



VCE BIOLOGY 2012

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 2012 Year 12 Trial Exam Unit 3

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 it and enter the correct answer. Marks will not be deducted for incorrect answers.

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

VCE Biology 2012 Year 12 Trial Exam Unit 3

SECTION A – Multiple Choice Questions

Question 1

Starch and glycogen are organic molecules that have many similarities and differences. A difference between starch and glycogen is that

- A. starch is soluble and glycogen is insoluble.
- B. starch is made from glucose monomers and glycogen is made from sucrose monomers.
- C. starch is found in plants and glycogen is found in animals.
- D. starch is mainly used as a structural component and glycogen is used as an energy store.

Question 2

Various components make up the plasma membrane. Which of the following makes up the least amount of the plasma membrane by mass?

- A. Phospholipids.
- B. Glycoproteins.
- C. Glycolipids.
- D. Lipoproteins.

Question 3

The following are all examples of substances crossing a membrane. Which of the following requires ATP?

- A. Alcohol moving across because it is lipophilic.
- B. Hydrophilic substances moving through protein channels.
- C. Sodium ions moving against a concentration gradient by a carrier protein.
- D. Glucose moving through a protein channel facilitated by a carrier molecule.

Question 4

Insulin is synthesised in beta cells in the pancreas and is stored. When the cell is appropriately stimulated, insulin is secreted out of the cell. Which of the following is not part of the process of insulin synthesis and secretion?

- A. Single stranded RNA moves from the DNA to the rough endoplasmic reticulum.
- B. Modifications occur to the enzyme as it moves through the Golgi complex.
- C. Mitochondria release ATP molecules.
- D. The Golgi complex packages the insulin in vesicles before exocytosis occurs.

Question 5

Enzymes are organic catalysts that control the chemical reactions in organisms. Which statement about enzymes is correct?

- A. Synthesising more of an enzyme results in more product.
- B. Strongly heating enzymes increases the rate of reaction because the molecules move faster.
- C. Some poisons act by blocking the active site of an enzyme permanently.
- D. Cooling an enzyme enough makes it permanently inactive by denaturing it.

Question 6

Figure 1 shows the effect of pH on enzyme activity for two different digestive enzymes.

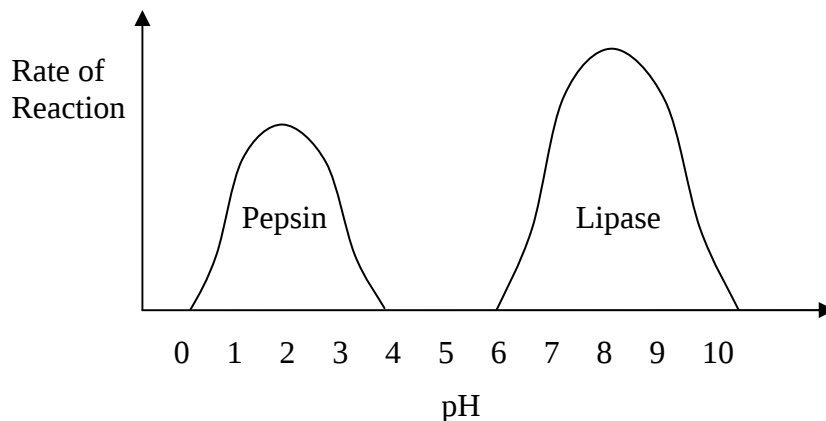


Figure 1

The difference in optimal pH between pepsin and lipase is consistent with

- A. the effect of substrate concentration on pH.
- B. the pH of the normal operating environment of the enzyme.
- C. different activation energies of particular reactions.
- D. the induced-fit model for the enzyme-substrate complex.

Question 7

A student conducted research into the limiting factors of photosynthesis. Two groups of plants (Group A and Group B) were supplied with different concentrations of carbon dioxide. The amount of photosynthesis was measured by determining the amount of oxygen produced. She presented her data as a graph, as shown in **Figure 2**.

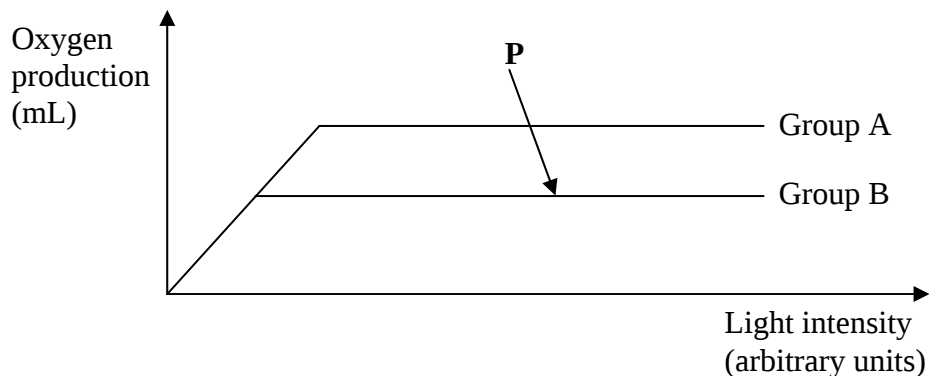


Figure 2

At point P on the graph, it can be inferred from the data that the limiting factor(s) of photosynthesis is/are the amount(s) of

- A. carbon dioxide, light intensity, water and chlorophyll.
- B. carbon dioxide, light intensity and water.
- C. carbon dioxide and light intensity.
- D. carbon dioxide.

