

BIOLOGY

Units 3 & 4

Trial Examination

SOLUTIONS BOOK

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Use this page as an overlay for marking the multiple choice answer sheets. Simply photocopy the page onto an overhead projector sheet. The correct answers are open boxes below. Students should have shaded their answers. Therefore, any open box with shading inside it is correct and scores 1 mark.

	ONE ANSWER PER LINE		ONE ANSWER PER LINE		ONE ANSWER PER LINE
1	☐ ☐ ☐ ☐ ☐	15	☐ ☐ ☐ ☐ ☐	28	☐ ☐ ☐ ☐ ☐
2	☐ ☐ ☐ ☐ ☐	16	☐ ☐ ☐ ☐ ☐	29	☐ ☐ ☐ ☐ ☐
3	☐ ☐ ☐ ☐ ☐	17	☐ ☐ ☐ ☐ ☐	30	☐ ☐ ☐ ☐ ☐
4	☐ ☐ ☐ ☐ ☐	18	☐ ☐ ☐ ☐ ☐	31	☐ ☐ ☐ ☐ ☐
5	☐ ☐ ☐ ☐ ☐	19	☐ ☐ ☐ ☐ ☐	32	☐ ☐ ☐ ☐ ☐
6	☐ ☐ ☐ ☐ ☐	20	☐ ☐ ☐ ☐ ☐	33	☐ ☐ ☐ ☐ ☐
7	☐ ☐ ☐ ☐ ☐	21	☐ ☐ ☐ ☐ ☐	34	☐ ☐ ☐ ☐ ☐
8	☐ ☐ ☐ ☐ ☐	22	☐ ☐ ☐ ☐ ☐	35	☐ ☐ ☐ ☐ ☐
9	☐ ☐ ☐ ☐ ☐	23	☐ ☐ ☐ ☐ ☐	36	☐ ☐ ☐ ☐ ☐
10	☐ ☐ ☐ ☐ ☐	24	☐ ☐ ☐ ☐ ☐	37	☐ ☐ ☐ ☐ ☐
11	☐ ☐ ☐ ☐ ☐	25	☐ ☐ ☐ ☐ ☐	38	☐ ☐ ☐ ☐ ☐
12	☐ ☐ ☐ ☐ ☐	26	☐ ☐ ☐ ☐ ☐	39	☐ ☐ ☐ ☐ ☐
13	☐ ☐ ☐ ☐ ☐	27	☐ ☐ ☐ ☐ ☐	40	☐ ☐ ☐ ☐ ☐
14	☐ ☐ ☐ ☐ ☐				

TEACHERS, PLEASE NOTE:

In marking the Exam, teachers should keep in mind that the language used in the suggested answers is sometimes more sophisticated than a student would offer, since these answers are written for teachers' information in their correction of the Exam.

*The answers suggested here might not be the only correct responses possible. Teachers must use their professional judgement in awarding marks for other answers offered. However, in accordance with the VCAA practice, students who give a correct response, and then offer a contradictory incorrect response within the same part of the question, should **not** be awarded any marks for the correct part of the response. Also, in accordance with the VCAA practice, no half marks should be given.*

SECTION A – MULTIPLE CHOICE QUESTIONS (1 mark each: 40 marks)

1	C	15	D	28	A
2	A	16	B	29	D
3	D	17	D	30	B
4	B	18	C	31	D
5	B	19	B	32	C
6	C	20	B	33	D
7	D	21	D	34	B
8	C	22	A	35	A
9	B	23	D	36	C
10	D	24	C	37	C
11	C	25	D	38	C
12	D	26	C	39	B
13	D	27	B	40	A
14	B				

SECTION B – WRITTEN RESPONSES**Question 1**

a adenine, uracil, guanine, cytosine

1 mark

b**mRNA****tRNA**

shape of the molecule	<i>linear</i>	<i>clover leafed shape (or any other close description or diagram)</i>	(1)
function	<i>carries the message of transcription of DNA from the nucleus to the ribosome</i>	<i>carries a specific amino acid to the ribosome</i>	(1)

(One mark per line correct)

2 marks

c Region 1 – A sequence of 3 nucleotides (anticodons) complementary to a specific mRNA codon (1).

Region 2 – An (acceptor) region where a specific amino acid is attached (1).

2 marks

d mRNA is broken down after translation (1).

tRNA is reactivated by attaching with a new specific amino acid (1).

