Neap

Final Examination 2023

NSW Year 11 Biology

Solutions and Marking Guidelines

SECTION I

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 1 B **B** is correct. The image shows mixed protozoa (unicellular organisms) such as amoeba and paramecium. This can be identified as nuclei are visible in the cells. Therefore, they must be eukaryotic unicellular organisms such as protozoa. **A** is incorrect. Animal cells do not have a cell wall. **C** is incorrect. The cells shown in the photograph do not have stomates. Stomates are made of guard cells and would be visible when looking at a cross-section of a leaf. **D** is incorrect. Based on the scale of 60.000 μm provided on the photograph, the organisms shown are too large to be bacterial cells. It would be difficult to see bacterial cells using a school microscope set to low power. The cells pictured also have visible nuclei.	Mod 1 Cell Structure BIO11–8 Bands 4–5
Question 2 C **C** is correct. This row outlines the features of both light and electron microscopes correctly. **A** is incorrect. Electron microscopes produce black-and-white, not colour, images. Light microscopes have a magnification of ×1000–2000, not up to ×10 000. **B** and **D** are incorrect. Light microscopes produce images with a low resolution, whereas electron microscopes produce images with a high resolution. Electron microscopes cannot view live specimens	Mod 1 Cell Structure BIO11–8 Bands 3–4
Question 3 B **B** is correct. Endocytosis is a process of active transport as it moves substances against the concentration gradient; therefore, it requires energy to occur. **A** is incorrect. Osmosis and diffusion are passive processes and thus do not require energy to occur. **C** is incorrect. It is true that exocytosis and diffusion occur across the cell membrane; however, exocytosis is an active transport method and requires energy to move substances out of a cell. **D** is incorrect. Osmosis is the movement of water, not salt, and occurs from an area of high solute concentration to an area of low solute concentration.	Mod 1 Cell Function BIO11–8 Bands 3–4
Question 4 D **D** is correct. Cell X is a guard cell; it can be identified because it is shaped like a kidney. **A** is incorrect. The jigsaw-shaped cells in the photograph are epidermal cells. **B** is incorrect. A sieve plate is located in a plant's phloem tissue, not the epidermis. **C** is incorrect. A stomate is a structure consisting of a stomatal pore and two guard cells; thus, the stomate is not a cell.	Mod 2 Cell Structure BIO11–9 Bands 3–4

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 5 B Cell X is approximately 60 μm. The guard cell is approximately three times the length of the scale, which is 20.000 μm. Therefore, $3 \times 20 = 60$ μm.	Mod 1 Cell Structure BIO11–6, 11–8 Bands 5–6
Question 6 A **A** is correct. Countercurrent flow maintains a concentration gradient between the fish's gills and the water. This allows oxygen to flow from a high concentration (in the water) to a low concentration (in the gills). **B** is incorrect. Carbon dioxide flows out of the gills. **C** is incorrect. Blood flows in the opposite direction to the water flowing over the gills. **D** is incorrect. Oxygen exists in a higher concentration in the water than in the gills; thus, the oxygen diffuses from the high concentration in the water to the low concentration in the blood.	Mod 2 Nutrient and Gas Requirements BIO11–9 Bands 5–6
Question 7 C **C** is correct. Water containing oxygen-18 (O^{18}) can be traced throughout a plant. Photosynthesis is the reaction of water with carbon dioxide to produce glucose and oxygen. If radioactive water containing O^{18} is used by the plant, then the products of photosynthesis, including the liberated oxygen, will contain O^{18}. **A** is incorrect. Carbon dioxide is not liberated during photosynthesis; it is used in the process. **B** is incorrect. Oxygen is not liberated during respiration; it is a reactant that is used in the process. **D** is incorrect. Water is not released through the plant's roots. It is taken up by the roots and released through the leaves during transpiration.	Mod 2 Nutrient and Gas Requirements BIO11–9 Bands 5–6