Question 8

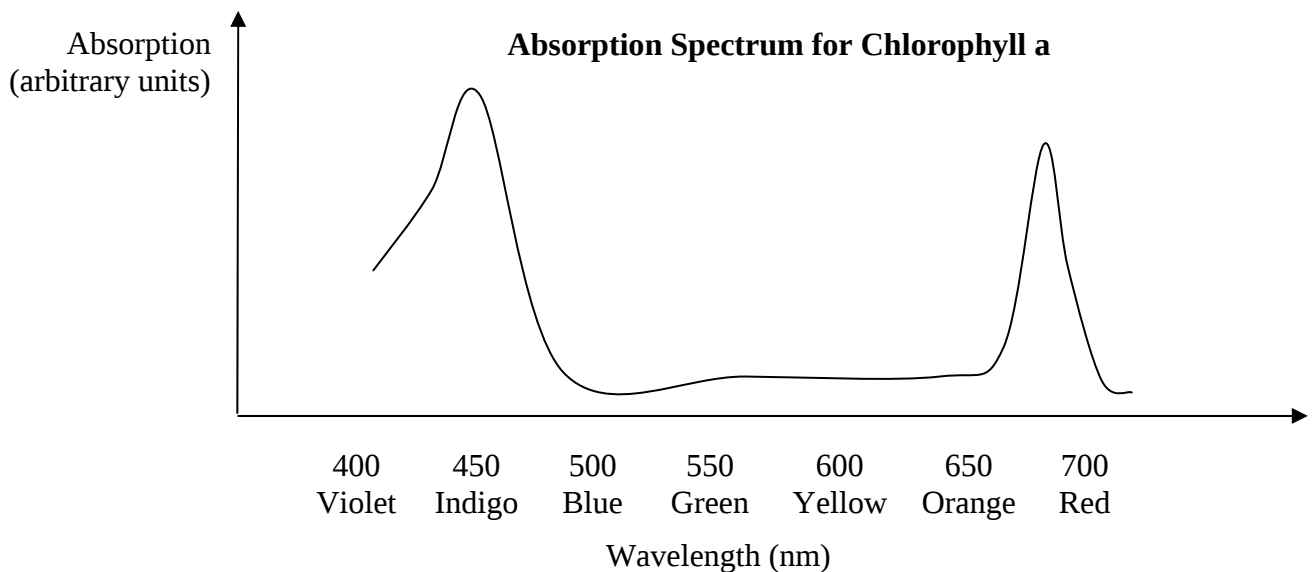


Figure 3

The graph in **Figure 3** is consistent with the following observations except one. Which one?

- A. Plants mainly do not use yellow light for photosynthesis.
- B. Green plants use green light mainly for photosynthesis.
- C. Plants grow well under red or violet lights.
- D. The leaves of plants appear green.

Question 9

Photosynthesis and cellular respiration involve a complex series of reactions that include a transfer of energy between light energy, stored chemical energy and heat energy. Which of the following statements is true of photosynthesis and cellular respiration in plants?

- A. Photosynthesis occurs during the day and respiration occurs at night.
- B. Photosynthesis and respiration both occur during the day only.
- C. Photosynthesis and respiration both occur during the day and night.
- D. Photosynthesis occurs during the day and respiration occurs during the day and night.

Question 10

Cellular respiration can be summarised in one chemical equation but this is a shorthand way of representing many chemical reactions that occur in a series of stages.

Which statement concerning the stage of electron transport is correct?

- A. For each glucose molecule that enters the Krebs cycle, five loaded acceptor molecules enter the electron transport reactions.
- B. Electron transport occurs on the outer membrane of the mitochondria.
- C. Electrons from the loaded acceptor molecules enable oxygen to combine with hydrogen to form water.
- D. For each molecule of glucose consumed in glycolysis, 36 ATP molecules are produced in the electron transport reactions.

Question 11

Glaucoma is a disease of the eye. The jelly-like substance in the eye-ball, the aqueous humor, is produced in excess resulting in high intra-ocular pressure.

Carbonic anhydrase catalyses the reaction that converts carbon dioxide and water into bicarbonate and hydrogen ions. The increase in the number of bicarbonate ions results in an increase in aqueous humor secretion.

Researchers studied the shape of the active site of carbonic anhydrase by looking at how the crystal deflected X-rays. Using computer modelling the researchers were able to create a carbonic anhydrase inhibitor called dorzolamine.

Which one of the following statements is incorrect?

Dorzolamine

- A. was produced by rational drug design.
- B. catalyses a decomposition reaction of carbonic anhydrase.
- C. decreases intra-ocular pressure by altering the concentration of bicarbonate ions.
- D. decreases the symptoms of glaucoma.

Question 12

It is important that the body maintains its volume of blood. The body responds to bleeding by forming a blood clot. The clot is composed of activated, sticky platelets (small blood cells) and insoluble fibres called fibrin.

When platelets, blood plasma and extracellular fluids mix, a series of reactions result in the formation of prothrombin. A further chain of reactions results in the formation of fibrin, see **Figure 4**.

Thrombin has a number of effects. It causes soluble fibrinogen to become insoluble fibrin and it also stimulates the production of prothrombin and prothrombinase.

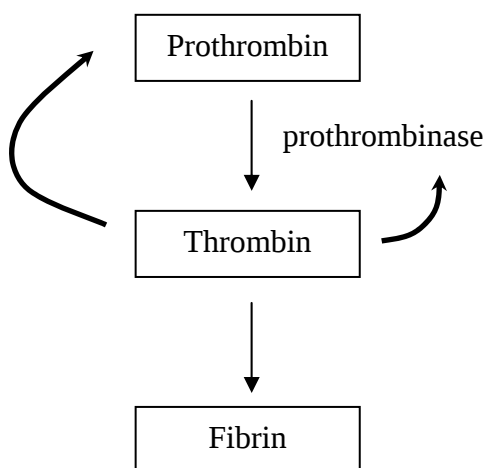


Figure 4

With reference to **Figure 4** only, the production of fibrin to form a blood clot is an example of all the following except one. Which one?