2 marks

Total Question 1: 7 marks

Question 2

- a** The more cristae the greater the surface area of the inner membrane for enzymes of the electron transport chain to act (1).
The muscles of the trained athlete would use more ATP than the non-athletes so would require more cristae for more ATP production from the electron transport chain (1).
(Students must make the comparison for the second mark). 2 marks
- b** Advantage 1: Can still form some ATP when oxygen is not available (1).
Advantage 2: As shown in the diagram, NAD is regenerated when pyruvate forms lactic acid and this is needed for glycolysis (1). 2 marks
- c** Lactic acid is toxic causing cramps so it is therefore important to remove it as soon as possible. **Or** Lactic acid is converted to pyruvate for energy to repair the damage. 1 mark
- d** Oxygen is the final electron acceptor in the electron transport chain which generates most of the ATP for the cell (1). If this step does not occur then the electron transport chain will not continue so there will be insufficient ATP for the cell to carry out energy requiring reactions and it will die (1). 2 marks
- e** Endosymbiosis (1). Mitochondria were originally bacteria that became engulfed by cells and incorporated into their function in a symbiotic fashion (1). 2 marks

Total Question 2: 9 marks**Question 3**

- a** Virus infected cells (1).
Stimulated by external signalling when cells are no longer needed (1). 2 marks
- b** mitochondria 1 mark
- c** The release of cytochrome c results in the activation of protease enzymes called caspases (1). The caspases dismantle the cell by cleaving proteins (1). 2 marks
- d** As BAX supports apoptosis by triggering the release of cytochrome c and Bcl2 prevents the release of cytochrome c (1) if BAX is less than Bcl2 then there will be less apoptosis (1). 2 marks

Total Question 3: 7 marks**Question 4**

- a** An epidemic is an outbreak of an infectious disease that infects more than the usual number of people at the same time in a community (1). A pandemic is an outbreak of an infectious disease that spreads between people within many countries and even the whole world (1). 2 marks
- b** Viruses must attach to specific receptor molecules on the cell surface to gain entry to the cell (1). Animal cells often have different receptors from human cells and this makes it more difficult for the virus to attach (1). 2 marks
- c** As Wuhan is a major transport hub people travel into and out of Wuhan to other places and so can spread the virus far and wide. 1 mark
- d** **Any two of the following:**
- The quarantine of anyone suffering from the virus (1).
 - Monitoring of passengers leaving the city by plane or public transport (1).
 - Prevent people from moving into the city or country (1).
 - Maintaining social/physical distancing (1).
 - Wearing face masks (1).
- 2 marks
- e** polymerase chain reaction 1 mark
- f** If the individual has recovered from the infection, they would not have any viral particles in their throat or tissue fluids. 1 mark
- g** Test for the presence of antibodies against the virus in the patient's blood. 1 mark

Total Question 4: 10 marks

Question 5

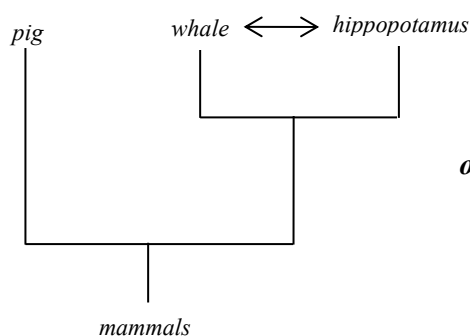
- a** The inflammatory response will be initiated involving dilation of and leakage of blood vessels and migration of neutrophils to the area (1). 1 mark
- b** If the neurotoxin produced by tetanus organisms blocks the release of inhibitory neurotransmitter in a pathway (1) the excitatory neurons can fire off with any stimulation as the action potentials of inhibitory neurons cannot move past the synapses (1). 2 marks
- c** Herd immunity is a form of indirect protection from an infectious disease that occurs if a very large percentage (90 – 95%) of the population have become immune to the disease by vaccination. This provides protection for those who are not immune. 1 mark
- d** No, they cannot. Tetanus is not spread from person to person but results when an individual gets tetanus spores in a deep wound. Therefore, only individuals who are vaccinated are immune. 1 mark

Total Question 5: 5 marks**Question 6**

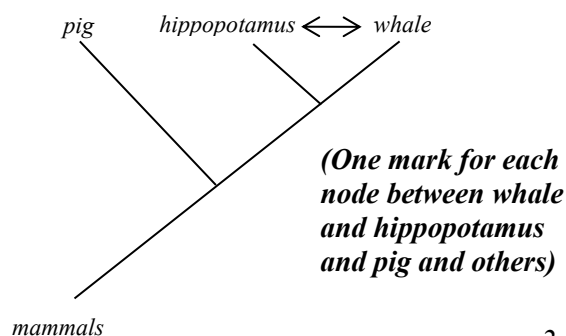
- a** B lymphocyte (1)
The allergen X (1) attaches to the binding site of the appropriate antibody on the surface of the B lymphocyte (1). 3 marks
- b** plasma cell (1)
In step 2 the B lymphocyte has differentiated into a plasma cell and this plasma cell has released IgE antibodies labelled Y (1) into the tissue fluid. 2 marks
- c** mast cell (1)
The IgE antibodies have attached to the mast cell (1). 2 marks
- d** The allergen attaches to the IGE antibodies on the mast cell (1). This results in the release of histamine labelled Z from vesicles resulting in the allergic response (1). 2 marks