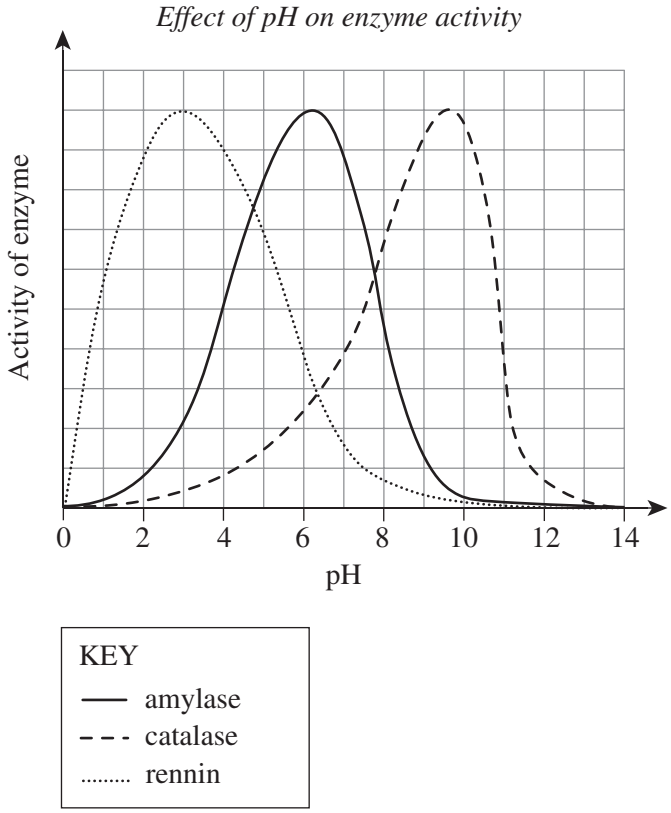
Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 8 C **C** is correct. As blood passes through a muscle, respiration occurs in the cells. This process uses glucose and oxygen and produces water and carbon dioxide; thus, the amount of carbon dioxide in the blood increases and the amount of glucose in the blood decreases. **A** is incorrect. Oxygen is required for respiration; therefore it decreases as the blood passes through the body's organs. Urea increases as the blood goes through the kidney. **B** is incorrect. It is true that the amount of oxygen increases as blood passes through the lungs, but the amount of glucose does not increase. **D** is incorrect. It is true that the amount of glucose increases as blood passes through the digestive tract, but the amount of urea does not decrease. It decreases as blood passes through the kidney.	Mod 2 Transport BIO11–9 Bands 3–4
Question 9 A Given that 89% of bacteria live in deep subsurface environments and 9% of bacteria live in terrestrial environments, 89 + 9 = 98% of all bacteria live in these two environments. Thus, 100 – 98 = 2% of bacteria live in marine environments.	Mod 3 Effects of the Environment on Organisms BIO11–5, 11–10 Bands 2–3
Question 10 A **A** is correct. Convergent evolution occurs when different organisms develop similar traits because of similar environmental pressures. Even though sharks and dolphins are two distinct types of animal (fish and mammal), they have evolved similarly because they occupy similar environments. **B** is incorrect. Different feeding strategies are not evidence for convergent evolution. **C** and **D** are incorrect. All organisms have similar DNA; however, the common ancestor shared by sharks and dolphins existed millions of years ago and thus does not account for traits shared by both animals.	Mod 3 Theory of Evolution by Natural Selection BIO11–10 Bands 3–4
Question 11 C **C** is correct. The mosquito populations became resistant to DDT through natural selection. Natural variation in the population caused some mosquitoes to be naturally resistant to DDT; these mosquitoes then survived and reproduced, leading to more mosquitoes being resistant to DDT. Eventually, the majority of the population becomes resistant. **A** is incorrect. DDT does not cause mutations in mosquitoes. This option describes Lamarckian inheritance, which refers to the inheritance of acquired characteristics. **B** is incorrect. DDT does not cause mutations in the *Plasmodium* parasite. **D** is incorrect. Natural variation led mosquitoes, not humans, to become resistant to DDT.	Mod 3 Evolution – the Evidence BIO11–10 Bands 4–5

