Neap

Trial Examination 2023

Suggested Solutions

QCE Biology Units 1&2

Paper 1

SECTION 1 – MULTIPLE-CHOICE QUESTIONS

	A	B	C	D
1.	○	●	○	○
2.	○	○	●	○
3.	○	○	●	○
4.	○	○	●	○
5.	○	○	●	○
6.	○	○	○	●
7.	●	○	○	○
8.	○	○	●	○
9.	○	○	○	●
10.	●	○	○	○
11.	○	○	●	○
12.	○	○	○	●
13.	○	●	○	○
14.	○	●	○	○
15.	○	●	○	○

	A	B	C	D
16.	○	●	○	○
17.	○	○	○	●
18.	●	○	○	○
19.	○	○	○	●
20.	○	○	○	●
21.	○	●	○	○
22.	○	○	●	○
23.	●	○	○	○
24.	○	○	●	○
25.	●	○	○	○

QUESTION 1 B

B is correct. An increase in body temperature triggers blood vessel dilation, which increases the blood flow near the surface of the skin and thus allows heat to leave the body faster.

A is incorrect. An increase in blood pressure is the body's response to adrenaline.

C is incorrect. Blood vessel constriction is the body's response to falling body temperature.

D is incorrect. Heart rate is independent of body temperature.

QUESTION 2 C

C is correct. Metabolic heat production is a physiological response that increases body temperature.

A and **B** are incorrect. Evaporation of sweat and increase in blood flow are physiological responses that decrease body temperature.

D is incorrect. Removal of excess clothing is a behavioural response that does not increase body temperature.

QUESTION 3 C

C is correct. The bacteria causes the disease and therefore is the pathogen.

A is incorrect. The term pandemic describes the extent of a disease.

B is incorrect. In this case, a vector is the rodent or flea carrying the disease.

D is incorrect. In this case, the reservoir is the population of rodents that maintain the pathogen in the environment.

QUESTION 4 C

C is correct. When cells are damaged, they release chemicals (including histamine) that cause the blood vessels to leak fluids into the damaged tissues, which leads to swelling.

A and **B** are incorrect. The adaptive (specific) immune response refers to an acquired response to specific pathogens that the body has previously encountered, which would only occur after the inflammatory response.

D is incorrect. The immune response is the whole process of the body's response to injury, whereas the question only describes part of the immune response.

QUESTION 5 C

C is correct. The number of antibodies slowly decreases over time.

A and **B** are incorrect. The trendline is clearly negative.

D is incorrect. The single data point at 21 days is the highest point on the graph, so it does not represent the mean.

QUESTION 6 D

D is correct. B and T cells are lymphocytes formed in bone marrow. B cells produce antibodies and T cells attack cells that have been overtaken by invading viruses or have become cancerous.

A is incorrect. B and T cells are part of the adaptive immune system.

B is incorrect. Only T cells are phagocytes.

C is incorrect. Only B cells produce antibodies.

QUESTION 7 A

A is correct. Oxygen is released during the light-dependent phase of photosynthesis as a by-product. The overall equation for photosynthesis is carbon dioxide + water $\xrightarrow{\text{light energy}}$ glucose + oxygen + water.

B is incorrect. The light-dependent phase of photosynthesis occurs in the thylakoid membrane.

C is incorrect. The carbon dioxide molecule does not split during the light-dependent phase of photosynthesis.

D is incorrect. Sunlight is absorbed by chloroplasts during the light-dependent phase of photosynthesis.

QUESTION 8 C

C is correct. Active transport requires energy from the cell.

A, **B** and **D** are incorrect. These options are only true for passive transport (diffusion or osmosis). Active transport may be against the concentration gradient and requires ATP to occur.

QUESTION 9 D

D is correct. The iodine molecules will move into the cell with the concentration gradient. This is because iodine is a very small molecule and will easily pass through the dialysis tubing.

A is incorrect. Although it is possible that the model cell will swell and burst, this is unlikely to happen within the 30-minute timeframe.

B is incorrect. Starch is too large to move through the semi-permeable dialysis tubing.

C is incorrect. Glucose is much smaller than starch and will likely move through the dialysis tubing via passive transport.

QUESTION 10 A

A is correct. Transpiration rates in plants vary according to environmental conditions. They also vary according to the type of plant, such as xerophyte, mesophyte and halophyte.

B is incorrect. Cold environments do not increase transpiration in plants.

C is incorrect. Transpiration does not remain constant.

D is incorrect. Transpiration does vary according to the availability of water to a plant.

QUESTION 11 C

C is correct. Huddling together to reduce surface area is a behavioural adaptation to stay warm in a cool environment.

A, **B** and **D** are incorrect. They are examples of adaptations of an endotherm in a warm environment.

QUESTION 12 D

D is correct. Bacteria and Archaea are both prokaryotic and generally have a singular circular chromosome located in a part of the cell called the nucleoid.

A, **B** and **C** are incorrect. These are characteristics of eukaryotic cells.

QUESTION 13 B

Cells A and C have cell membranes but they do not have cell walls and so they are likely to be from animals. Cell B could be from a plant due to the presence of a cell wall and a chloroplast. Chloroplasts are needed to perform photosynthesis, which does not occur in animal cells.

QUESTION 14 B

B is correct. This option correctly identifies the nucleus, endoplasmic reticulum, mitochondrion and lysosome.

A, **C** and **D** are incorrect. These options incorrectly identify the organelles.

QUESTION 15 B

B is correct. The peak of the graph (the highest point) occurs at approximately 40°C. This indicates the peak of the enzyme activity.

A is incorrect. The peak of enzyme activity is at approximately 40°C, which is not a very low temperature.

