



VCE BIOLOGY 2011

YEAR 12 TRIAL EXAM UNIT 3

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Time allowed: 90 minutes

Total marks: 75

25 Multiple Choice Questions

6 Short Answer Questions

An Answer Sheet is provided for Section A.
Answer all questions in Section B in the space provided.

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Student Name.....

VCE Biology 2011 Year 12 Trial Exam Unit 3

Student Answer Sheet

There are 25 Multiple Choice questions to be answered by circling the correct letter in the table below. Use only a 2B pencil. If you make a mistake, erase and enter the correct answer. Marks will not be deducted for incorrect answers.

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

VCE Biology 2011 Year 12 Trial Exam Unit 3

SECTION A – Multiple Choice Questions

Question 1

A university student was using an electron microscope to determine the presence of organelles in onion cells and cheek cells. She recorded her results in **Table 1** below. For which organelle did the student make an error?

	Onion cells	Cheek cells
A. Chloroplasts	×	×
B. Nucleus	✓	✓
C. Centrioles	✓	✓
D. Cell wall	✓	×

Table 1

Question 2

Which element is not found in carbohydrates?

- A. Carbon.
- B. Nitrogen.
- C. Hydrogen.
- D. Oxygen.

Question 3

Which of the following is composed of monosaccharide monomers?

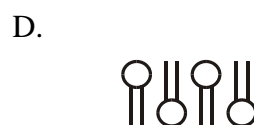
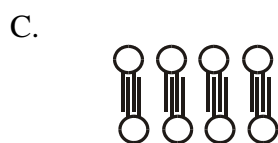
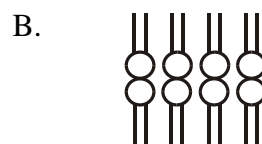
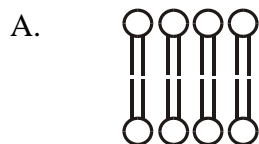
- A. Nucleic acid.
- B. Lipid.
- C. Protein.
- D. Glycogen.

Question 4

A phospholipid molecule can be represented as



Which diagram most closely resembles the phospholipid arrangement in a plasma membrane?



Question 5

Figure 1 below shows three ways that molecules can cross a plasma membrane.