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 12 **B** **B** is correct. Before the average biomass of field site X can be calculated, 1.5 must be identified as an outlier and removed from the data. Adding the remaining values together gives: $11.4+10.9+11.8+10.6+11.1=55.8$ Dividing the total by the number of values gives: $\frac{55.8}{5}=11.2$ (to 3 significant figures) Thus, the average biomass of leaf litter in field site X is 11.2 grams per cubic metre. **A** is incorrect. This option is the average of the data from field site X with the outlier included. **C** is incorrect. This option is the average of the data from both field sites, excluding the outlier from field site X. **D** is incorrect. This option is the average of the data from field site Y.	Mod 4 Population Dynamics BIO11–11, 11–4 Bands 4–5
Question 13 **D** **D** is correct. All organisms shared a common ancestor, which is evident because organisms I, II, III and IV can be traced back to the first branch on the left of the cladogram. **A** is incorrect. Organism I is not the common ancestor of all the organisms. **B** is incorrect. Organisms III and IV are more closely related than organisms II and III. The cladogram shows that organisms II and III shared a common ancestor approximately 75 million years ago, whereas organisms III and IV shared a common ancestor approximately 25 million years ago. **C** is incorrect. While the diagram could show the evolution of humans and chimpanzees from a common ancestor, there is not enough information provided in the cladogram to make this conclusion.	Mod 3 Evolution – the Evidence BIO11–5, 11–10 Bands 2–3
Question 14 **D** **D** is correct. The sustainable planning regulations require low-water-use species to be placed in the gardens of new dwellings. Certain indigenous species from Australia have adapted to dry conditions and thus use less water than exotic plant species. **A** is incorrect. While this may be correct, it is a subjective statement and not the reason for encouraging the use of indigenous species. **B** and **C** are incorrect. Although these options are true – indigenous plants often have hard leaves and small flowers and do promote healthier ecosystems – these characteristics are not directly related to the factors assessed as part of the sustainable planning regulations. Therefore, option **D** is more correct.	Mod 4 Future Ecosystems BIO11–11 Bands 2–3

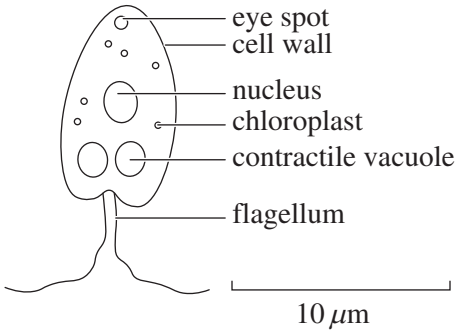
Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 15 **A** **A** is correct. Quadrats are used to estimate the abundance of populations of small, immobile organisms such as limpets. **B** and **C** are incorrect. Large animals will move, so quadrats are an inappropriate method of estimating the abundance or distribution of large animals. **D** is incorrect. Transects are more effective than quadrats for estimating the distribution, not abundance, of plants.	Mod 4 Population Dynamics BIO11–25, 11–11 Band 2–3

