity of change or on the amount of responsibility of human activity. 11 01 NATURE OF
SCIENCE Developments in scientific research follow improvements in apparatus: the invention of electron microscopes led to greater understanding of cell structure. This is catalysed by that activated enzyme. Actively
reconstructing the memory requires the activation of all the neurones involved in the memory. Even though uric acid is quite energy expensive to produce as a nitrogenous waste, it is not water soluble and so can be stored within a specialized structure within the egg as the embryo develops. The defect was corrected and new blood cells were made
containing the new gene. You may also recall that the active transport mechanism that resulted in the resting potential positions of sodium and potassium was the Na/K pump. These functions include: • metabolism • growth • reproduction • response • homeostasis • nutrition • excretion. 731 15 To learn more about cholera go to the hotlinks site,
search for the title or ISBN, and click on Chapter 15: Section D.2. Option D: Human physiology Cholera is a disease caused by the bacterium Vibrio cholera; more specifically it is caused by 
that marine mammals, like elephant seals, dolphins, and whales are descended from a terrestrial ancestor. This is another reason for motor impairment when using marijuana. Like the mitochondrion, a chloroplast contains its own DNA and 70S ribosomes. Look at the diagram of synaptic transmission (Figure 12.38). Attempt to find micrographs of the
same types of tissue that are cancerous and determine their mitotic index. If the calculated value for chi-squared is greater than the critical value, the null hypothesis can be rejected. Why is there a very good chance that this is true? These exceptions will now be discussed. • Return to the previous page. Earlier in this chapter we considered situations
in which one particular essential substance was missing from the diet, such as vitamin C or vitamin D. The coding fragments make up what are known as exons, while the noncoding fragments make up introns. Type I diabetes most often develops in children or young adults, but can develop in people of any age. These cells have many nuclei and may
increase in size to several centimetres. The production of penicillin increases as the biomass of the mould levels off (the stationary phase). 

Application: Use of animal experiments, autopsy, lesions, and fMRI to identify the role of different brain parts. Now it is the 'paternal' chromosome (no longer 100% paternal) that has B and the 'maternal' chromosome (no longer 100% paternal) that has been described by the increase in size to several centimetres.
chromosome that has b. Next, determine the maximum time duration that is both reasonable and safe for the exercise you have chosen. H HO C C Trying to draw complex organic molecules by somehow memorizing the entire intact structure is frustrating and impossible for most people. The components of erythrocytes are recycled within our liver,
and much of the iron is recovered in order to produce more erythrocytes in the bone marrow. Overproduction of offspring. Natural selection favours useful adaptations and selects against harmful ones in a way that is not based on luck and chance, but on fitness. If a cell does not have glucose available, other organic molecules may be substituted,
such as fatty acids or amino acids. With the invention of the microscope in the mid 1600s, many new creatures were discovered that were nothing like plants or animals. This suggests that vulnerability to tobacco addiction decreases with age. As mentioned, the synthesis of thyroxin requires iodine. • They bind to the receptors in the membrane of
neurones involved in pain perception, and block the release of neurotransmitters. • Skeletal muscle fibres are multinucleate and contain specialized endoplasmic reticulum. Without crossing over, the allele G would always be inherited with L for the simple reason that 429 10 Genetics and evolution they are linked. In fact the red-coloured parts of the
plant that develop are not the flowers. 1 2 3 370 A photon of light is absorbed by a pigment in Photosystem II and is transferred to other pigment molecules until it reaches one of the chlorophyll a (P680) molecules in the reaction centre.