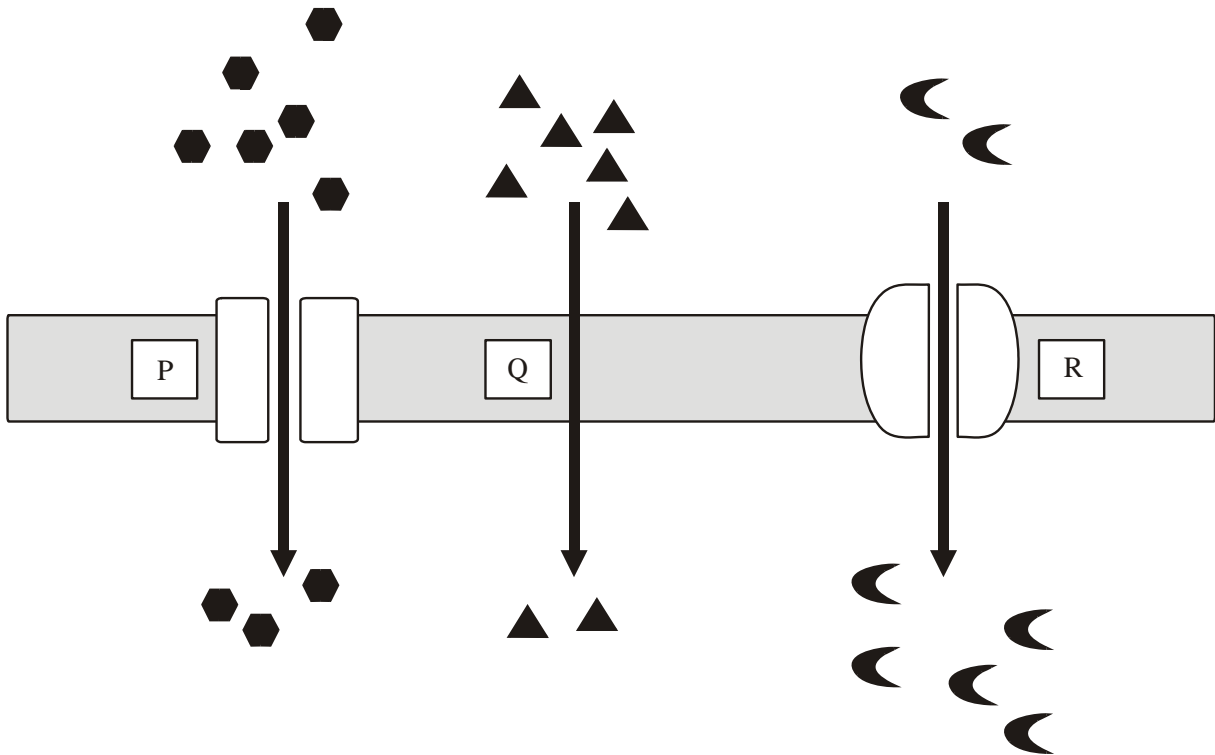


Figure 1

The three types of movement are

	P	Q	R
A.	active transport	diffusion	facilitated diffusion
B.	diffusion	active transport	facilitated diffusion
C.	diffusion	facilitated diffusion	active transport
D.	facilitated diffusion	diffusion	active transport

Question 6

An enzyme

- A. is composed of amino acids.
- B. has an identical shape to the substrate.
- C. works more efficiently at higher temperatures.
- D. causes the substrate to be unchanged at the end of the reaction.

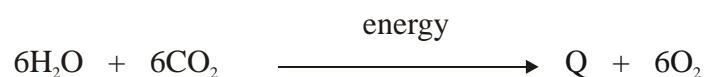
Question 7

Glycolysis is part of aerobic respiration. Glycolysis

- A. is the second stage of aerobic respiration.
- B. can only occur when mitochondria are present.
- C. results in the formation of pyruvate.
- D. releases three molecules of ATP for each glucose molecule used up.

Question 8

Equation 1 below is a summary of a process that occurs in some living organisms.



Equation 1

The product Q in this reaction is

- A. new water.
- B. a monosaccharide.
- C. chlorophyll.
- D. an amino acid.

Question 9

Figure 2 below shows the amount of oxygen produced in the leaf of a tree over a period of time.

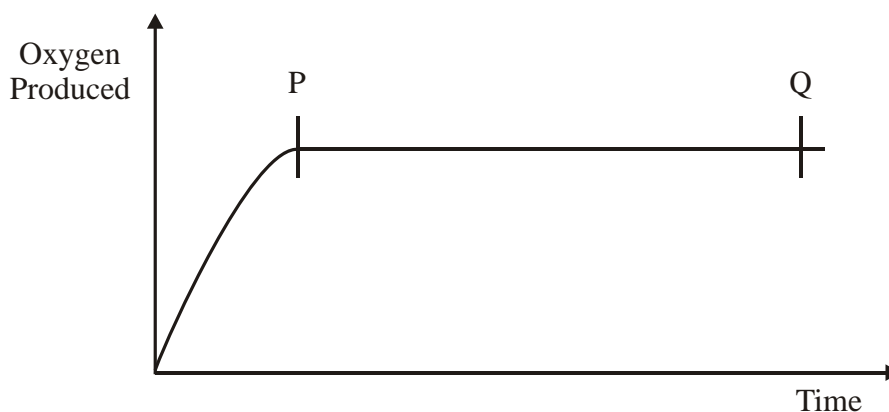


Figure 2

Which statement might explain the shape of the graph between P and Q?

- A. The sun set at the time indicated by P.
- B. Xylem tissue can only supply a certain rate of water.
- C. There is an unlimited supply of carbon dioxide.
- D. The chlorophyll was used up at point P.

Question 10

In respiration, the electron transport chain

- A. occurs on the outer membrane of the mitochondria.
- B. has oxygen as an input.
- C. occurs before the Krebs Cycle.
- D. produces 2 ATP molecules.

Question 11

Cellular respiration occurs

- A. during the day and night.
- B. only during the day.
- C. only during the night.
- D. only when photosynthesis is not occurring.

Question 12

Which of the following is not a function of proteins?

- A. Signal transduction.
- B. Transport across membranes.
- C. The movement of water during osmosis.
- D. Acting as enzymes.