SECTION II

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 16	
For example: Models help to simplify complex biological structures and processes. They enable scientists to visualise processes and structures that cannot be seen with the human eye. On the other hand, a limitation of models is that they cannot incorporate the exact details of the real object or concept. For example, structures that require models are often complex, and thus, models may be too simplistic to accurately represent them. Factors such as scale and the materials used may result in misunderstanding the structure or concept. Models can be used to help visualise the process of natural selection. To create a representation of natural selection, students could use materials like coloured toothpicks sprinkled on the lawn or participate in the peppered moth game using dice and grey, white and black cardboard squares. Computer simulations are also helpful in modelling natural selection, using animations of organisms such as frogs, beetles and birds as predators. Modelling natural selection is limited by the fact that simplistic models primarily only show changes that occur over 10 generations, which is much faster than the rate of natural selection in nature. However, these models can help students understand the main tenets of natural selection by representing the organisms within a population, the change in population size over time, and how this connects to selecting agents and reproductive fitness. *Note: The response shown is more detailed than a student would be expected to write. Responses could also refer to other examples of modelling, including but not limited to modelling surface-area-to-volume ratio, osmosis and cell structures.*	Mod 1 Cells as the Basis of Life Mod 2 Organisation of Living Things Mod 3 Biological Diversity Mod 4 Ecosystem Dynamics BIO11–7, 11–8, 11–9, 11–10, 11–11 Bands 2–5 • Outlines ONE benefit of using models in biology. AND • Outlines ONE limitation of using models in biology. AND • Provides ONE example of a structure or process that can be modelled in biology. AND • Relates the example to the benefit and limitation . . . . . 4 • Any THREE of the above points . . . 3 • Any TWO of the above points . . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 17	
Osmosis is the movement of water from an area of low solute concentration to an area of high solute concentration through a semi-permeable membrane. Individuals with diabetes have a high concentration of glucose (a solute) in their blood. Thus, water flows from nearby body or blood cells to the plasma where the solute concentration is higher. This results in those cells dehydrating. A dehydrated cell will not be able to metabolise and function, which may lead to cell death.	Mod 1 Cell Function BIO11–8 Bands 3–5 • Defines osmosis. AND • Explains how high blood glucose levels will result in water moving from body or blood cells into the blood or plasma. AND • States that the dehydration of body cells can result in cell death . . 3 • Any TWO of the above points. . . . . 2 • Provides some relevant information 1
Question 18	
(a)  	Mod 1 Cell Function BIO11–4, 11–7, 11–8 Bands 1–5 • Uses an appropriate scale. AND • Draws a graph that shows the pH range for amylase, catalase and rennin. AND • Labels axes AND includes an appropriate title. AND • Uses an appropriate key or labels the graphs . . . . . 4 • Any THREE of the above points. . . 3 • Any TWO of the above points. . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
(b) Trypsin will most likely act in the duodenum. The pH of the duodenum is 8–9 and the optimum pH range for the action of trypsin is 7.5–8.5. Therefore, trypsin's optimum pH range falls within the pH range of the duodenum. *Note: Responses may also refer to the small intestine, as the duodenum is part of this organ.*	Mod 1 Cell Function BIO11–5, 11–8 Bands 3–4 • Identifies that trypsin will most likely act in the duodenum. AND • Explains that trypsin's optimum pH falls within the pH range of the duodenum . . . . . 2 • Identifies that trypsin will most likely act in the duodenum. OR • Provides some relevant information 1
Question 19	
For example: Chloroplasts and mitochondria are both membrane-bound organelles found in plant cells. Their internal membranes expand the surface area, which increases the rate of reactions in the organelles. In contrast, chloroplasts contain grana, thylakoids and stroma, while mitochondria contain cristae. Chloroplasts and mitochondria are involved in energy conversion processes that involve carbon dioxide, oxygen, water and glucose. However, chloroplasts are the site of photosynthesis, while mitochondria are the site of respiration.	Mod 1 Cell Structure BIO11–8 Bands 2–4 • Compares chloroplasts and mitochondria by referring to: – at least ONE similarity in their structure – at least ONE difference in their structure – at least ONE similarity in their function – at least ONE difference in their function . . . . . 4 • Compares chloroplasts and mitochondria by referring to any THREE of the above points . . . 3 • Compares chloroplasts and mitochondria by referring to any TWO of the above points . . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 20	
(a) *Chlamydomonas reinhardtii*  	Mod 1 Cell Structure BIO11–7, 11–8 Bands 1–5 • Draws a clear biological diagram of *Chlamydomonas reinhardtii* with all THREE of: – SIX correct labels – an appropriate heading – a correct scale . . . . . 3 • Draws a clear biological diagram of *Chlamydomonas reinhardtii* with all THREE of: – FOUR correct labels – an appropriate heading – a correct scale . . . . . 2 • Draws a relevant diagram of *Chlamydomonas reinhardtii* with some correct labels 1
(b) *Chlamydomonas reinhardtii* is a eukaryotic cell. This is evident because it has membrane-bound organelles such as the nucleus.	Mod 1 Cell Structure BIO11–8 Band 3 • Determines that *Chlamydomonas reinhardtii* is a eukaryotic cell. AND • Justifies the answer . . . . . 2 • Provides some relevant information 1
(c) *Chlamydomonas reinhardtii* is an autotroph. An autotroph is a self-feeding organism that can make its own food by the process of photosynthesis. *Chlamydomonas reinhardtii* has a chloroplast, which is the site of photosynthesis. Thus, the cell photosynthesises and produces its own food.	Mod 1 Cell Function BIO11–8 Band 3 • Determines that *Chlamydomonas reinhardtii* is an autotroph. AND • Justifies the answer . . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 21	
For example: Cell differentiation is the process where cells in multicellular organisms become specialised for specific functions. *Any one of the following examples:* • Nerve cells that transmit electrochemical signals over large distances. • Red blood cells that carry millions of molecules of haemoglobin, which transports oxygen to other cells in the body. • In plants, palisade mesophyll cells contain many chloroplasts and are responsible for photosynthesis. As seen in the example, cell differentiation is important as it means cells are more efficient because they only have one function.	Mod 2 Organisation of Cells BIO11–9 Bands 2–4 • Outlines cell differentiation. AND • Provides at least ONE example of a differentiated cell. AND • Explains why cell differentiation is important . . . . . 3 • Any TWO of the above points. . . . . 2 • Provides some relevant information 1
Question 22	
For example: Gills are a gas exchange structure present in fish and are made up of gill arches supporting rows of filaments with lamellae. Lungs are a gas exchange structure present in humans, which contain small air sacs called alveoli. Gas exchange structures are highly vascularised. This means they have a good supply of blood to deliver carbon dioxide from the cells in the body and to receive oxygen from the environment. The large surface area of gas exchange structures maximises the diffusion of oxygen into and carbon dioxide out of the organ. The surfaces of the structures are moist as gases must dissolve in water to diffuse across the respiratory surface. The structures have thin surfaces to reduce the distance that gases have to cross into or out of the organ; therefore, diffusion is faster.	Mod 2 Nutrient and Gas Requirements Mod 2 Transport BIO11–9 Bands 2-4 • Identifies TWO examples of gas exchange structures. AND • Explains how all FOUR features of the organisms' respiratory systems facilitate function . . . . . 4 • Identifies TWO examples of gas exchange structures. AND • Explains how THREE features of the organisms' respiratory systems facilitate function . . . . . 3 • Identifies TWO examples of gas exchange structures. AND • Explains how TWO features of the organisms' respiratory systems facilitate function . . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 23	

