



VCE BIOLOGY 2007 TRIAL EXAM Year 12 Unit 3

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Time allowed 90 minutes

Total Marks 75

Multiple Choice Section 25 marks

Short Answer Section 50 marks

QUESTION AND ANSWER BOOKLET

Structure of Booklet

Section	Number of Questions	Number of Questions to be Answered
A	25	25
B	8	8

Answer Multiple Choice questions by circling the appropriate letter on the answer sheet attached. Use space provided below question in Short Answer section.

Lisachem Materials
PO Box 721 Bacchus Marsh Victoria 3340
Tel: (03) 5367 3641 Fax: (03) 5367 7383
Email: Lisachem@bigpond.net.au

Student Name.....

VCE Biology 2007 Year 12 Trial Exam Unit 3

Student Answer Sheet

Answer each Multiple Choice question by circling the appropriate letter. Use a pencil. If you make a mistake erase and enter the correct answer. Marks will not be deducted for incorrect answers.

Write your answers to Short Answer Section in the space provided directly below the question.

Multiple Choice

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 2007 Year 12 Trial Exam Unit 3

Multiple Choice Section

Question 1.

The cell wall found in plant cells is composed of:

- A. phospholipid.
- B. chitin.
- C. cellulose.
- D. protein.

Question 2.

The cell organelle involved in the transport of proteins within a cell is the:

- A. golgi body.
- B. endoplasmic reticulum.
- C. microtubule.
- D. vesicle.

Question 3.

Exergonic reactions are primarily involved in:

- A. photosynthesis.
- B. protein synthesis.
- C. the release of energy.
- D. the manufacture of ADP.

Question 4.

Which one of the following structures are involved in the peptide bonds that join amino acids together to form polypeptides?

- A. primary.
- B. secondary.
- C. tertiary.
- D. quaternary.

Question 5.

The element that is present in proteins, but is absent in carbohydrates is:

- A. carbon.
- B. hydrogen.
- C. nitrogen.
- D. oxygen.

Question 6.

Mitochondria are the organelles used for the complete breakdown of glucose during cellular respiration in eukaryotic cells. This is because the:

- A. breakdown of glucose occurs in the mitochondria since the Krebs's cycle doesn't require oxygen.
- B. enzymes necessary for complete glucose breakdown are found in the mitochondria and require oxygen to function.
- C. glucose breakdown in mitochondria releases energy during an endergonic reaction.
- D. anabolic reactions that occur in the mitochondria when oxygen is present release energy.

Question 7.

The following sequence of amino acids represents a small section of a polypeptide: ...leucine-isoleucine-methionine-alanine-lysine-tyrosine-arginine. From this section of polypeptide one can conclude that the number of nucleotides present in the messenger-RNA that resulted in the formation of this section of polypeptide is:

- A. 7.
- B. 14.
- C. 21.
- D. cannot be determined from the data given.

Question 8.

During the light-dependent stage of photosynthesis:

- A. oxygen (O₂) is released from the breakdown of carbon dioxide (CO₂).
- B. light is absorbed by the green pigment chlorophyll that is present on grana.
- C. light is absorbed by the stroma and the light energy is converted into chemical energy.
- D. light is absorbed by the grana and the light energy is used to release energy in ATP molecules in the formation of glucose.

Question 9.

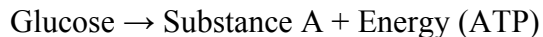
Using the symbols provided which one of the following best represents a chemical reaction between a substrate and an enzyme?

E-Enzyme; S-Substrate; P_A-Product A; P_B-Product B

- A. $P_A + E \rightarrow P_B + E$.
- B. $P_B + E \rightarrow P_A + E$.
- C. $S + E \rightarrow P_A + P_B + E$.
- D. $S + E \rightarrow P_A + P_B + S$.

Question 10.

The following word equation summarizes a biochemical reaction in animal cells:



This biochemical reaction can be regarded as being:

- A. anabolic.
- B. polymerization.
- C. catabolic.
- D. aerobic respiration.

Question 11.

Which one of the following statements best describes homeostasis in animals?

Homeostasis is the process in which animals

- A. maintain their blood levels at a constant level.
- B. survive a changing environment.
- C. maintain a constant internal environment for their cells.
- D. maintain a constant internal and external environment for their optimal physiological functioning.

Question 12.

What is the function of helper T-cells in the human body? The

- A. production of specific antibodies against their particular antigen.
- B. engulfing of viruses and bacteria during phagocytosis.
- C. release of histamine from mast cells during the inflammation response.
- D. recognition of antigens and promoting B-cells to clone and form plasma cells.