- A. Negative feedback.
- B. A precipitation reaction resulting in a solid product.
- C. A chain of reactions controlled by enzymes.
- D. A stimulus resulting in a response.

Question 13

Consider **Figure 5**. The arrows represent a signal mechanism between components.

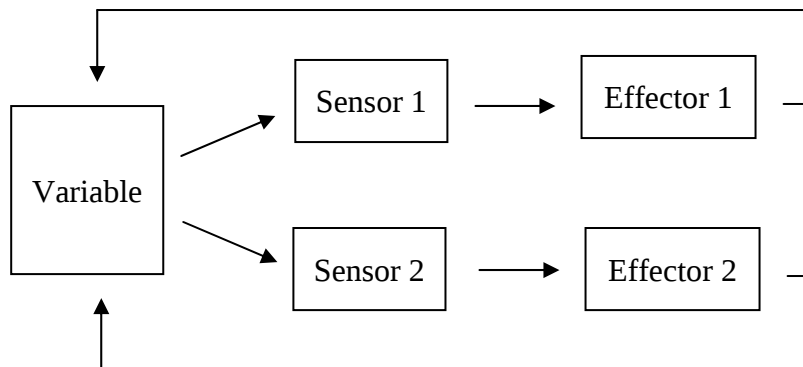


Figure 5

The component of the homeostatic system that is being kept relatively stable is

- A. the sensors.
- B. the effectors.
- C. the variable.
- D. the signalling mechanism.

Question 14

Figure 6 shows the shoots of two plants exposed to the sun. The shoot on the right has had its tip removed.

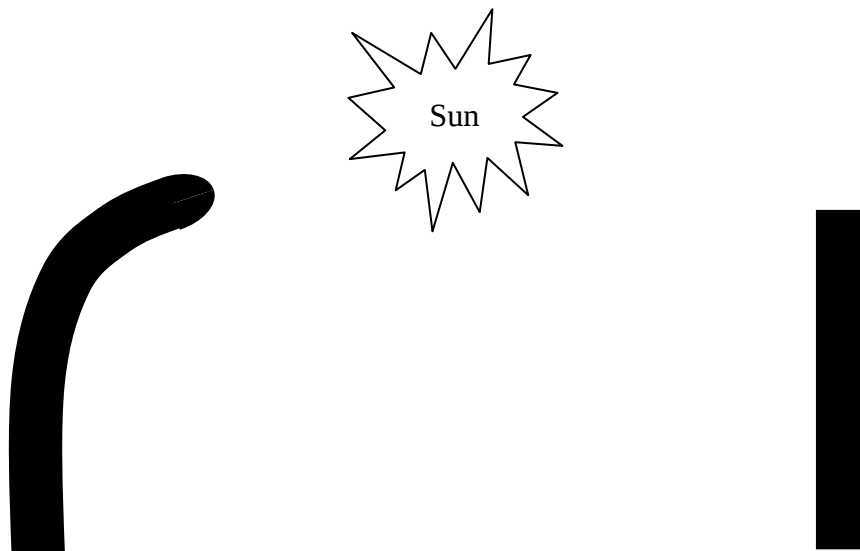


Figure 6

The lack of bending in the shoot on the right is a result of

- A. the absence of auxin.
- B. geotropism.
- C. the presence of cytokinins.
- D. phototropism.

Question 15

The bending in the shoot on the left in **Figure 6** is a result of

- A. cell elongation on one side.
- B. negative phototropism.
- C. ethylene causing cell ripening.
- D. apical dominance.

Question 16

Hormones can be classified according to their solubility in water. Which of the following statements about hormones is correct?

- A. Cells that produce hormones do not have target cells in the same organ.
- B. Protein hormones are lipid soluble and need a surface membrane receptor to start signal transduction.
- C. The receptor to a steroid hormone occurs in the plasma membrane.
- D. Signal transduction of a water-soluble hormone requires a receptor in the plasma membrane.

Question 17

When food is present in the intestines, the parasympathetic nervous system accelerates peristalsis, thus increasing the rate of mechanical and chemical digestion of the food.

When the parasympathetic nerves are activated,

- A. the CNS is involved.
- B. the autonomic nervous system is deactivated.
- C. the somatic nerves carry impulses.
- D. sensory nerves are stimulated.

Question 18

A nervous impulse in the parasympathetic nervous system

- A. cannot continue past synaptic gaps.
- B. can travel in either direction along a dendrite.
- C. is composed of ions travelling along the axon.
- D. relies on the diffusion of neurotransmitters.

Question 19

Neurons connect to other neurons. Some neurons activate further impulses, but other neurons inhibit further impulses. A single activation signal is cancelled out by a single inhibition signal. **Figure 7** shows part of a neural network that controls a muscle fibre. The network contains six neurons, M, N, O, P, Q and R.