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must contribute an allele in order for the homozygous recessive condition to be expressed. The releasing hormones stimulate the anterior pituitary cells to secrete specific hormones stimulate the anterior pituitary cells to secrete specific hormones. Examples of animal phyla Of all the phyla of animals, we will consider seven here. 196 Over millions of years, and after geological transformation, the kerogen in porous sedimentary rock becomes crude oil or, if it is in a gas state, natural gas. A person suffering from severe altitude as soon as possible. Medulla oblongata maintains vital body functions such as breathing and heart rate. Figure 9.15 This shows the distribution of tissues in a stem of a dicotyledonous plant. The subgenus Microscordum contains species that are tetraploids, meaning 2n = 4x = 32 (a total of four sets of eight chromosomes). PCR can be used to test nasal secretions. Continued addiction is even more harmful. 402 The sequence of events in the stem causing it to bend towards a light source is as follows. Only Gram-negative bacteria have an outer membrane with attached lipopolysaccharide molecules. T T t T t t Gene pools are generally relatively stable over time. Meiosis is completed for these cells, but each must now differentiate into a fully functioning, motile spermatozoon. The inability to break down phenylalanine is a result of inheriting the mutated form of a gene that should be producing an enzyme (phenylalanine hydroxylase) that helps break down phenylalanine. This allows nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have not been to be replenished in the soil by plants such as beans, which have nitrogen to be replenished in the soil by plants such as beans, which have not been to be replenished in the soil by plants such as beans, which have not been to be replenished in the soil by plants such as beans, which have not been to be replenished in the soil by plants such as beans, which have not been to be replenished in the soil by plants such as beans, and the soil by plants such as beans as beans. 72 beats min-1, your SA node is generating an action potential every 0.8 seconds. ATP adenosine triphosphate plus inorganic phosphate plus inorganic phosphate yields adenosine triphosphate two reactants (ADP + Pi) colliding at a very high speed, at exactly the correct orientation, leading to a new covalent bond forming between them, is extremely small. Arabidopsis thaliana is a small flowering plant native to Europe and Asia that has been studied extensively regarding light sensing and flower development. Little did he know that it would allow him to see nature in a new way and come up with what would become one of the most important, controversial, and misinterpreted ideas in biology: evolution by natural selection. Guidance Students should be clear that characteristics acquired during the lifetime of an individual are not heritable. The complementary base pairs are adenine (A)-thymine (T) and cytosine (C)-guanine (G). (Total 6 marks) 3 Osteoporosis is a major health problem for many post-menopausal women. You can enjoy listening to music yet avoiding harmful listening habits that can lead to permanent hearing loss, by following these steps. When cellular respiration is complete, carbon dioxide is released into the atmosphere, and when the giraffe dies, its body will be eaten by scavengers and the remains broken down by decomposers. sarcomere relaxed Z line Z line actin filament myosin filaments (heads not shown) sarcomere contracted Z line actin filament Sarcomere shown at rest and during a contraction. Correlation says nothing about the direction of the influence. Let's look at the advantages and disadvantages of each type of nitrogenous waste. Ancient population with variation in neck lengths. 3.1 Genes Understandings: A gene is a heritable factor that consists of a length of DNA and influences a specific characteristic. 11 Of the greenhouse gases discussed in this chapter, state which one has a warming potential approximately 100 times that of carbon dioxide. Each pit is shared by each of the glandular cell types creating and secreting one of the components of gastric juice (hydrochloric acid, pepsinogen, or mucus). Lithosphere = where all the rocks are found. products of first replication Figure 2.39 This figure demonstrates the general process of semi-conservative replication of DNA. She follows the male as he leads her to the nest he has constructed in the bed of the river. Skill: Utilization of molecular visualization software to analyse the association between protein and DNA within a nucleosome. 5 A genetic disease can be described as being an autosomal dominant disease. RT is reverse transcriptase that will allow mRNA to make cDNA (which is much more stable than mRNA). This section will look at these issues. Both are controlled by the hypothalamus, and both secrete hormones regulating many body functions. 1 2 3 4 Examples of endocytosis, the intake of extracellular fluids. The resting potential is created by the active transport of sodium ions (Na+) and potassium ions (K+) in axon resting two different directions. Metabolic pathways are usually carried out in designated compartments of the cell where the necessary enzymes are clustered and isolated. Are there any parallels between biology and art? 769 Case study 2 Babies born on a full moon Ask an experienced midwife 'Are more babies born on a night when there is a full moon?' and chances are pretty good she will say yes. The concentrations of these gases in the atmosphere are naturally low, which normally prevents too much heat retention. It is the result of the growth of the thyroid gland in an attempt to compensate for not being able to produce enough thyroxine because of a deficiency of iodine in the diet. Transgenic animals One way of genetically engineering an animal is to get it to produce a substance that can be used in medical treatments. Wash your hands thoroughly after working in any phase of this procedure.