Question 13

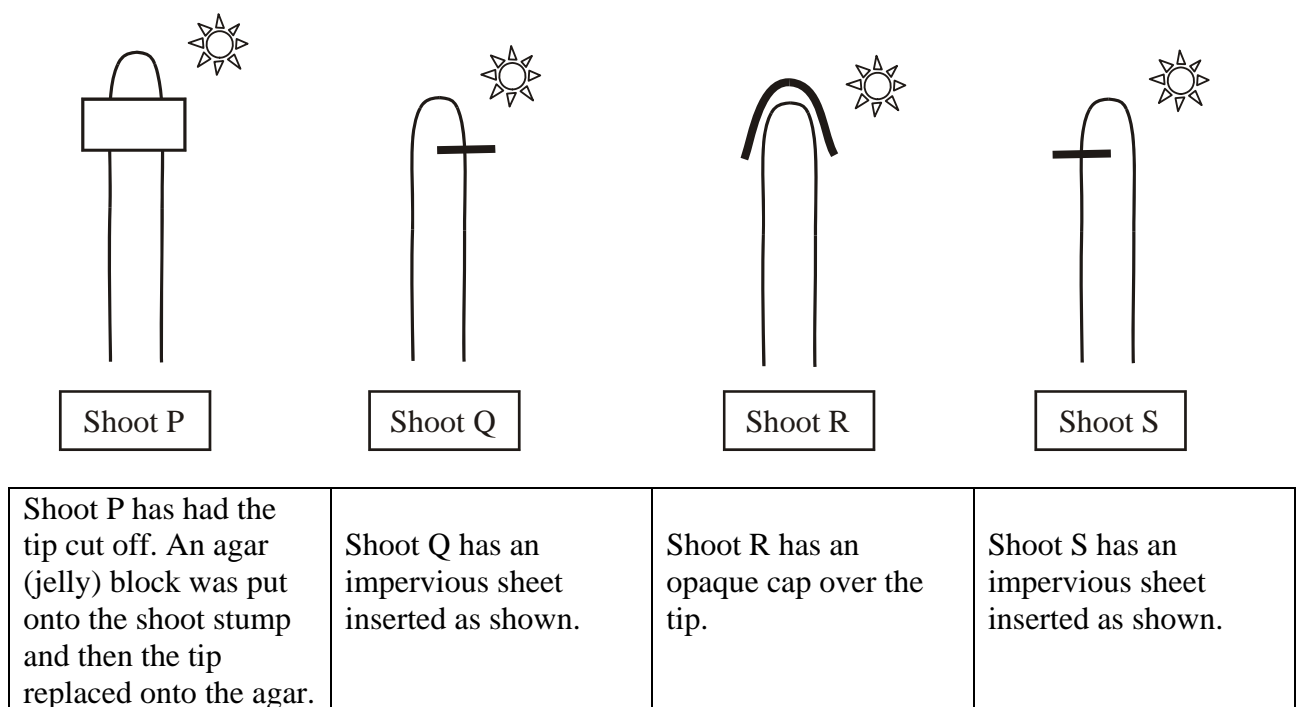


Figure 3

With reference to **Figure 3** above, all the shoots are illuminated from the right.

Which shoots will bend to the right, towards the light?

- A. Shoot P and Shoot Q only.
- B. Shoot S only.
- C. Shoot Q only.
- D. None of the shoots.

Question 14

A plant grows in the garden and starts to flower as summer approaches. The flowering is caused by the

- A. days becoming longer.
- B. days becoming shorter.
- C. nights becoming longer.
- D. nights becoming shorter.

Question 15

Pineapples are an example of a tropical plant that undergoes CAM (crassulacean acid metabolism) photosynthesis. Pineapples

- A. reduce water loss during the day by increasing the transpiration rate.
- B. initially turn CO₂ into a stable 3-Carbon compound.
- C. close their stomata during the day to reduce water loss.
- D. open their stomata during the night and use the moonlight to photosynthesize.

Question 16

The opening of stomata is caused by the movement of water. Which statement concerning stomata is correct?

- A. Guard cells have inelastic bands running from end to end.
- B. Osmosis causes water to move out of the guard cells, making them turgid.
- C. The cell walls of the guard cells are thicker on the side away from the stomatal pore.
- D. Osmosis occurs as a result of the movement of potassium ions into the guard cells.