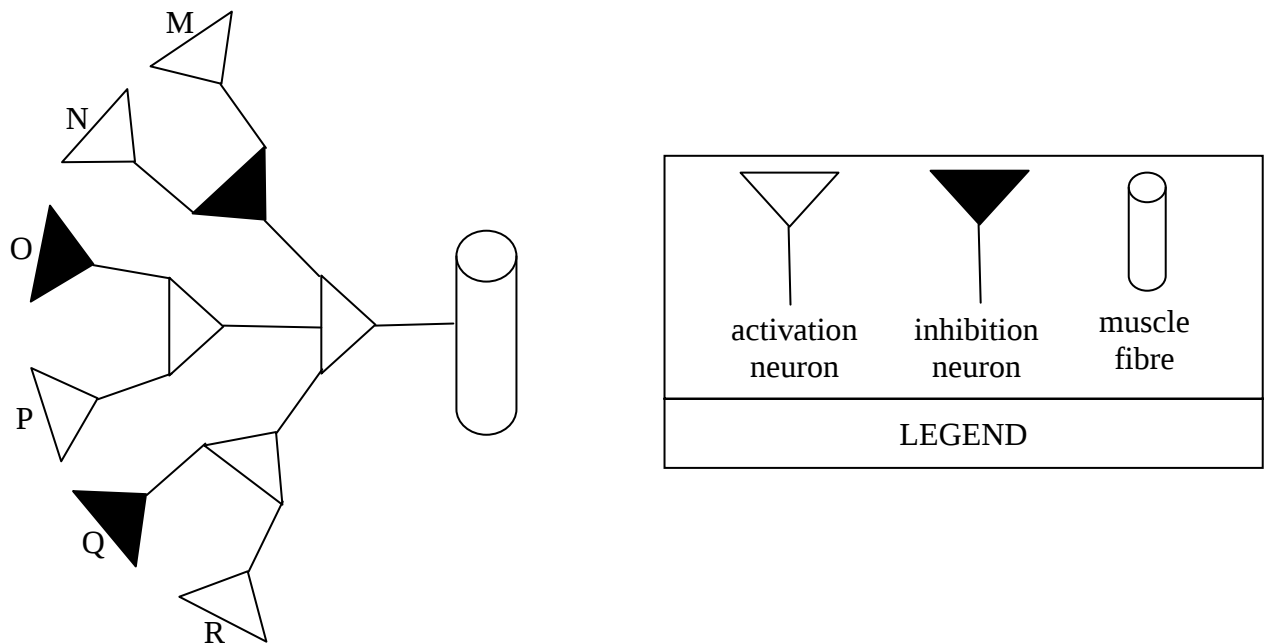


Figure 7

Which combination of excited neurons will cause the muscle fibre to contract?

- A. M, N, P, R.
- B. N, O, Q, R.
- C. M, O, P, R.
- D. M, N, O, P, Q, R.

Question 20

Figure 8 shows neurons acting together to produce a response from a stimulus.

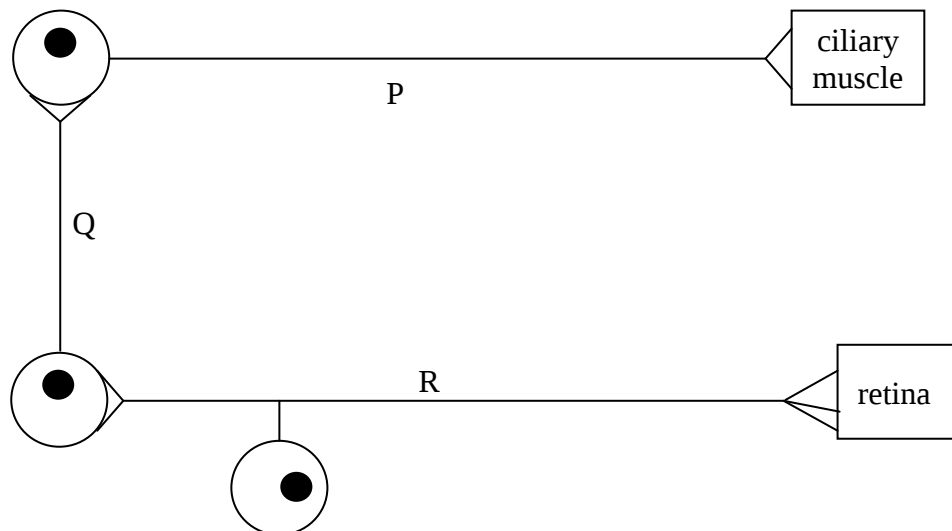


Figure 8

The motor neuron in **Figure 8** is represented by

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

Question 21

Which of the following is not a pathogen?

- A. The virus that causes the common cold.
- B. The mosquito, *Anopheles spp*, that transmits malaria.
- C. The fungus, *Uncinula nercator*, that causes powdery mildew in grapes.
- D. The mite, *Pediculus capitis*, that causes scalp inflammation.

Question 22

Poliovirus causes poliomyelitis. The virus binds to a receptor on a host cell which alters the structure of the virus and enables the viral RNA to enter the cell by endocytosis. The virus infects most cells without producing symptoms, but in about 1% of infections the virus destroys motor neurons, causing paralysis in some muscles.

Which statement about poliovirus is correct?

- A. Penicillin has no effect on poliovirus.
- B. The viral RNA enters host cells through protein channels.
- C. Polio sufferers cannot feel pain in the paralysed areas.
- D. The virus damages the motor neurons by secreting toxins.

Question 23

When a particular antigen enters the body for the first time it may meet up with a lymphocyte, resulting in clonal expansion and the production of many plasma cells.

This process of clonal expansion results in

- A. many antibodies, ready to combat a wide range of pathogens.
- B. many T memory cells which may last a lifetime.
- C. immunoglobulins.
- D. a secondary antibody response which is larger than the primary antibody response.

