Neap

Trial Examination 2021

VCE Biology Unit 1

Written Examination

Suggested Solutions

SECTION A – MULTIPLE-CHOICE QUESTIONS

1	A	B	C	**D**
2	**A**	B	C	D
3	A	**B**	C	D
4	A	B	C	**D**
5	A	**B**	C	D
6	A	B	C	**D**
7	A	B	**C**	D
8	**A**	B	C	D
9	**A**	B	C	D
10	A	B	**C**	D
11	A	B	C	**D**
12	**A**	B	C	D
13	A	B	C	**D**

14	**A**	B	C	D
15	A	B	**C**	D
16	A	B	C	**D**
17	A	B	**C**	D
18	A	**B**	C	D
19	A	**B**	C	D
20	A	B	**C**	D
21	**A**	B	C	D
22	A	B	**C**	D
23	A	B	C	**D**
24	A	**B**	C	D
25	**A**	B	C	D

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Question 1 D

D is correct. Prokaryotes have no membrane-bound nucleus or organelles. **A** is incorrect. Plant eukaryotes have a cell wall. **B** and **C** are incorrect. All prokaryotes and eukaryotes have a plasma membrane and many ribosomes.

Question 2 A

A is correct. Chloroplasts have a double outer-membrane, whereas mitochondria have a smooth outer-membrane and a folded inner membrane. **B** is incorrect. There are no pigments in mitochondria; enzymes are attached to the inner folded membrane. **C** is incorrect. Both organelles have membranes made of phospholipid and protein. **D** is incorrect. Both organelles contain ribosomes.

Question 3 B

B is correct. Vesicles are surrounded by a membrane and carry out a range of activities. **A** is incorrect. Cytoplasm is the fluid containing the organelles inside the cell membrane. **C** is incorrect. Lysosomes are a specific type of vesicle with the role of digesting engulfed material. **D** is incorrect. The nucleolus is an organelle with a specific function that is not surrounded by a membrane.

Question 4 D

D is correct. By having several different membrane-bound intracellular environments, the cell can function efficiently to carry out all activities optimally. **A**, **B** and **C** are incorrect. None of these are an advantage of membrane-bound compartmentalisation in the cytosol.

Question 5 B

B is correct. Lipid-soluble molecules can dissolve in the phospholipid bilayer and readily pass through. **A** is incorrect. Protein molecules are too large to pass through protein channels in the plasma membrane. **C** is incorrect. Although ions are small, they cannot pass through the bilayer directly, as they are water soluble, and so must pass through the protein channels. **D** is incorrect. The presence of cholesterol helps to maintain membrane stability, but it does not aid in the membrane acting as a semi-permeable boundary.

Question 6 D

D is correct. The diagram of method A shows facilitated diffusion and the diagram of method B shows active transport, so the direction of movement in method A is along the concentration gradient, whereas the movement in method B is against the concentration gradient. **A** is incorrect. Facilitated diffusion does not require energy. **B** is incorrect. Facilitated diffusion does need carrier protein molecules. **C** is incorrect. The movement in method B is not through the phospholipid bilayer.

Question 7 C

C is correct. Absorption of glucose out of the small intestine into the blood is against the concentration gradient, and therefore requires active transport. **A** is incorrect. Water absorption in a plant's roots occurs by osmosis. **B** is incorrect. The loss of water vapour out of the leaves of a plant occurs by diffusion. **D** is incorrect. Protein hormones are large molecules and would leave the cells by exocytosis.

Question 8 A

A is correct. In photosynthesis, carbon from the input of carbon dioxide joins with the hydrogen ions from water, using energy to produce the carbohydrate glucose. **B** is incorrect. Oxygen is not a waste product; plant cells will use it in cellular respiration. **C** is incorrect. Solar energy is already light energy, so no conversion is needed. **D** is incorrect. Absorbed light energy is converted into chemical energy (glucose).

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Question 9 B

B is correct. Carbon dioxide is an input and oxygen is an output in photosynthesis; in cellular respiration, ADP and P_i are converted into ATP using the energy given off in glucose breakdown. **A**, **B** and **C** are incorrect. These options incorrectly identify the chemicals.