(a)

	Animal and their adaptation	*Function of the adaption*
Behavioural	Elephants from Africa spray water on themselves.	As Africa is a hot environment, elephants spray water on themselves to cool down through evaporative cooling. As the water evaporates, it takes body heat from the elephant and cools the body.
Structural	Polar bears from the Arctic region have thick fur.	The Arctic region is an extremely cold environment. The polar bear's thick fur traps a layer of air around its body. The layer of air acts as an insulator and reduces heat loss from the polar bear's body, which keeps it warm in its cold environment.
Physiological	The spinifex hopping mouse from the Australian desert can produce highly concentrated urine.	The Australian desert is very hot and there is little water available. By concentrating its urine, the spinifex hopping mouse conserves valuable water and stays hydrated for longer periods of time.

Mod 3 Adaptations
BIO11–9 Bands 2–4

- Classifies all THREE adaptations.

AND

- Describes how all THREE adaptations help the animals to survive 3

- Classifies all THREE adaptations.

AND

- Describes how TWO adaptations help the animals to survive.

OR

- Classifies TWO adaptations.

AND

- Describes how all THREE adaptations help the animals to survive 2

- Classifies ONE adaptation.

AND

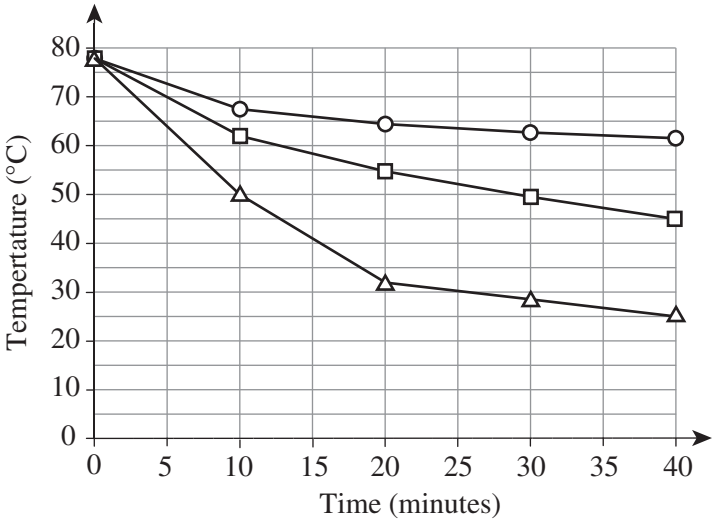
- Describes how ONE adaptation helps the animals to survive.

OR

- Describes how TWO adaptations help the animals to survive.