Question 17

Malaria kills approximately 3 million people each year. The protozoan *Plasmodium vivax* has a complex lifecycle, spending some of its lifecycle in humans and part of its lifecycle in female mosquitoes. A human may catch malaria when bitten by an infected female mosquito. The pathogen for the disease is

- A. *Plasmodium vivax*.
- B. malaria.
- C. mosquitoes.
- D. humans.

Question 18

Which of the following do not kill bacteria?

- A. Antibiotics.
- B. Bacteriophages.
- C. Antiseptics.
- D. Cytotoxic T (T_C) cells.

Question 19

Immunity includes both specific and non-specific defences. Which of the following would be an example of a specific defence?

- A. Antibodies.
- B. Cytokines.
- C. Phagocytes.
- D. All of the above.

Question 20

B and T cells are an important part of the immune response. Which statement is correct?

- A. B cells mature in the thymus gland.
- B. B cells can become plasma cells and release antibodies.
- C. T cells release antibodies to signal B cells to respond.
- D. Helper T cells can directly kill foreign or infected cells.

Question 21

Figure 4 below is a diagram of an antibody.

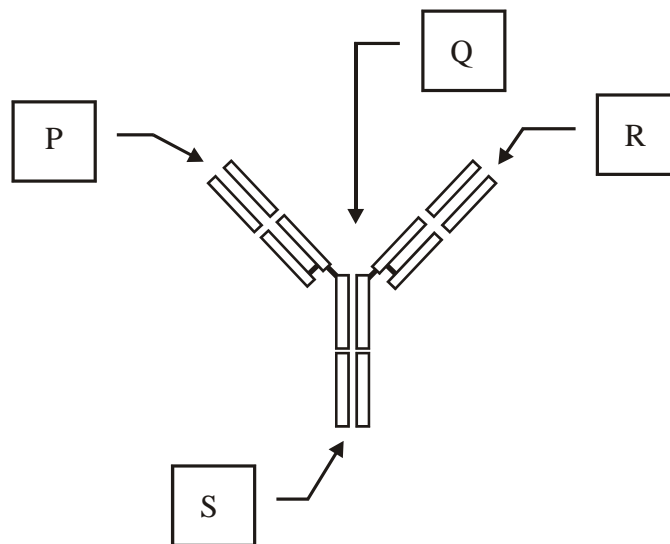


Figure 4

The antigen binding sites are

- A. Q.
- B. S.
- C. P and R.
- D. P, R and S.

Question 22

Hayfever is an allergic response. Which statement is correct?

- A. During the allergic response, mast cells secrete excess mucus.
- B. Antibodies called immunoglobulin E (IgE) are involved.
- C. Drugs called antihistamines stop the pollen from entering.
- D. Hayfever occurs mainly in winter, when people catch colds.

Question 23

An Rh negative mother is pregnant and will soon give birth to her first baby, called Beth, who is Rh positive. Which statement is true?

- A. Beth is at risk from the mother's antibodies.
- B. A future baby is at possible risk from the mother's antibodies.
- C. The doctor will inject Rh antigens into the mother to reduce her immune response.
- D. All of the above.

Question 24

Autoimmune diseases are caused by the body mistakenly attacking its own cells. Which of the following has *incorrect* information concerning autoimmune diseases?

	Disease	Attacked cells
A.	Diabetes	Beta cells in pancreas
B.	Multiple sclerosis	Myelin sheath of axons
C.	Rheumatoid arthritis	Cartilage of joints
D.	Sickle cell anaemia	Red blood cells

Question 25

One of the drugs used to treat AIDS patients inhibits reverse transcriptase. This drug

- A. stops the synthesis of DNA from the viral RNA.
- B. stops the synthesis of the AIDS toxin.
- C. reverses the synthesis of mRNA.
- D. blocks T cell receptors.

End of Section A

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SECTION B – Short Answer Questions

Question 1

Insulin is a protein made by cells in the pancreas. Insulin has an effect on many cells throughout the body. Proteins are made in two stages, transcription and translation.

The following represents a base sequence from a section of DNA coding for the insulin gene.

C C T A G G T A G

- a. Explain what happens when this base sequence is transcribed. Include the product of transcription in your answer. Assume the base sequence is read from left to right.

(2 marks)

- b. What is the site of protein synthesis?

(1 mark)

- c. What is the maximum number of amino acids that could be coded for by this base sequence?