Total Question 6: 9 marks**Question 7**

- a** The hippopotamus and the pig have the most similar physical appearance and the whale looks completely different (1). The bone structure of the foot is more similar in the hippopotamus and the pig, both having 4 digits whereas the flipper of the whale has 5 digits (1). 2 marks

b

or

**(One mark for each node between whale and hippopotamus and pig and others)**

2 marks

- c** Using the nucleotide sequence given, the hippopotamus and the whale have only two differences in nucleotides at the same locus whereas the pig differs from the other two by six differences (1) making the hippopotamus and the whale more closely related than the hippopotamus and the pig (1). 2 marks
- d** Cytochrome c is an important protein in the electron transport chain in aerobic respiration and is present in all eukaryotic cells making it an ideal choice for comparison of amino acid sequences with those with the fewer differences being more closely related. 1 mark

Total Question 7: 7 marks

Question 8

- a** Golden rice is a transgenic organism (1) that contains genes from another organism. In this case Golden rice contains genes from a bacterium and maize (1) and is therefore transgenic. 2 marks

b Social Implications**Any 2 of the following for 2 marks:**

- Use of Golden rice could increase the economy as less money would be spent on children suffering from blindness or illness (1).
- Golden rice needs to be made available to farmers in areas where children suffer from VAD (1).
- Yet to be proven safe (1).
- Other crops that are less expensive also contain large amounts of vit A (1).
- Farmers need appropriate land to grow the rice (1).

Biological Implications

Any 2 of the following for 2 marks:

- Beta carotene levels in Golden rice may not be high enough to make a difference to an individual's health (1).
- Problems with having to cross breed with other wild varieties of rice (1).
- Improved health of children due to improved nutrition (1).
- Some consumers are still concerned about GM (genetically modified) crops affecting their health (1).

4 marks**Total Question 8: 6 marks****Question 9****a** Any one of the following for one mark:

- isometric dating (1)
- electron spin resonance (1)
- DNA analysis and the molecular clock (1)

1 mark**b** Any two of the following for two marks:

- larger teeth in *H. erectus* than *H. sapiens* (1)
- more prominent cheek bones in *H. erectus* than *H. sapiens* (1)
- more pronounced brow ridges in *H. erectus* than *H. sapiens* (1)
- larger orbitals for the eyes in *H. erectus* than *H. sapiens* (1)
- brain case more rounded in *H. sapiens* than *H. erectus* (1)

2 marks**c** The foramen magnum is positioned at the base of the skull so that the head sits upright on the spine. 1 mark**d** Any two of the following explanations for two marks:

- *H. erectus* had characteristics suiting it to a woodland habitat so if climate change occurred too rapidly for selection to act by making them more suited to the rainforest environment (1) then they would not be able to survive.
- The fauna that *H. erectus* was used to hunting may have died out due to the changing habitat from woodland to rainforest (1).
- *H. erectus* may have been more vulnerable to predation in a rainforest environment than in a woodland environment (1).

2 marks**Total Question 9: 6 marks**

Question 10

- a** The germinating peas will have a greater/lesser/same rate of oxygen uptake than the non-germinating peas. 1 mark
- b** Independent variable: pea type either germinating or non-germinating (1)
Dependent variable: rate of oxygen uptake (1) 2 marks
- c** 1. temperature (1)
2. **Any one of the following for one mark:**
- the number of seeds in vial 1 and vial 2 (1)
 - the volume of KOH (1)
 - time to equilibrate (1) 2 marks
- d** This enabled the contents of the tubes to reach the temperature of incubation (equilibrate) before the experimental measurements were taken. 1 mark
- e** CO₂ gas is produced during respiration (1). By removing the CO₂ produced the change in volume measured will be due to the uptake of O₂ by the peas (1). 2 marks
- f** As the peas use up the O₂ in respiration the gas volume in the vial decreases and the pressure decreases resulting in water moving into the pipette (1). The rate of water entering over time is a measure of the rate of O₂ uptake. 1 mark
- g** **The answer provided by the student should reflect the hypothesis given in part a.** 1 mark
- h** **Any three of the following for 3 marks:**
- reading the top of the meniscus of water in the pipette instead of the bottom (1)
 - not allowing enough time for the respirometers to equilibrate (1)
 - possible leakage of the respirometer (1)
 - no. of peas not being the same (1)
 - recording the time incorrectly when taking readings (1) 3 marks
- i** This respirometer was a control. Any reading generated by the respirometer containing the glass beads should ideally be subtracted from the other two respirometer readings to compensate for any rise in temperature generated by the respiring peas. 1 mark

Total Question 10: 14 marks**Total Section B: 80 marks****Total Trial examination: 120 marks****END OF SUGGESTED SOLUTIONS**