Question 24

Problems in unborn children can be caused by the father contributing a gene that results in a surface protein on the baby's red blood cells. If none of the mother's cells has this surface protein, then the baby's red blood cells are seen by the mother's immune system as foreign. Blood containing red blood cells with the surface protein is classified as Rhesus positive (Rh+).

First-born children do not suffer from Rhesus incompatibility because

- A. the father's sperm release antibodies that agglutinate the antigens.
- B. the mother has produced no Rh antibodies that can harm the unborn child.
- C. the Rhesus antibodies cannot cross the placenta.
- D. the mother is given an injection of Rh antibodies to stop the immune response.

Question 25

Multiple sclerosis (MS) is a disease of the nervous system that affects the nerves in the brain and spinal cord. In twin studies, if one twin suffers from MS, an identical twin has a 25% chance of also getting the disease compared to a non-identical twin who has a 3% chance of getting the disease. MS is more common in colder places such as Tasmania than warmer places such as Queensland.

Multiple sclerosis

- A. does not run in families.
- B. is not caused by environmental factors.
- C. can be diagnosed by looking for the pathogen in the blood.
- D. affects the myelin sheath of axons, slowing the impulses.

End of Section A

VCE Biology 2012 Year 12 Trial Exam Unit 3

SECTION B – Short Answer Questions

Question 1

The lowlands copperhead snake (*Austrelaps superbus*) is common in the Otway Ranges of Victoria. It is poikilothermic, which means its body temperature fluctuates with the temperature of the environment. Like most animals, its muscles contract when the neurotransmitter acetylcholine is released by neurons. The production of acetylcholine is catalysed by choline acetyltransferase as follows:



- a. Name the substrate molecules for the enzyme in the production of acetylcholine.

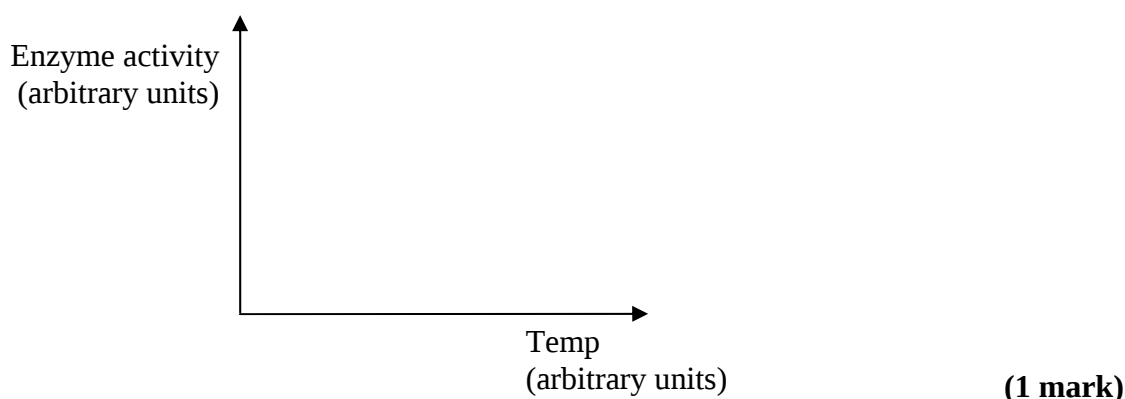
_____ (1 mark)

- b. What kind of organic molecule is choline acetyltransferase? How do you know?

_____ (2 marks)

In the winter, snakes are seen less frequently and when they are, they are often found basking in the sun. During the hottest part of a summer day, the snakes avoid spending too much time in the direct sun.

- c. Enzymes control most of the activities of the snakes. Draw a sketch graph, on the axes provided, that explains the basking behaviour of the snake, in terms of the effect that temperature has on enzyme activity.



- d. A disadvantage of being a poikilotherm is inactivity in cold weather. Describe an advantage to the snake of being a poikilotherm.

(1 mark)

A student performed two experiments using choline acetyltransferase and measured the amount of acetylcholine produced.

	Independent variable
Experiment 1	concentration of choline and acetyl-CoA
Experiment 2	concentration of choline acetyltransferase

The student then graphed the results of one of the experiments. The graph is shown in **Figure 9**.

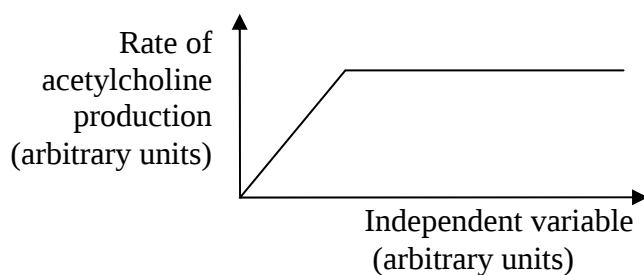


Figure 9

- e. Does **Figure 9** show the results of Experiment 1 or Experiment 2? Justify your answer.