* There are many factors that can affect germination. Identify which taxon in the diagram represent the lesser apes. Could it be argued that just as an artist sees things in his or her own way, so a scientist sees things in his or her own way, so a scientist sees things in his or her own way, so a scientist sees things in his or her own way. then be broken down to provide an organism with the energy necessary to maintain life is the basis of nutrition. The bond that is freed up is used to form the covalent bond between the two monosaccharides. Is it better to be right or to belong? The information must be accurate, complete, and understandable, so that society can make informed decisions regarding the appropriateness of the research. 39 The current size limit for black grouper is 24 inches. Figure 2.16 The highlighted zone in the middle of the fatty acid shows that it has a single double bond in the hydrocarbon chain. If such people could be supplied with factor IX, their problem would be solved. Genes are made of DNA. The figure below shows the inactivation of the microbes in seawater as a function of the cumulative amount of sunlight and time. The water content is quite high, making this urine hypotonic in relation to the surrounding interstitial fluid of the medulla. 131 03 Genetics 3 4 The images are cut out and separated, a process that can be done using scissors or using a computer. The effects of FSH and LH on the ovaries The hormones FSH and LH have several effects on the ovaries. Figure 6.20 A graph showing the voltage changes across the membrane of an axon for three nerve impulses. In this process, the two haploid sex cells join to make a single diploid cell called a zygote. 1 2 3 4 Starting materials: target DNA collected from nasal secretions; nucleotides to use for making copies of DNA; DNA polymerase primer that gets the new copy started. Examples: five fingers on each hand, colour blindness, type O blood. Bloodletting was a common medical procedure that was based on Galen's theory of circulation. • In Abha, Saudi Arabia, a study of 944 males revealed that 7.2% of the population was Rh-. F. This has been confirmed in the fossil record for some species, notably sharks, cockroaches, and horseshoe crabs, which have persisted for hundreds of millions of years. Likewise, varieties of cows that only produce 5-10 litres of milk a day will not be selected, whereas varieties that produce 30-40 litres of milk per day or more will be selected by breeders. Boaters dumped their waste in the water. The nervous and endocrine systems work cooperatively in order to ensure homeostasis. Heroin, introduced into the USA, has become a social catastrophe. Rather, it seems to be caused by a redistribution of available auxin, especially to the side of the stem away from the light source. He took purebred tall plants and crossed them with purebred short plants. + 1 4 HO OH 5 CH2OH H OH H O 4 1 O 5 H OH H H O 4 1 O 5 H OH H H O 4 1 O 5 H OH H H O 4 1 O 5 H OH H H O 4 1 O 5 H OH H OH H O 4 1 O 5 H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H OH H O 4 1 O 5 H O H O 4 1 O 5 H O H O 4 1 O 5 H O H O 4 1 O 5 H O 4 1 Condensation reactions can be used to synthesize even larger molecules by accomplishing the same or a similar reaction on more than one area of a monomer such as a monosaccharide. Table 11.6 Some of the functions of progesterone and oestrogen during pregnancy Progesterone Oestrogen Helps maintain the highly vascular tissue characteristic of the uterus/placenta Encourages muscle growth of the uterus Suppresses contractions of the uterus is highly muscular, for the birth contractions Stimulates mammary gland development late in pregnancy in preparation for milk production Induces production of oxytocin receptors in uterine muscles late in pregnancy (see below for the function of oxytocin) Both progesterone and oestrogen inhibit the production of oxytocin receptors in uterine muscles late in pregnancy. All of these are needed at specific locations in the alimentary canal. • Skill: Testing for association between two species using the chi-squared test with data obtained by quadrat sampling. The hydrolytic activity of amylase ceases in the highly acidic environment of the stomach. It is cut into slabs, granules, or blocks, and moved to where it is needed. The evolutionary design behind the repeated branches and individual cells joined by intercalated discs is based on getting the muscle cells to work together as a unit. So far in this discussion, the respiratory substrate has been a hexose. The water intake of kangaroo rats comes almost exclusively from the foods that they eat. A A normal male. How can we mathematically quantify the variation that we have observed? It grew from a zygote and produces new cells by mitosis. Label the parts from memory and then begin to learn the bullet points given above in order. Today, in some countries, tonnes of grain sit and rot in silos, while in other countries people go hungry. • Examples for mouthparts: tweezers, clothespins, wooden tongs, or even chopsticks. Is there any area of scientific knowledge the pursuit of which is morally unacceptable or, on the contrary, morally required? The increase and decrease in blood glucose levels goes on 24 hours a day, every day of your life. It has a simple nervous system and at the anterior end are two eyespots that contain photoreceptors stimulated by light. 