(1 mark)

mRNA CODE FOR AMINO ACIDS							
UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys
UUC	Phe	UCC	Ser	UAC	Tyr	UGC	Cys
		UCA	Ser				
		UCG	Ser				
UUA	Leu			UAA	STOP	UGA	STOP
UUG	Leu			UAG	STOP	UGG	Trp
CUU	Leu	CCU	Pro	CAU	His	CGU	Arg
CUC	Leu	CCC	Pro	CAC	His	CGC	Arg
CUA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CUG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser
AUC	Ile	ACC	Thr	AAC	Asn	AGC	Ser
AUA	Ile	ACA	Thr	AAA	Lys	AGA	Arg
AUG	START/ Met	ACG	Thr	AAG	Lys	AGG	Arg
GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly
GUC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GUA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GUG	Val	GCG	Ala	GAG	Glu	GGG	Gly

AMINO ACIDS	
Ala	Alanine
Arg	Arginine
Asn	Asparagine
Asp	Aspartate
Cys	Cysteine
Gln	Glutamine
Glu	Glutamate
Gly	Glycine
His	Histidine
Ile	Isoleucine
Leu	Leucine
Lys	Lysine
Met	Methionine
Phe	Phenylalanine
Pro	Proline
Ser	Serine
Thr	Threonine
Trp	Tryptophan
Tyr	Tyrosine
Val	Valine

Table 2

- d. Using **Table 2** above, list in correct order the full names of the amino acids that are coded for by the section of DNA [CCTAGGTAG].

_____ (2 marks)

- e. Protein synthesis uses a three-base code. Explain why a two-base code cannot work.

 _____ (2 marks)

- f. The insulin has to move out of the cell and into the bloodstream. Name the cell organelle involved in the secretion of insulin and explain how it achieves this task.

 _____ (2 marks)

Total marks = 10

Question 2

Cells react to chemicals by producing a coordinated response.

- a. What is this process called?

(1 mark)

There are two main groups of hormones which react with cells in different ways. One group of hormones can easily cross the plasma membrane. Testosterone is an example of a hormone that can cross the plasma membrane easily.

- b. From which group of chemicals is testosterone derived, that allows it to easily cross the plasma membrane?

(1 mark)

- c. For a hormone such as testosterone, describe the processes that occur to produce a response in the cell.

(2 marks)

Total marks = 4

Question 3

Pepsin is an enzyme which reacts with food proteins in the stomach to produce peptides. The stomach has a pH of 2.

- a. The names of enzymes usually have the same ending. What is the ending?

(1 mark)

- b. To what chemical group do all enzymes belong?

(1 mark)

- c. Pepsin reacts with proteins. What is the general name given to chemicals with which enzymes react?

(1 mark)

- d. In a reaction between pepsin molecules and food protein molecules, which will be used up first? Explain.

(2 marks)

- e. What role does the tertiary structure of pepsin have in the reaction?

(2 marks)

- f. Sketch a graph on the axes in **Figure 5** below to show activity of pepsin against pH.



Figure 5

(1 mark)

- g. On the graph in **Figure 5** above indicate the optimal pH.

(1 mark)