(1 mark)

Total marks = 6

Question 2

Sugar cane grows in hot climates such as Queensland. One of the reactions that occurs in sugar cane is shown in simplified form in **Figure 10**. **Questions 2a - 2e refer to the reaction in Figure 10.**

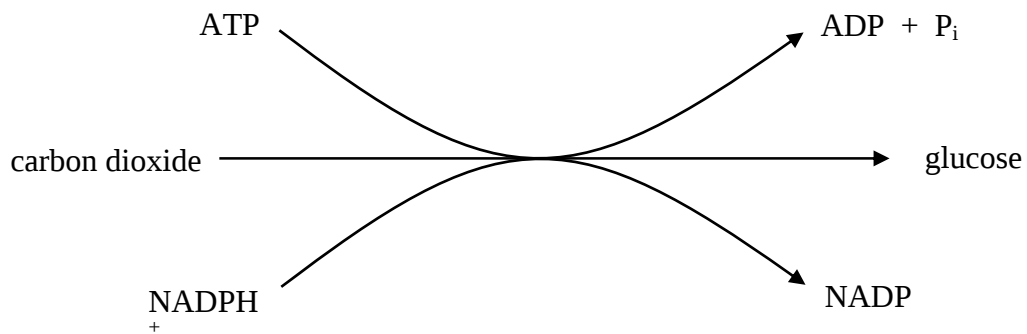


Figure 10

- a. Is the reaction exergonic or endergonic? How do you know?

(1 mark)

- b. What term describes the group of reactions shown in **Figure 10**?

(1 mark)

- c. Does this reaction occur at night time? Explain.

(2 marks)

- d. Where precisely does this reaction take place?

(1 mark)

- e. NADP is called a carrier molecule. What does it carry and where does its “load” go?

(2 marks)

In Queensland, the heat can easily dehydrate the sugar cane plants through excessive evaporation of water through the stomata. The sugar cane plant has a structural feature that increases the CO₂ diffusion gradient between the outside of the leaf and the cells where the Calvin cycle occurs.

- f. Explain how this feature enables the plant to survive in a hot climate without dehydrating.

(1 mark)

Total marks = 8

Question 3

The production of breads and alcoholic drinks generally involves the use of the yeast *Saccharomyces cerevisiae*.

- a. What is the name for anaerobic respiration in yeast?

(1 mark)

- b. Write the word equation for anaerobic respiration of glucose in yeast.

(1 mark)

Mammalian muscle tissue has the ability to respire aerobically when oxygen is present or anaerobically when oxygen is in short supply.

- c. Write the balanced chemical equation for aerobic respiration in muscles.

(2 marks)

- d. Respiration of glucose in muscles produces ATP molecules. Compare the amount of ATP production in aerobic respiration with anaerobic respiration.

(1 mark)

- e. Name the stage of aerobic respiration that produces the most ATP molecules.

(1 mark)

- f. Explain why anaerobic respiration in muscle cells has different products to anaerobic respiration in yeast cells.

(1 mark)

Total marks = 7

Question 4

The concentration of sugar in the blood is kept relatively stable by a homeostatic mechanism.

- a. Name the part of the body that senses the level of glucose in the blood.

(1 mark)

- b. Name the two hormones produced by the pancreas that adjust the level of glucose in the blood. Describe the mechanism of each hormone.

Hormone 1:

Mechanism:

Hormone 2:

Mechanism:

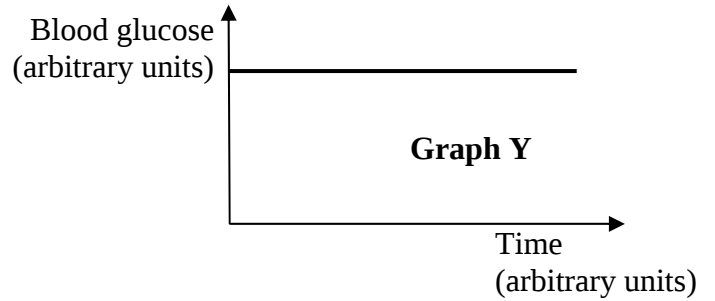
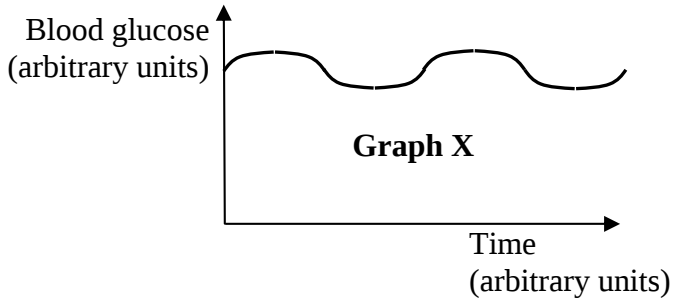
(4 marks)

- c. Is the maintenance of blood glucose levels an example of a positive or negative feedback mechanism? Justify your answer.

(1 mark)

A person's blood glucose levels were measured over a period of time and the data graphed.

- d. Is the graph more likely to look like graph X or graph Y? Justify your answer.



(2 marks)

- e. Urine does not normally contain glucose. Why would sugar in their urine indicate that a person may be suffering from diabetes mellitus?

(1 mark)

Total marks = 9

Question 5

The hydatid tapeworm, *Echinococcus granulosus*, has part of its life cycle in a carnivore, such as a dog, and the other part in a herbivore, such as a sheep. Hydatid cysts form in the internal organs of the sheep, and occasionally humans. If a dog should eat the cysts, the worm will grow in its intestines and then release eggs.

- a. Draw a diagram of the lifecycle of the worm, clearly labelling the hosts and the stages of the worm's lifecycle.



(2 marks)

- b. Why does the adult worm have hooks and suckers?

(1 mark)

- c. Explain why the primary host is always a carnivore, such as a dog, dingo or fox, and the intermediate host is always a herbivore, such as a sheep, kangaroo, wallaby, horse, pig or camel?

(2 marks)

- d. Would humans be considered a primary or intermediate host? Explain.

(1 mark)

- e. Describe two ways to reduce the incidence of the tapeworm on farms.