C is incorrect. The graph shows that enzyme activity is related to temperature.

D is incorrect. There is still enzyme activity above 30°C.

QUESTION 16 B

B is correct. The axon conducts the action potential, or impulse, that travels along the neuron.

A is incorrect. The myelin sheath of an axon provides insulation that speeds up the transmission of the electrical impulse.

C is incorrect. The axon is part of all nerves but is not a sensory receptor.

D is incorrect. The axon is present in motor neurons.

QUESTION 17 D

D is correct. Stem cells are uniquely different to other cells because they have the potential to become different types of cells, such as bone cells and blood cells.

A is incorrect. Cell division is not unique to stem cells.

B is incorrect. Stem cells do not have specialised functions.

C is incorrect. Stem cells are capable of self-renewal.

QUESTION 18 A

A is correct. The correct hierarchical structural organisation is cells, tissues, organs, system and organism.

B is incorrect. Tissues are a subsidiary of organs.

C is incorrect. Organs and tissues are subsidiaries of a system.

D is incorrect. Cells are the simplest structure listed.

QUESTION 19 D

D is correct, and **A** and **B** are incorrect. The structures of alveoli and gills maximise the surface area where gas exchange occurs. This gas exchange surface is very thin, must remain moist and is surrounded by an extensive capillary system.

C is incorrect. The large surface area is for improved oxygen uptake, not loss.

QUESTION 20 D

D is correct. Y represents oxygen entering the bloodstream.

A is incorrect. Z represents oxygenated red blood cells.

B is incorrect. X represents deoxygenated red blood cells.

C is incorrect. Carbon dioxide leaves the alveoli, as shown in the diagram.

QUESTION 21 B

This option correctly identifies the active site, the enzyme and the substrate. The substrate binds with the enzyme's active site, forming an enzyme–substrate complex. The substrate is converted to products, and the products then leave the enzyme.

QUESTION 22 C

C is correct, and **A** and **B** are incorrect. The structure of the villi in the lining of the intestine increases the surface area of the lining of the intestine. This increases the area where the nutrients can be passively absorbed into the bloodstream.

D is incorrect. The villi may slow the movement of material through the gut inadvertently, but this is not their main function.

QUESTION 23 A

A is correct. Halophytes are plants that grow in very salty environments. In order to absorb water in this type of environment, they need to increase the salt in their roots to allow for the passive absorption of water from the environment.

B and **C** are incorrect. Few stomata and large fleshy leaves are features of xerophytes.

D is incorrect. Specialised air sacs are a feature of hydrophytes.

QUESTION 24 C

C is correct. Xylem cells facilitate the movement of water from the roots throughout the rest of the plant. They are made of hydrophobic material.

A is incorrect. This option describes stomata.

B and **D** are incorrect. These options are also part of the vascular bundles but they relate to the phloem.

QUESTION 25 A

A is correct. Hormones are specialised chemical messengers in the body.

B is incorrect. Upregulation increases the response to a stimulus.

C is incorrect. Hormones are produced by many organs.

D is incorrect. Hormones are specific.

SECTION 2

QUESTION 26 (6 marks)

a) eukaryotic cell

The presence of membrane-bound organelles indicates that it is a eukaryotic cell.

[2 marks]
1 mark for identifying the cell type.
1 mark for justifying the response.

b)

	Structure name
A	cell wall
B	cytoplasm
C	vacuole
D	nucleus

[4 marks]
1 mark for each correct structure name.

QUESTION 27 (7 marks)

a) *For example:*

The enzyme at 37°C would experience a decrease in activity due to the lowered temperature.

The activity of the enzyme at room temperature would continue at the same rate, as there would be no noticeable change in temperature.

The enzyme at 4°C would experience a significant increase in activity due to the increase in temperature.

The enzyme at 65°C would experience no change, as it is already denatured.

[5 marks]
1 mark for explaining the change for the enzyme at 37°C.
1 mark for explaining the change for the enzyme at room temperature.
1 mark for explaining the change for the enzyme at 4°C.
1 mark for stating that there is no change for the enzyme at 65°C
1 mark for stating that the enzyme at 65°C is denatured.

b) A human is likely to utilise this enzyme, as the enzyme functions best around 37°C (as shown in the graph), which is the body temperature of humans.

[2 marks]
1 mark for identifying human.
1 mark for justifying the response.

QUESTION 28 (8 marks)

a)

	Component name
A	oxygen *(moving out)*
B	water *(moving out)*
C	carbon dioxide *(moving in)*
D	guard cell

[4 marks]
1 mark for each correct substance and structure name.

b) The movement of oxygen, water and carbon dioxide is controlled by the turgidity of the guard cells. When a plant has adequate water, the cells are hydrated and the guard cells are turgid. This opens the stomata and allows water vapour out. If a plant has inadequate water, the cells lose water pressure, the guard cells become flaccid and the stomata openings shrink. This reduces water loss.

[4 marks]
1 mark for explaining that guard cells control the movement of gases in and out of leaves.
1 mark for explaining that turgidity keeps guard cells open.
1 mark for explaining that a loss of water pressure closes the stomata.
1 mark for explaining that the closing of the stomata conserves water in plants.

QUESTION 29 (4 marks)

a) *Any two of:*

- phagocytes
- plasma
- white blood cells
- platelets

[2 marks]
1 mark for each correct component identified.

b) *For example, any one of:*

- Plasma contains phagocytes (white blood cells). These cells engulf and destroy foreign bodies.
- Platelets aid in clotting, which can form a barrier to the environment as well as reduce infection and blood loss.

[2 marks]
1 mark for stating the feature of the component that aids in disease prevention.
1 mark for describing how the feature prevents disease.