554 Dopamine secretion You will recall that dopamine is the neurotransmitter that activates the reward pathway and gives us a sense of pleasure or satisfaction. Liquid smoke is produced when smoke from certain types of burning wood is allowed to condense in water. That person probably does not blink. Even if the mouse does not normally have a disease (e.g. cystic fibrosis), it can be induced to have it by manipulating its genome. Research centres are active in this area of study throughout the world, and the objective of this conference was to allow the research centres are just a few examples of biomarkers that have been discovered; much research is ongoing in this field. (2) (Total 4 marks) 4 (a) Define the term polygenic inheritance. Too few young fish indicates lack of spawning, and too few old fish may mean that over-fishing is taking place. Table 13.7 Examples of knockout mice Knockout mice Knockout mouse Defect Benefit to research Cftr Defective in the gene that makes CFTR, a protein that regulates passage of salts and water in and out of cells Allows research into cystic fibrosis, which is the most common fatal genetic disease in the USA P53 Has a disabled Trp53 tumour gene Cancer research Lep Has a mutant gene for leptin Obesity research 635 13 Option B: Biotechnology and bioinformatics Other model organisms used in comparative genomics Complete sequences of the model organisms shown in Table 13.8 have been found and added to databases. This ensures survival and enhances the ability to reproduce. George E. In what ways is this useful to the general public? Figure 6.26 Hormonal summary of the menstrual cycle. Throughout our lives we continuously repeat the process of filling our lungs with air and then expelling that air. In fact, after this activity you can try making the newly identified protein sequence your name. With large herds of cattle being raised worldwide, there is a concern that the quantities of methane they produce are contributing to the greenhouse effect, which will be discussed in the next section. In some cases these exudates harden over time. Instead, one very large cell breaks down into many fragments, and each of the fragments becomes a platelet. They also act as a quick summary for review. Application: Analysis of data from air monitoring stations to explain annual fluctuations. 387 09 Plant biology Mineral ions It is essential that mineral ions move into the root as well as water. The function of pepsin is to catalyse the hydrolysis of large polypeptide chains into smaller peptides. They have all originated in one species and made the transition to infect another species, specifically infecting human beings.

Students should know that most organisms use the same 20 amino acids in the same genetic code, although there are some exceptions. (a) Draw the carbon backbone of the molecule). • Application: Consequences of high altitude for gas exchange. Gregor Mendel (1822–1884) studied the genetics of garden pea plants. Therefore, the human body has some ingenious ways of making it difficult for pathogens to enter it and start an infection. (a) (b) (c) (d) (e) NATURE OF SCIENCE Assessing risks associated with scientific research: scientists attempt to assess the risks associated with genetically modified crops or livestock. The first global survey of bird diversity will tell us which species are most vulnerable to extinction. Figure 12.14 EEG showing activity followed by electrocerebral silence. This process requires the expenditure of energy in the form of ATP. 456 mouse spleen harvested many days later leucocytes removed mouse injected with a chosen antigen (e.g. HCG) ELISA test used to identify cultures secreting desired antibody hybridomas grown in separate cultures fused with myeloma cells to form hybridoma cells antibody purified from cell culture Figure 11.2 A flowchart summarizing the production of monoclonal antibodies. What is of C C H great interest to industries using coal is the H H H H Hydrocarbons, the long chains of carbon atoms attached to hydrogen atoms (see Figure 4.10). Those enzymes trapped in the pores are said to be immobilized. Argument against the question: Why can't these socalled experts make up their minds? Each type of B lymphocyte (or plasma cell) is capable of synthesizing and secreting a specific antibody that binds to a specific antigen. (c) Why do the measurements have a high point and a low point for each year? • Carbon dioxide is produced by respiration and diffuses out of organisms into water or the atmosphere. Increasing crop yields? If the number of test subjects is very low, you may have to use one or more subjects for more than one exercise duration. The organic products of glycolysis are always two pyruvate molecules. If the end of the line contains a name, it is the taxon for the organism. pear strawberry Bar charts use rectangles to show the amount of data in a certain number of categories. 534 number of isopods out of 20 Table 12.9 Effect of humidity 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 humid control dry 0 5 10 15 20 25 30 35 time in minutes !0.5 40 45 Time / min 60.5 Chamber empty 0 10 10 5 10 10 40 10 10 45 10 10 Table 12.11 Effect of humidity on the movement of isopod: control trial 2 5 Process the raw data. In the making of yogurt lactose sugar in the milk is broken down by the lactase enzyme of the bacteria fermenting the milk. Some farmers in the world are growing crops that are not destined for human food nor for animal feed but rather for fuel to power cars and city buses. 16 If the normal cells have an average cell cycle time of 600 minutes, estimate the average, relative cell cycle time of the cancer cells. This is because they are no longer able to hide against the darkened background. To learn more about the mitotic phases, go to the hotlinks site, search for the title or ISBN, and click on Chapter 1: Section 1.6. 24 If a parent cell has 24 chromosomes, how many chromatids would be present during metaphase of mitosis?

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