(2 marks)

Total marks=8

Question 6

Warts are caused by a virus called human papillomavirus (HPV). There are 40 different kinds of HPV, each with a slightly different DNA. In a small percentage of women, types 16 and 18, are able to cause cancer of the cervix (the opening of the uterus). Those viruses are transmitted by sexual contact.

In 2006, the Australian Government introduced a vaccination for all females in the first year of secondary school for the two types of HPV associated most commonly with cervical cancer. The vaccine consists of the protein shell of the virus only.

- a. Why can't viruses reproduce themselves without a host cell?

(1 mark)

- b. Describe two examples of non-specific immunity that might stop HPV entering the body.

(2 marks)

- c. If some cells are infected with HPV, they secrete interferon. What does interferon do?

(1 mark)

- d. Why can't the vaccine make you sick?

(1 mark)

- e. Why is it important that the vaccine is given before sexual activity begins?

(1 mark)

- f. Vaccine particles combine with B lymphocytes and the B lymphocytes subsequently make antibodies against the vaccine particles. Draw a diagram to show agglutination of the vaccine particles. Label an antibody, a hinge joint and a recognition site.



(4 marks)

- g. That particular B lymphocyte goes on to produce two kinds of cell. Name and describe the functions of the two kinds of cell.

(2 marks)

Total marks = 12

End of Section B

End of Trial Exam

Suggested Answers

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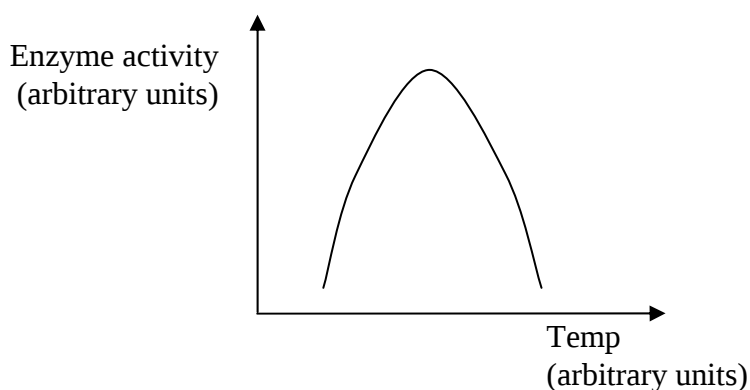
SECTION A – Multiple Choice Answers

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

SECTION B – Short Answer (Answers)

Question 1

- Choline + acetyl-CoA (**1 mark**).
- Protein or enzyme because the question states that it is an organic catalyst. Or enzyme because it ends in -ase. (**1 mark** for kind of molecule and **1 mark** for reason)
- 1 mark** for correct sketch.



- A Poikilotherm can survive on less food because it does not need food to provide heat energy (**1 mark**).
- Experiment 1. Increasing the substrate concentration will increase the rate of reaction until all the active sites on the enzyme are being used. Substrate concentration higher than that, as shown by the plateau, will not increase the reaction rate. The graph of Experiment 2, where the enzyme concentration is increased, will have no plateau. (**1 mark**).

Question 2

- a. Endergonic because it requires an input of energy (ATP) to occur **(1 mark)**.
- b. Light independent stage **(1 mark)** of photosynthesis.
- c. No **(1 mark)**. Despite being called the light independent stage it relies on the outputs of the light dependent stage which can only occur during the day **(1 mark)**.
- d. The stroma **(1 mark)** of the chloroplast.
- e. It carries hydrogen ions **(1 mark)** which combine with carbon dioxide to form glucose **(1 mark)**.
- f. Sugar cane is a C₄ plant. C₄ plants have photosynthetic cells around the vascular bundles (in addition to the mesophyll cells) which results in a higher concentration gradient of carbon dioxide in the air spaces of the leaves and therefore higher rates of photosynthesis. This allows the stomata of the sugar cane plants to close for periods of time during the day, conserving water **(1 mark)**.

Question 3

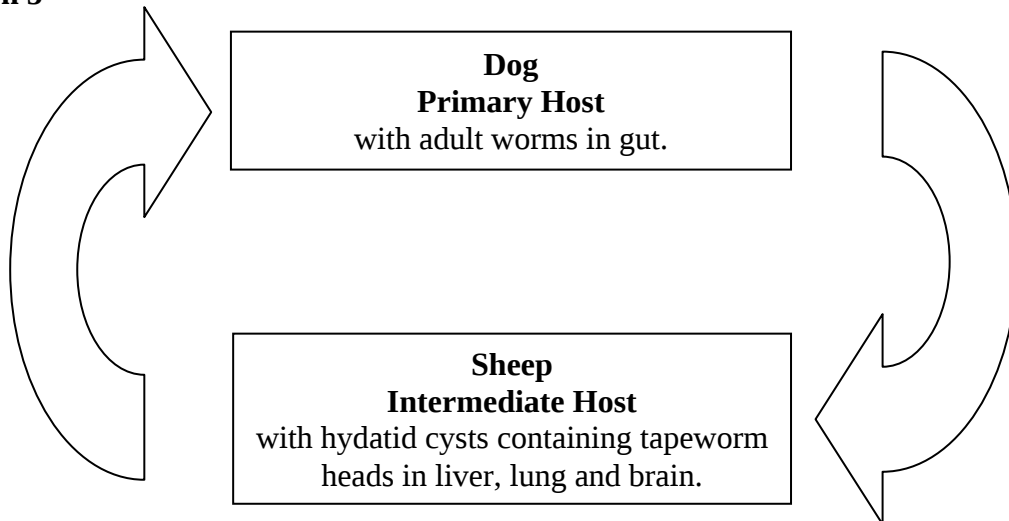
- a. Fermentation **(1 mark)**.
- b. Glucose → carbon dioxide + ethanol **(1 mark)**
- c. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (all correct **2 marks**, 1 error **1 mark**, more than one error **0 marks**). Ignore energy.
- d. The respiration of each glucose molecule results in 36 ATP molecules in aerobic respiration and 2 ATP molecules in anaerobic respiration **(1 mark)**. Alternatively, answer may be expressed in moles.
- e. Electron transport **(1 mark)** produces 32 ATP molecules.
- f. Muscle cells have different enzymes **(1 mark)** to yeast cells. Different enzymes produce different products.

