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BIOLOGY
Unit 3
Trial Examination

SOLUTIONS BOOK

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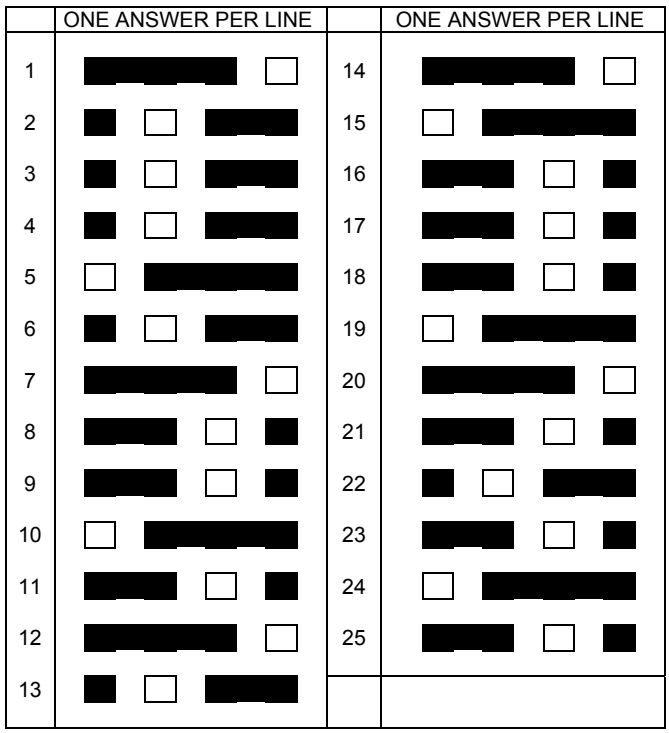
Use this page as an overlay for marking the multiple choice answer sheets. Simply photocopy the page onto an overhead projector sheet. The correct answers are open boxes below. Students should have shaded their answers. Therefore, any open box with shading inside it is correct and scores 1 mark.



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: 25 marks)

1	D	14	D
2	B	15	A
3	B	16	C
4	B	17	C
5	A	18	C
6	B	19	A
7	D	20	D
8	C	21	C
9	C	22	B
10	A	23	C
11	C	24	A
12	D	25	C
13	B		

SECTION B – SHORT ANSWER QUESTIONS

Question 1

a $C_6H_{12}O_6 + 6O_2 + 36ADP + 36P_i \longrightarrow 6CO_2 + 6H_2O + 36\ ATP$ *1 mark*

b *Stage 1 – cytoplasm*
Stage 2 – inner compartment or matrix of the mitochondria
Stage 3 – the inner membrane or cristae of the mitochondria. *3 marks*

c *X is CO_2 , Y is O_2 , Z is H_2O* *3 marks*

Total Question 1: 7 marks

Question 2

a *The number of bubbles per minute.* *1 mark*

b *Light intensity (or distance from light source.)* *1 mark*

c *The greater the light intensity the faster the rate of photosynthesis.* *1 mark*

d *1. All the gas bubbles are oxygen (1) 2. All gas bubbles are the same size (1)* *2 marks*

e *The lamp is a source of heat and the rate of photosynthesis is influenced by temperature.* *1 mark*

f *Place a flat transparent container of water between the light source and the plant. (Student answer may be drawn on the diagram)* ***or*** *provide fresh solution at each stage.* *1 mark*

g *In this experiment $NaHCO_3$ solution is used as the source of CO_2 for the plant to photosynthesise (1). Therefore the solution should be changed for each set of experiments to make sure that the concentration of CO_2 is kept constant (1).* *2 marks*

h *The graph becomes straight because CO_2 is the limiting factor in this experiment at maximum light intensity.* *1 mark*