OR

- Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
(b) *Change in temperature over time*  KEY flask 1 (insulation) flask 2 (control) flask 3 (evaporative cooling) *Note: Students are not required to provide the conditions for each flask in the key to receive full marks.*	Mod 3 Adaptations BIO11–7, 11–10 Bands 3–5 • Includes an appropriate title. AND • Plots the points correctly AND draws a curve of best fit for each flask. AND • Labels axes correctly and includes a key. AND • Uses an appropriate scale. . . . . 4 • Any THREE of the above points . . . 3 • Any TWO of the above points. . . . . 2 • Any ONE of the above points 1
(c) All three flasks lost heat over time. Flask 1 lost the least amount of heat, flask 2 lost a middling amount of heat, and flask 3 lost the most heat. Flask 1, which was insulated with wool, retained the most heat during the investigation and decreased in temperature from 77°C to 63°C. This indicates that a layer of wool around a warm body reduces heat loss. The layer of wool traps air, which acts as an insulator and prevents heat within the flask from moving outside the flask. Flask 3, which was continually wiped with water, lost the most heat and decreased in temperature from 77°C to 25°C. The evaporation of water is an endothermic process. When water changes state from liquid to gas, it takes energy to evaporate. When water evaporated from the surface of flask 3, it used energy from the flask and thus cooled the temperature of the flask rapidly.	Mod 3 Adaptations BIO11–5, 11–10 Bands 3–5 • Identifies the trend in all three graphs. AND • Explains why flask 1 retained the most heat. AND • Explains why flask 3 lost the most heat. AND • Refers to the data . . . . . 3 • Any THREE of the above points . . . 2 • Any TWO of the above points. 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 24	
Evolution is a change in a population over time. The evolution of the Eastern San Antonio frog population in Chernobyl can be explained using the main principles proposed by Darwin and Wallace as part of the Theory of Evolution by Natural Selection. • Variation: Inheritable variation exists within a population. In the Eastern San Antonio frog population, there is natural variation in the colour of the frogs that ranges from dark to light. Prior to the Chernobyl disaster, the light-coloured frogs were the dominant variant. • Reproduction: More organisms are produced than will survive. The Eastern San Antonio frogs reproduced in large numbers, but not all offspring survived to reproduce. • Struggle for survival: Offspring compete for resources such as food and mates. The Eastern San Antonio frogs' ability to survive was dependent on their ability to withstand radiation. • Survival of the most adapted: After the Chernobyl disaster, the level of ionising radiation in the area increased dramatically. Scientists believe that melanin has a protective role against radiation; thus, the frogs with more melanin (that is, the dark-coloured frogs) survived where the frogs with less melanin (that is, the light-coloured frogs) died from the effects of radiation. As the dark-coloured frogs had more favourable characteristics, they adapted and survived to reproduce, passing their inheritable traits to their offspring. Thus, the Eastern San Antonio frog population in Chernobyl became dominated by the dark-coloured variant.	Mod 3 Theory of Evolution by Natural Selection Mod 3 Evolution – the Evidence BIO11–7, 11–10 Bands 1–6 • Explains the evolution of the Eastern San Antonio frog population using the following principles of the Theory of Evolution by Natural Selection: – inheritable variation exists within a population – more organisms will be produced than will survive – struggle for survival or competition for resources – the most adapted organism will survive to reproduce – the population will become predominantly similar to the more adapted organism . . . . . 4 • Explains the evolution of the Eastern San Antonio frogs using at least FOUR principles of the Theory of Evolution by Natural Selection . . . . 3 • Explains the evolution of the Eastern San Antonio frogs using at least THREE principles of the Theory of Evolution by Natural Selection . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 25	
(a) Radioactive isotopes (radioisotopes) are elements that undergo radioactive decay at a measurable, consistent rate. Scientists can use radioisotopes such as carbon-14 in radiometric dating to measure the absolute age of fossils. Scientists can estimate the age of a rock or fossil by comparing the ratios of the parent isotope and its daughter nucleus in the rock or fossil, using radioactive decay curves. This technique is known as absolute dating. Carbon-14 has a relatively short half-life, so it can only be used to date young fossils. When dating older fossils, palaeontologists can use the radioisotopes found in igneous rock layers. These layers surround the sedimentary rock layers that contain the fossils. Using 'clocks' such as potassium–argon dating, scientists can find the ages of the