Question 10 C

C is correct. A mesophyll leaf cell contains chloroplasts and is the main type of cell in which photosynthesis occurs. **A** and **D** are incorrect. Root hair cells and inner stem storage cells are located in the dark, so no photosynthesis occurs. **B** is incorrect. Xylem vessel cells are dead.

Question 11 D

D is correct. Biomimicry is the design and production of materials, structures and systems modelled on entities and processes in nature; it shows that we can learn developmental ideas from nature. **A**, **B** and **C** are incorrect. The structures and functions copied will not involve the use of nature, the collection of products from nature for human benefit or be identical to those in nature.

Question 12 A

A is correct. Once blood glucose concentration begins to rise above the optimum, insulin will be released and reach a peak before glucose peaks. As the glucose concentration decreases back to normal, the insulin will then decrease rapidly back to a low concentration, as it has fulfilled its purpose. **B**, **C** and **D** are incorrect. These options do not show this relationship between mean blood glucose and insulin concentration.

Question 13 D

D is correct. The beta cells in the pancreas are the sites of insulin synthesis. If they are broken down, the person will make little or no insulin and suffer from type 1 diabetes. **A** and **C** are incorrect. The kidney and liver play no direct role in glucose regulation. **B** is incorrect. The pancreas is a ductless endocrine gland, so there could be no effect from a duct blockage.

Question 14 A

A is correct. With broken-down beta cells in a malfunctioning pancreas, there will be little or no insulin produced. **B** is incorrect. The opposing hormone, glucagon, is produced by alpha cells in the pancreas. **C** is incorrect. A person with type 1 diabetes will consistently produce little to no insulin. **D** is incorrect. ADH hormone is involved with the regulation of blood solute concentration.

Question 15 C

C is correct. The symptoms displayed with type 1 diabetes show that the systems of the human body are interconnected and interdependent, and a malfunction in one system will have consequences in the others. **A**, **B** and **D** are incorrect. The symptoms given do not show any of these to be true.

Question 16 D

D is correct. A living community needs to have an energy source, either light energy, energy from chemical reactions or a source of food/complex organic molecules containing stored chemical energy. **A** and **C** are incorrect. As it is completely dark in the cave, there can be no photosynthesis or healthy green plants. **B** is incorrect. There must be animals, such as bats, crickets or spiders, visiting the cave and depositing organic matter for energy to be provided to the community of organisms in the pond.

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Question 17 C

C is correct. The organisms in the pond will rely on organic matter brought into the cave for their energy source. **A** is incorrect. No light or energy from chemical reactions is available for autotrophic nutrition. **B** is incorrect. There is no light in the cave for photosynthesis. **D** is incorrect. The organisms cannot make their own food, so they must be consumers (heterotrophs), not decomposers.

Question 18 B

B is correct. An ecosystem consists of a community of interacting living organisms, such as barnacles, oysters, sea anemones and sea urchins, together with their non-living surroundings (water, rocks, sand) in a particular place at a particular time. **A** and **C** are incorrect. Community and population refer only to the living organisms. **D** is incorrect. Biosphere is a term used for the global ecosystem.

Question 19 B

B is correct. The diagram shows an intertidal zone, which will be exposed to the air between high and low tide. Therefore, the organisms that live in this area are well-adapted by having hard outer-coverings and clinging firmly to the rock surface to prevent water loss (dehydration). **A** is incorrect. The organisms are not mobile. **C** is incorrect. The organisms are only open to the air when the tide is out, and so would not be mainly adapted to absorb oxygen from the air. **D** is incorrect. Being exposed to the sun does not necessarily make the organisms producers.

Question 20 C

C is correct. The red and brown algae are in the sub-tidal zone, not the intertidal zone where the barnacles and oysters live, so they could not provide them with food. **A** is incorrect. Red and brown algae can carry out photosynthesis using different coloured pigments for light absorption. **B** is incorrect. Some algae do float in the water, while others are fixed. **D** is incorrect. The algae are never available at low tide as they are in the sub-tidal zone.

Question 21 A

A is correct. As the density of population S increases, the density of population R decreases due to them being eaten by the predatory organisms in population S. When the population of R decreases, then the density of population S will decrease as its food source decreases. Then this pattern repeats. **B**, **C** and **D** are incorrect. The relationships they describe are not supported by the data in the graph.