Total Question 2: 10 marks

Question 3

a *glucose* *1 mark*

b *An enzyme lowers the activation energy needed for that reaction.* *1 mark*

c *The enzyme activity increases with the increase in temperature as there are more successful collisions between the substrate and the enzyme forming the enzyme-substrate complex resulting in more product.* *1 mark*

d *The enzyme activity decreases because the higher temperature distorts the bonds in the active site of the enzyme (or denatures the enzyme) so that the there will be fewer enzyme-substrate complexes formed and a slower reaction.* *1 mark*

e *The substance methotrexate is a very similar shape to the substrate dihydrofolate (1) and will therefore compete with dihydrofolate for the active site of the enzyme. Once methotrexate has bound to the active site of the enzyme, the dihydrofolate cannot bind so the action of the enzyme is inhibited (1).* *2 marks*

f *The "S" phase of the cell cycle is the synthesis phase when the amount of DNA in the cell doubles in preparation for mitosis or meiosis.* *1 mark*

g *Cancer involves cells undergoing mitosis (1), as methotrexate interferes with the pathway that forms nucleotides, therefore DNA replication will be slow and hence growth and division of all cells, including cancer cells, will be slow (1).* *2 marks*

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

Question 4

a *The sucking of the baby on the nipple.* *1 mark*

b *Oxytocin is a neurohormone (1) as it is produced by nerve cells in the hypothalamus and passes into the bloodstream and moves to target cells (1).* *2 marks*

c *X is a sensory neuron or afferent neuron.* *1 mark*

d *This is an example of a positive feedback (1). As the baby sucks milk is produced and as milk is produced the baby sucks more (1).* *2 marks*

e

- *As the baby suckles this is the stimulus to excite the sensory neuron to the hypothalamus.*
- *This causes the hypothalamus to make oxytocin that is secreted by the pituitary.*

} 1

- *Oxytocin enters the bloodstream and moves to the breast tissue where it causes contraction of smooth muscle.*
- *The response is the release of milk.*

} 1

2 marks

f *This is not an example of homeostasis as it is not maintaining a constant internal environment.* *1 mark*

Total Question 4: ***9 marks***

Question 5

a *To produce a specific antibody against a specific antigen.* *1 mark*

b *The plasma cell is much larger than the B lymphocyte. (As can be seen in the scale of 1μm on the lower right of the diagram.)* *1 mark*

c *When the B cell differentiates into a plasma cell, the plasma cell has to make antibodies which are protein. The plasma cell will need to increase the number of ribosomes or rough endoplasmic reticulum to do this (1) and will need to increase the golgi bodies in order to deliver these proteins out of the cell (1).* *2 marks*

d *Tissue rejection occurs because the transplanted tissue has non-self antigens that differ from the self markers of the individual's own tissue.* *1 mark*

e *Cytotoxic T cells.* *1 mark*

f *The tissue is recognized as foreign by T helper cells and these cells activate cytotoxic T cells (1). The cytotoxic T cells bind to the foreign antigens on the transplanted tissue and produce cytotoxins that destroy the tissue cells (1)* *2 marks*

Total Question 5: ***8 marks***

Question 6

a	*The presence of capsaicin, because of its burning sensation, would act as a deterrent to animals that might eat the fruit.*	*1 mark*
b	*The sodium ion is charged and as such cannot pass easily through the non-polar lipid layer of the cell membrane.*	*1 mark*
c	*TRPV1 ion channel is a transmembrane protein. X represents an □ chain or helix, which is part of the secondary structure of a protein.*	*1 mark*
d	*Capsaicin attaches to the capsaicin receptor and this causes the TRPV1 ion channel to open enabling Na^+ ions to enter (1). The flooding of the neuron with Na^+ ions sets up an action potential (1) that travels to the brain resulting in the sensation of pain.*	*2 marks*
e	*Even though the response to these two stimuli results in the sensation of pain, the temperature stimulus can result in tissue damage whereas the ingestion of chillies does not.*	*1 mark*
f	*With this continual exposure to capsaicin the nerves cannot produce the neurotransmitters in sufficient quantities, leading to a reduction in the sensation of pain.*	*1 mark*
	Total Question 6:	***7 marks***

Total Section B:	***50 marks***
Total examination:	***75 marks***

END OF SUGGESTED SOLUTIONS