igneous rock layers above and below the fossils and thus estimate the age of the fossils. Radiometric dating helps scientists to investigate past ecosystems by providing information about what organisms were on Earth during a particular period in the past. From this, scientists can draw conclusions about the evolution of organisms. Ice core drilling involves drilling into a glacier or ice sheet and extracting large cylinders of ice (ice cores). Scientists systematically melt the extracted ice cores to release trapped bubbles of gases and microbes, which can be traced to a known date of formation. The composition of gases, such as carbon dioxide and oxygen-18, are examined using a mass spectrometer and compared with other samples to determine how the concentration of gases in the atmosphere has changed over time. Scientists can also use microbes, such as pollen, found in the ice core samples to develop an understanding of past life and ecosystems on Earth. Analysing ice cores provides information about the climatic conditions that existed on Earth hundreds of thousands of years ago. This contributes to scientists' understanding about the changes in past ecosystems.	Mod 4 Past Ecosystems BIO11–11 Bands 2–6 • Describes in detail radiometric dating. AND • Explains in detail how radioisotopes can be used to investigate past ecosystems. AND • Describes in detail ice core drilling. AND • Explains in detail how ice core drilling can be used to investigate past ecosystems . . . . . 6–7 • Describes radiometric dating. AND • Explains in detail how radioisotopes can be used to investigate past ecosystems, AND • Describes ice core drilling. AND • Explains in detail how ice core drilling can be used to investigate past ecosystems . . . . . 5 • Describes radiometric dating. AND • Explains how radioisotopes can be used to investigate past ecosystems. AND • Describes ice core drilling. AND • Explains how ice core drilling can be used to investigate past ecosystems . . . . . 4 • Any THREE of the above points . . . 3 • Any TWO of the above points . . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
(b) When examining ice core samples, future scientists will see very high levels of carbon dioxide in the samples from the 20th century. The levels increased from approximately 280 ppm in 1900 to approximately 400 ppm in 2000. Scientists will see that this spike occurred much more rapidly than in previous centuries. The previous ten centuries show consistent levels of carbon dioxide at approximately 280 ppm. *Note: The response shown is more detailed than a student would be expected to write.*	Mod 4 Past Ecosystems BIO11–11 Bands 1–3 • Identifies the trend of rapid carbon dioxide increase. AND • Compares the trend to centuries prior to the 20th century 1
Question 26	
For example: Human activities such as mining and agriculture have impacted natural ecosystems in many ways. Mining can cause air pollution and water contamination. This occurs when leftover chemicals from mining processes, such as lead, mercury, cyanide and acids, leak into rivers and lakes. These chemicals, as well as ore dust and various gases, can have disastrous effects on organisms and ecosystems. They can affect the lungs of organisms or destroy organisms completely. They can also poison the water supply. Mining practices, such as open-cut mining, can destroy habitats by exposing soil that is prone to weathering and erosion. There are practices that humans can implement to restore a mining site. One such strategy is removing the contaminants of a mining site in order to prevent air and water pollution. This can involve the disposal or containment of waste products. Another strategy of restoration is stabilising mining sites, which involves using heavy machinery to reconstruct the original landscape. During stabilisation, appropriate drainage is also created to minimise the erosion of the mining site. Storing the topsoil removed during the construction of the mine and replacing it when the mining process is completed is another strategy that contributes to environment restoration. Mixing the soil with fertiliser can also encourage the rapid rehabilitation of plants. Revegetation in mining sites involves reintroducing indigenous species to the soil. Seeds for grasses and bushes or established seedlings are planted so that the land is regenerated. Quickly planting flora can help to minimise erosion. (continues on next page)	Mod 4 Future Ecosystems BIO11–7, 11–11 Bands 1–6 • Describes in detail the impact of mining on natural ecosystems. AND • Outlines in detail at least TWO strategies used to restore mining sites. AND • Describes in detail the impact of agriculture on natural ecosystems. AND • Outlines in detail at least TWO strategies used to restore agricultural sites. . . . . 6–7 • Describes the impact of mining on natural ecosystems. AND • Outlines at least TWO strategies used to restore mining sites. AND • Describes the impact of agriculture on natural ecosystems. AND • Outlines at least TWO strategies used to restore agricultural sites . . . 5