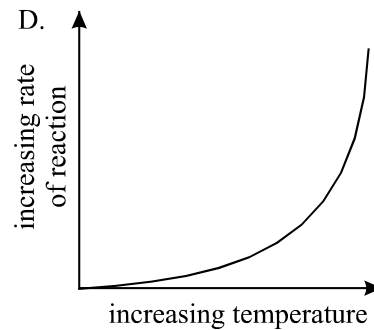
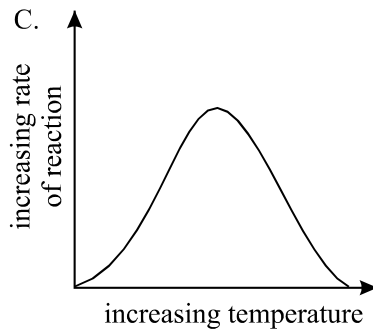
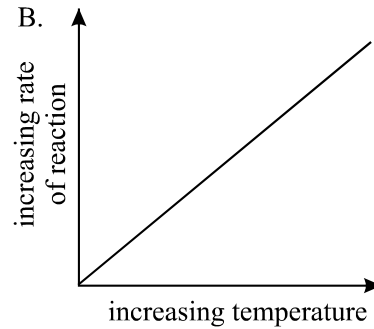
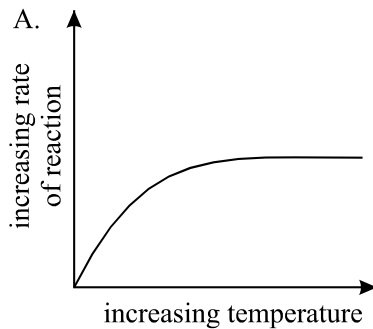
Question 13.

Which one of the following molecules contains the least amount of energy that can be used by a cell? A single molecule of

- A. glucose.
- B. pyruvic acid.
- C. adenosine triphosphate.
- D. sucrose.

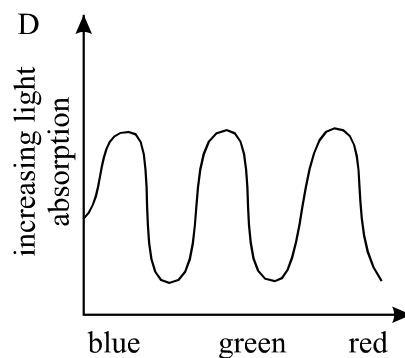
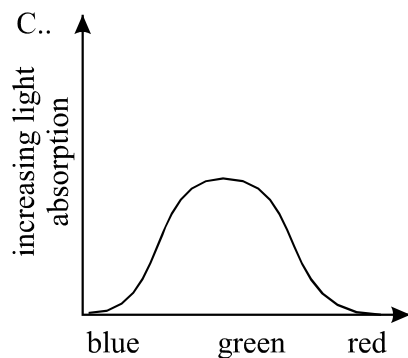
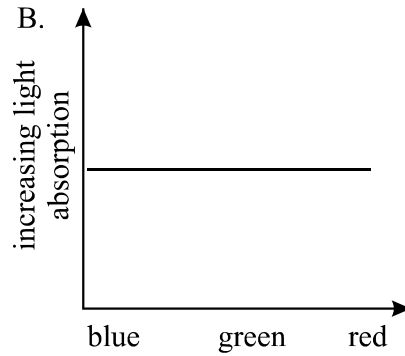
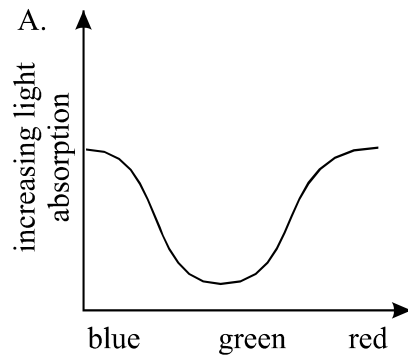
Question 14.

Which one of the following graphs best illustrates the relationship between increasing rate of reaction and increasing temperature for an enzyme?



Question 15.

Which one of the following graphs best shows how different wavelengths of light are absorbed by green plants during photosynthesis?



Use the following information to answer question 16.

The graph below in **Figure 1** shows the results of how the rate of photosynthesis increases with increasing light intensity at four different temperatures.