Question 4

- a. Pancreas **(1 mark)**.
- b. Glucagon **(1 mark)** causes glycogen in the liver to be converted to glucose and released into the blood **(1 mark)**. Insulin **(1 mark)** allows glucose to cross plasma membranes and thus sugar can move from the bloodstream to the muscles and liver **(1 mark)**.
- c. Negative feedback because the response (such as more insulin lowering the blood glucose levels) reduces the stimulus (blood glucose levels are too high) **(1 mark in total for both negative and reason)**.
- d. Graph X **(1 mark)**. Glucose levels will be affected by food and exercise and will therefore go up and down within limits **(1 mark)**.
- e. A person suffering from diabetes mellitus cannot produce enough insulin. Thus sugar levels will build up in the bloodstream. Excess sugar will be excreted in the urine. **(1 mark)**.

Question 5

a.



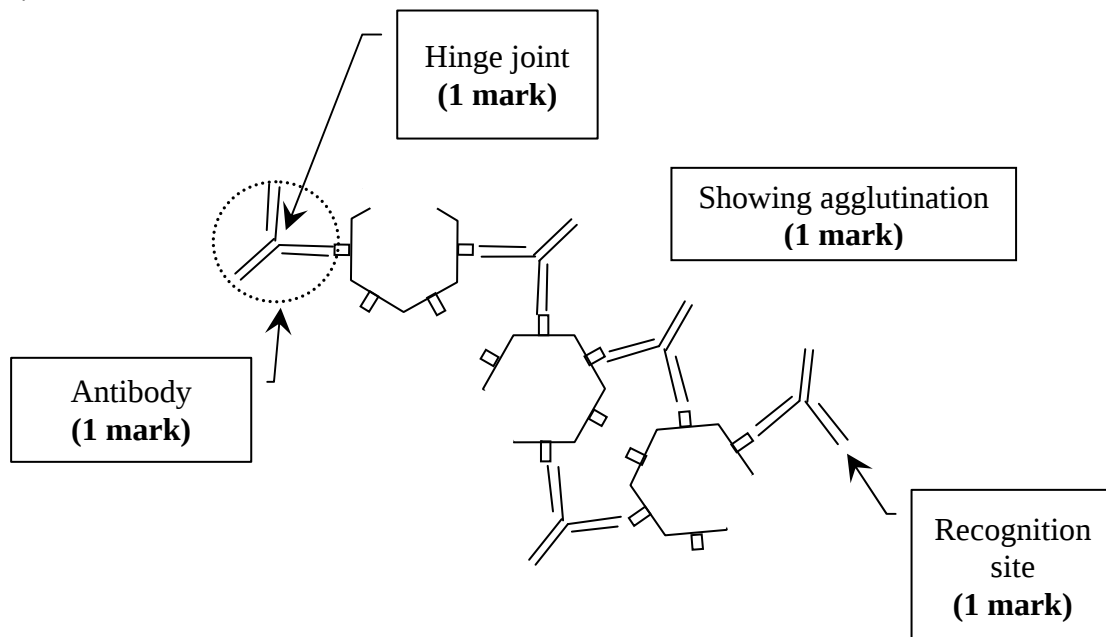
(1 mark for hosts and stage of lifestyle, 1 mark for arrows)

- b. The worm attaches to the walls of the intestine with hooks and suckers (1 mark).
- c. In order for the worm to pass from the intermediate host to the primary host, the primary host must eat the body of the intermediate host, i.e. it must be a carnivore (1 mark). In order for the worm to pass from the primary host to the intermediate host, the intermediate host must eat the eggs that have passed out with the faeces onto vegetation, i.e. it must be a herbivore (1 mark).
- d. Humans are far more likely to be in close contact with an infected dog, the primary host, than to eat the (uncooked) liver, lungs or brain of an infected sheep, the intermediate host. Ingesting the eggs from the dog would result in cysts and therefore the human would be considered an intermediate host (1 mark).
- e. Any two of : regular de-worming of dogs using drugs, do not feed dogs meat or meat by-products from farm stock, keep dogs away from possible intermediate hosts, humans should not allow dogs to lick their face, humans should wash hands before eating. (2 marks)

Question 6

- a. Viruses lack the organelles for protein synthesis (1 mark).
- b. Skin creates a physical barrier, mucus can trap the viruses and carry them out (2 marks). Do not accept natural flora (viruses do not compete for resources).
- c. Interferon is secreted by cells when they are infected by viruses. It causes uninfected cells to become more resistant to the virus (1 mark).
- d. The vaccine contains no genetic material and therefore the virus cannot replicate (1 mark).

- e. The vaccine can prevent the disease but cannot cure it **(1 mark)**.
f.



- g. Plasma cells produce antibodies against HPV **(1 mark)**.
B-memory cells last for years and can react quickly against a particular antigen, giving immunity against that antigen **(1 mark)**.

End of Suggested Answers