Total marks = 9

Question 4

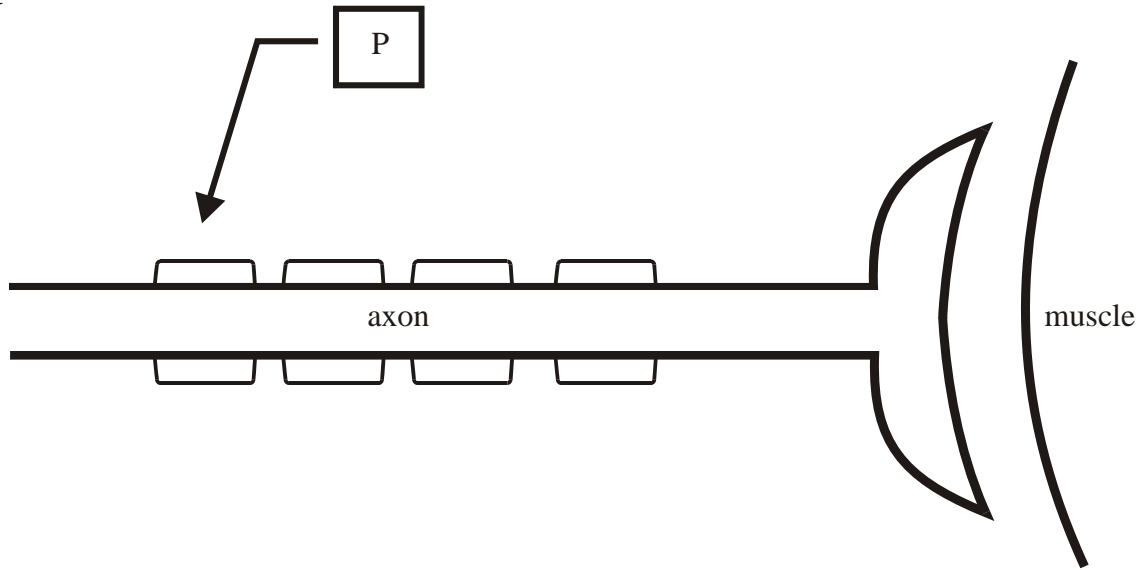


Figure 6

Figure 6 above represents part of a motor neuron ending at a muscle.

- a. Structures like the one labelled P are located around the axon. What is the name of structure P and what is its function?

(2 marks)

- b. The axon does not join the muscle. What is the space between the axon and the muscle called?

(1 mark)

- c. Explain how the impulse travelling along the neuron causes the muscle to contract if the neuron and the muscle are not touching each other.

(2 marks)

In South America, some indigenous people dip arrows into a liquid containing curare. When an animal is shot with the arrow, the curare has the effect of killing the animal by asphyxiation, as the respiratory muscles of the prey are unable to contract.

- d. Curare works as an antagonist against acetylcholine. Explain how curare causes paralysis.

(2 marks)

- e. The antidote for curare is an acetylcholinesterase inhibitor that reduces the degradation of acetylcholine. Explain how the antidote restores the ability of the neuron to produce muscle contraction again.

(1 mark)

Total marks = 8

Question 5

- a. Define homeostasis.

(3 marks)

Figure 7 below represents a homeostatic feedback loop that might come into play on a hot day. It shows that the hypothalamus detects that the blood in the brain is too hot.

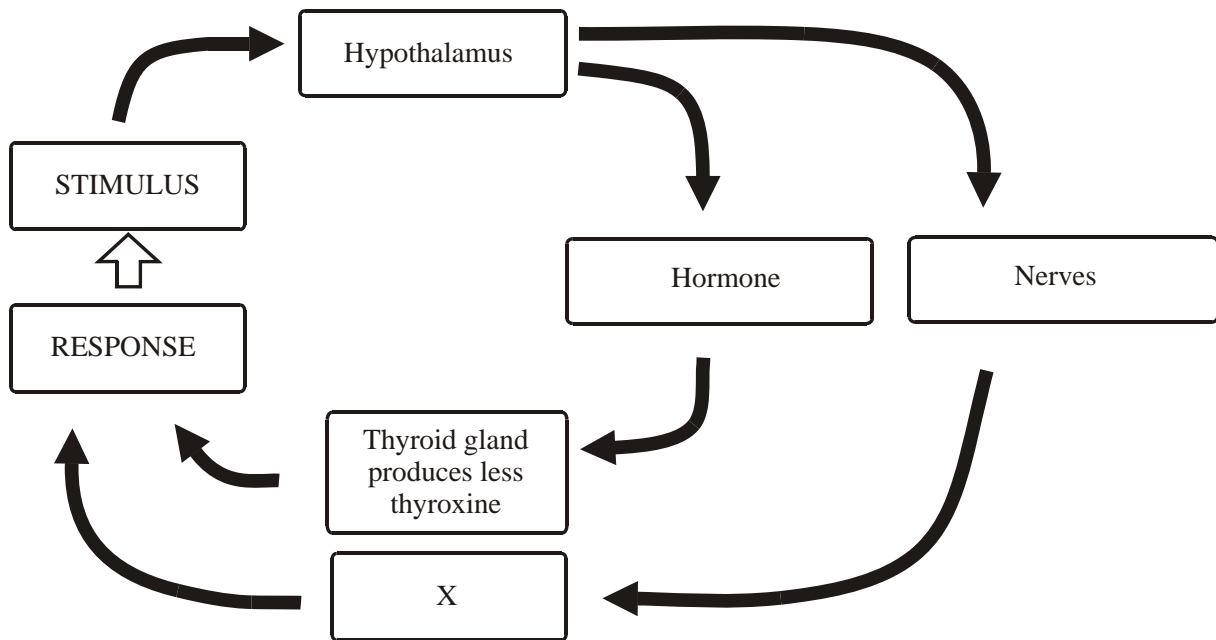


Figure 7

Questions 5 b –5 f refer to **Figure 7** above.

b. What is the stimulus?