Question 22 C

C is correct. Abiotic means non-living factors, and chemical environmental conditions are non-living. **A**, **B** and **D** are incorrect. Pathogens, interspecific competition and predators all involve living organisms.

Question 23 D

D is correct. Buds beneath the surface of the bark are protected from the fire but are ready to grow vigorously even though the outer bark is burnt. **A**, **B** and **C** are incorrect. Smooth shiny bark, cylindrical leaves and horizontal surface stems would all be destroyed by the heat and intensity of the fire.

Question 24 B

B is correct. Wombats live on the ground and in burrows, whereas koalas are tree-dwelling, so wombat competition would not threaten the species density and diversity of the koalas. **A**, **C** and **D** are incorrect. Habitat loss, motor vehicle accidents and bacterial diseases are all major threats to koalas.

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Question 25 A

A is correct. Transferring some of these unaffected, disease-free koalas to the mainland and breeding them in captivity will increase the population numbers of the disease-free koalas. This will hopefully maintain the koala species at levels above vulnerable when they are put back into their natural environments.
B, **C** and **D** are incorrect. None of these strategies would result in a better outcome than breeding the disease-free koalas in captivity.

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SECTION B

Question 1 (10 marks)

a. eukaryote 1 mark

The organism has a membrane-bound nucleus and other membrane-bound organelles that can be seen in the electron micrograph. 1 mark

b. *Any two of:*

Name	Function
vesicle	digestion, transport or storage
rough endoplasmic reticulum	protein synthesis and transport
nucleus	control of the activities and reactions in the cell

4 marks

1 mark for each structure correctly labelled and named.
1 mark for each function accurately outlined.

c. **i.** to carry out aerobic cellular respiration and produce ATP as an energy storage molecule 1 mark

ii. With no mitochondria, the *Monocercomonoides* cells will be able to produce only a small amount of energy by anaerobic cellular respiration, so their activities may be restricted. 1 mark

d. **i.** parasitism 1 mark

ii. physiological adaptation 1 mark

Question 2 (7 marks)

a. **i.** structural adaptation 1 mark

ii. Microvilli provide a greater surface area for reabsorption of sodium ions and water. 1 mark

b. **i.** active transport 1 mark

ii. Movement of sodium ions is from a lower concentration in the tubule to a higher concentration in the blood. 1 mark

The cells are densely packed with mitochondria, which provide the energy needed for active transport. 1 mark

c. **i.** osmosis 1 mark

ii. passive, as no added cell energy is needed for the water to move along the concentration gradient 1 mark

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Question 3 (6 marks)

a. **i.** cellular respiration 1 mark

ii. *For example:*

If there is no carbon dioxide in the air surrounding the leaf, then the plant will not carry out photosynthesis. 1 mark

b. **i.** Lee was correct, as it is essential to have a control experiment for comparison in order to show that the lack of carbon dioxide (the independent variable) was the factor that caused the results, and not some other factor. 1 mark

ii. The dependent variable is the presence of starch (indicated by the change in colour of the iodine). 1 mark

c. **i.** $6CO_2 + 12H_2O \xrightarrow{\text{light, chlorophyll}} C_6H_{12}O_6 + 6CO_2 + 6H_2O$ 1 mark

ii. No. Cellular respiration takes place day and night, so it would be occurring at the same time as photosynthesis when the leaf was in bright sunlight. 1 mark

Question 4 (8 marks)

a. Jess was correct. The contents of the digestive tract are still external, whereas the fluids bathing the cells are internal. 1 mark

b. the hypothalamus 1 mark

Note: 'The brain' is not a specific answer and should not be awarded a mark.

c. **i.** *For example, any one of:*

- Vasodilation/expansion of the blood vessels in the skin could occur, thereby bringing more warm blood from the core to the surface in order to increase heat loss.
- Increased sweating could occur, as evaporation of the liquid sweat uses heat energy to convert it into gaseous water vapour, thereby cooling down the body.
- Ingesting cold food or drink, having a cold bath or swimming in cold water would reduce heat in the body as it is absorbed into the cold medium.

2 marks

1 mark for stating the corrective mechanism.
1 mark for describing the corrective mechanism.

ii. *For example, any one of:*

- Shivering would increase body temperature as the skeletal muscle cells increase the rate of cellular respiration.
- Standing in front of a heater or fire, or having a warm bath will increase body temperature, as heat will be absorbed by radiation and conduction.