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
(continued) After plants are established, the damaged ecosystem can be restored through the reintroduction of native animals. Removing any fences around the site will allow animals to move onto the site. Breeding programs, nesting boxes, construction of faunal bridges or tunnels and feeding stations can also assist with the reintroduction. It is also important that exotic species are controlled when restoring the ecosystem of a mining site. Agricultural practices such as land clearing, overgrazing and irrigation can also result in the destruction of natural ecosystems. Land clearing involves the clearing of large tracts of land for crops or livestock, which can destroy native habitats and leave the land susceptible to erosion from wind and water. Erosion strips essential nutrients from the soil exposed by land clearing. Overgrazing impacts the ecosystem by reducing vegetation cover and thus exposing the soil to weathering and erosion. Irrigation in agricultural areas can cause salt to rise to the surface of the soil. Salt is detrimental to plants as it causes dehydration and death. There are a number of practices that can be employed on farms to reduce the negative impacts of agriculture and help restore ecosystems. Farmers can reduce the erosion of soil and maintain good soil health by planting deep-rooted vegetation, such as trees. Planting dedicated areas of farms with native flora can also help to restore the land. Extensive planting of native trees that link with Crown land or national parks containing native forests can also be restorative, as these provide areas for native plants and animals to survive and flourish. It is important that exotic species are controlled within these neighbouring national parks. The effects of overgrazing on vegetation cover can be minimised by reducing the number of livestock or rotating stock through various paddocks. This ensures that vegetation can recover. To restore the land damaged by irrigation-caused salinity, salt-resistant plants should be established, followed by deep-rooted plants and trees. Over time, the shrubs and trees will extract water from a greater depth than the crops, lowering the water table. *Note: The response shown is more detailed than a student would be expected to write. This is so that teachers may advise their students of the range of information that could be included.*	• Describes the impact of mining on natural ecosystems. AND • Outlines at least ONE strategy used to restore mining sites. AND • Describes the impact of agriculture on natural ecosystems. AND • Outlines at least ONE strategy used to restore agricultural sites . . . 4 • Any THREE of the above points . . . 3 • Any TWO of the above points . . . . . 2 • Provides some relevant information 1