_____ (1 mark)

c. What might the effector X be?

_____ (1 mark)

d. How would effector X produce the required response?

_____ (1 mark)

e. Is this a negative feedback system? Explain.

 _____ (2 marks)

- f. Describe an effector that might come into play on a cold day and how it would produce a response.

(2 marks)

Total marks = 10

Question 6

Measles is a disease caused by a virus. The symptoms include fever, discomfort, sore throat, coughing, and finally a painful and itchy rash. Very occasionally, infection leads to brain damage, pneumonia, convulsions, and sometimes death.

In 1920, over 7,000 people died of measles in the United States. The measles vaccine became available in 1963 and with widespread use of the vaccine, there were no reported deaths from measles in 1998. The vaccine contains a live virus.

If a baby, called Ben, is breast fed by his mother who once suffered from measles, Ben is protected from measles by passive immunity.

- a. Explain how Ben can have passive immunity from measles.

(1 mark)

Dom is 10 years old and has recently been diagnosed with measles.

- b. Explain why vaccinating Dom with the measles virus would not cure his measles.

(1 mark)

Betty is 18 months old. Her parents are considering getting Betty vaccinated against measles. They are concerned that the live virus in the vaccine will give her measles instead of protecting her from the disease.

- c. Why is it unlikely that the vaccine will give Betty the measles?

(1 mark)

d. What component of the vaccine is crucial to creating immunity to measles?

(1 mark)

e. Explain the role of B cells in creating active immunity.

(3 marks)

f. Frank is 30 years old and was vaccinated against measles as a child. Explain how Frank's body will remove the measles virus before he shows any symptoms.

(2 marks)

Total marks = 9

End of Section B

End of Trial Exam

Suggested Answers

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SECTION A – Multiple Choice Answers

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

SECTION B – Short Answer (Answers)

Question 1

- Messenger RNA (mRNA) is made using the DNA strand as a template (**1 mark**). The product is an mRNA strand with a base sequence G G A U C C A U C (**1 mark**).
- Ribosome (**1 mark**).
- Three (**1 mark**).
- Glycine, Serine, Isoleucine.
(**2 marks** for 3 correct, **1 mark** for 1 or 2 correct, **1 mark** if all 3 correct but abbreviated)
- A two-base code allows $4 \times 4 = 16$ different codes (**1 mark**). As there are 20 amino acids, at least 20 codes are needed (**1 mark**).
- Golgi Complex (or Apparatus or Body) (**1 mark**). The insulin is packaged into vesicles which coalesce with the plasma membrane, releasing the contents outside the cell (**1 mark**).