2 marks

1 mark for stating the corrective mechanism.
1 mark for describing the corrective mechanism.

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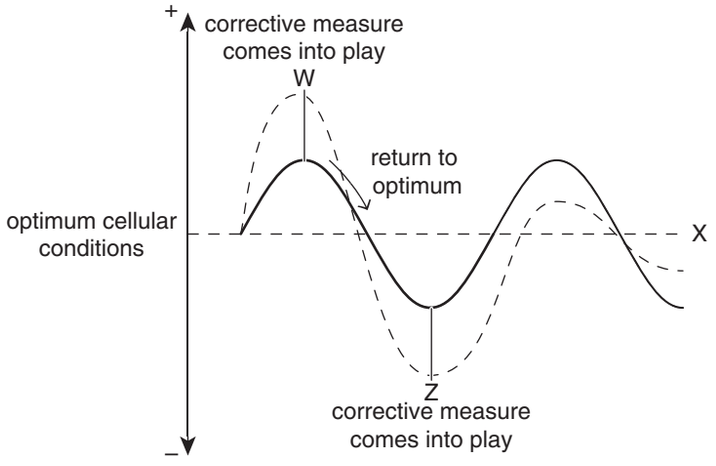
d. *For example:*



1 mark

Any one of:

- The upward curve is higher, as a greater amount of heat has been produced than lost, resulting in a higher increase in body temperature.
- The downward curve is lower, as there is less heat lost to the environment; maybe the person is wearing a jumper for insulation.

1 mark

Note: An alternative graph may be drawn that shows less variation. Accept a supporting reason identifying that as body temperature fluctuates around the optimum, there is less difference in body temperature over time.

Question 5 (8 marks)

a. **i.** Water evaporates from the moist cell walls of the leaf cells into the intercellular leaf spaces, then travels from this higher concentration out through the open stomata into the surrounding air. 1 mark

ii. The rate of water loss slows down because the concentration difference of the water vapour inside and outside the leaf has decreased. 1 mark

iii. Species 2 was the *Pelargonium*, as it has a lower percentage mass decrease over the four-hour period. 1 mark

It is better adapted to reducing water loss due to the presence of the thicker cuticle and hairy leaves. 1 mark

b. **i.** *For example, any one of:*

- The percentage of water lost in exhaled air and sweat would increase.
- The percentage of water lost in urine would decrease.

1 mark

ii. Their kidney would reabsorb more water, so that they produced a smaller volume of concentrated urine. 1 mark

c. Nearly half of the kangaroo rat's water loss is evaporated water vapour, mainly in their breath, with much less lost in their urine and faeces. 1 mark

The kangaroo rat is well-adapted to desert conditions and produces very concentrated urine (uric acid paste) and very dry faeces to retain water when compared to the urine and faeces of a human. 1 mark

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Question 6 (11 marks)

a. **i.** the direction of energy flow 1 mark

ii. An arrow between the musky rat kangaroo and the common taipan would place the common taipan at the fourth tropic level. 1 mark

b. **i.** mutualism 1 mark

ii. The seeds of the fruit trees are excreted in the dung of the cassowary and are then dispersed some distance from the parent plant, reducing competition for light, water and other resources. 1 mark

c. **i.** A keystone species is one that has a disproportionately large impact on an ecosystem relative to its abundance. 1 mark

ii. Due to their role in the distribution of seeds, cassowaries are a specific species that aid in the balance of the Daintree Rainforest. 1 mark

d. **i.** Reduced suitable habitats due to farming and subdividing the land will result in reduced numbers of cassowaries. 1 mark

ii. As cassowaries are a keystone species, this could affect the dispersal of fruit trees and other plant species, potentially even resulting in the breakdown of the ecosystem. 1 mark

e. **i.** The second name is the descriptive name in the species name, such as *camaldulensis* in the name of the red gum. 1 mark

ii. The two types of gum trees have different morphological/structural features and are not in the same species. They have different first genus names as they are also in different genera. 1 mark

iii. *For example:*

- The binomial system of nomenclature provides a universal system of naming that is used internationally and aids in communication between scientists in different countries.
- any other reasonable answer

1 mark

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