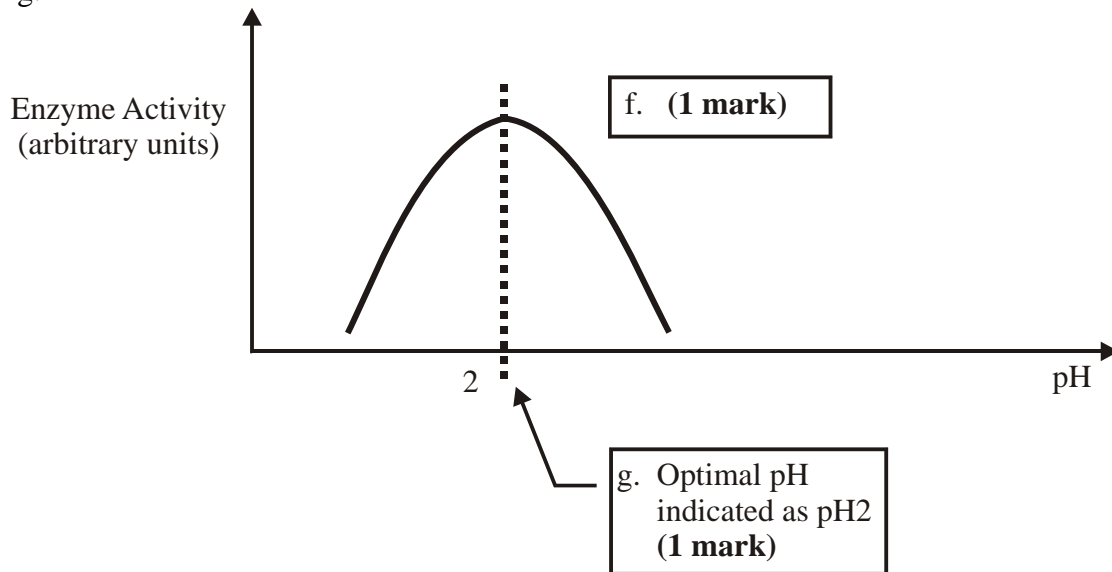
Question 2

- Signal transduction (**1 mark**).
- Lipids (**1 mark**).
- Being composed of lipids, testosterone is lipid-soluble and passes easily across the plasma membrane. (**0 marks**, see Question 2b). Testosterone then combines with a receptor molecule in the cytosol (**1 mark**). Together, the testosterone and receptor molecule are able to pass into the nucleus and activate or suppress particular genes (**1 mark**). This will affect the production of particular proteins.

Question 3

- ase (**1 mark**).
- Proteins (**1 mark**).
- Substrate (**1 mark**).
- The food protein molecules (**1 mark**) will be used up first because they are chemically altered during the reaction. The pepsin being an enzyme remains unchanged at the end of the reaction and can be used again (**1 mark**).
- It gives the pepsin a particular 3-dimensional shape (**1 mark**) so that it can bind with the food protein molecule (**1 mark**).

f-g.



Question 4

- Myelin sheath (1 mark). Increase the speed of the impulse (1 mark).
- Synaptic cleft or synaptic gap or synapse (1 mark).
- The neuron releases a neurotransmitter (1 mark) which reacts with receptors on the muscle cells, (1 mark) causing the muscle to contract.
- Curare competes with the acetylcholine and blocks the receptor sites (1 mark) on the muscles so that the muscle then does not contract as they are not stimulated to do so (1 mark).
- Acetylcholinesterase causes the acetylcholine to last longer than the curare and therefore acetylcholine competes more successfully and replaces the curare on the receptor sites, causing contraction (1 mark).

Question 5

- Homeostasis maintains an internal environment such as glucose levels, blood concentration and temperature (1 mark). The internal environment is not kept at exactly set levels but is maintained within a range (1 mark). This occurs despite a changing external environment such as eating, exercise, temperature changes and infection (1 mark).
- A rise in the temperature of the blood passing through vessels in the brain (1 mark).
- Effectors might include sweat glands, smooth muscles in blood vessels or skeletal muscle. The action of these effectors would result in responses such as sweating or vasodilation or behaviour such as sitting in shade (1 mark).
- Evaporation of sweat causes cooling. Or vasodilation brings more hot blood to the surface of the body to allow more conduction of heat into the air. Or sitting in the shade reduces heating from the sun (1 mark).
- This is a negative feedback system (1 mark) because the response reduces the stimulus (1 mark).
- Muscles shivering releasing heat. Or peripheral blood vessels constricting to reduce heat loss to the air. (1 mark for effector, 1 mark for mechanism).

Question 6

- a. Ben obtains measles antibodies from the mother's milk **(1 mark)**.
- b. Vaccines will have no effect if the pathogen is already present. This is because the vaccine contains the same antigens that are present on the pathogen. Vaccines need to be given well in advance of the infection to have time to produce an immune response. **(1 mark)**.
- c. The live virus is attenuated (or weakened) **(1 mark)**.
- d. The antigen **(1 mark)**.
- e. B cells detect the presence of antigens **(1 mark)**. Some B cells remain as memory cells **(1 mark)**. In the future, when the pathogen is present, the B memory cells change into plasma cells which produce antibodies **(1 mark)**.
- f. Frank will have B memory cells which will recognise the measles pathogen. They will change into plasma cells and release antibodies to agglutinate the antigens **(1 mark)**. Macrophages will digest the agglutinated pathogen **(1 mark)**.

End of Suggested Answers