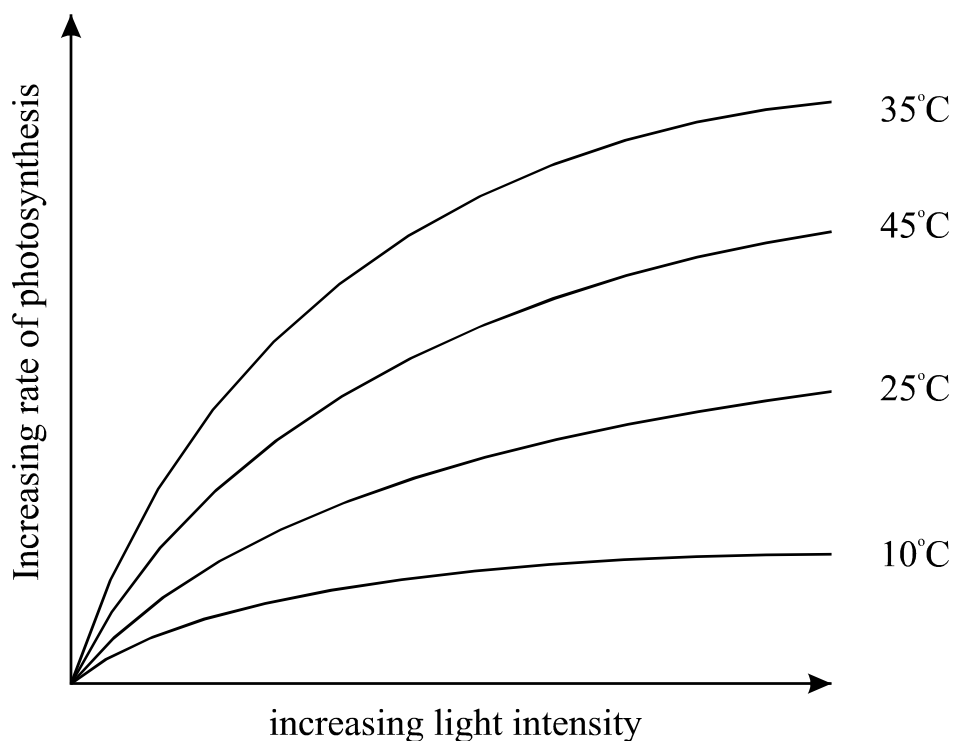


Figure 1

Question 16.

Which one of the statements below is the best explanation for the results shown in the graph in **Figure 1**?

- A. the greater the temperature and the greater the light intensity, the greater the rate of photosynthesis.
- B. the rate of photosynthesis is the same for all light intensities because the temperature gradually increases.
- C. the increase in temperature has no effect on the rate of photosynthesis since light intensities are increasing.
- D. at temperatures of 45°C enzymes do not function as efficiently as they do at temperatures of 35 °C, during photosynthesis.

Question 17.

Which one of the following helps to prevent the entry of pathogens into humans?

- A. B-lymphocytes and T-lymphocytes.
- B. immunoglobulins and phagocytes.
- C. histamines and inflammation.
- D. mucus and cilia.

Question 18.

Waste products are the result of metabolic processes occurring in cells. Which statement below best explains why removing waste products is necessary for metabolic processes to continue? The waste products:

- A. produced by metabolic activity destroy the cells in which they are made.
- B. change the optimum internal environment of cells and this would interfere with the metabolic processes.
- C. cause a change in the cell membrane and this interferes with nutrients that need to enter the cell.
- D. prevent the diffusion of ATP from the mitochondria to where the energy is needed for optimal cell functioning.

Use the following information to answer questions 19 and 20.

The diagram in **Figure 2** below shows how two solutions A and B are initially set up. The two solutions are separated by a semi-permeable membrane, which allows both water and glucose molecules to pass through.

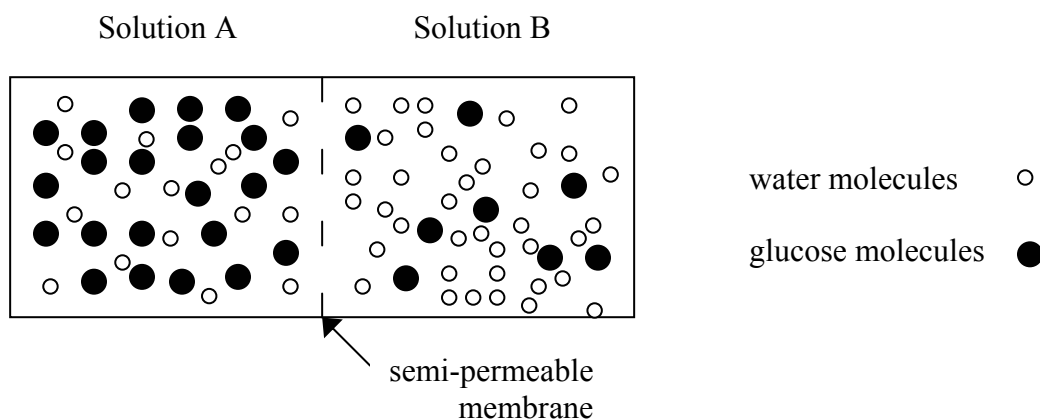


Figure 2

Question 19.

After the initial set-up, the two solutions were allowed to stand for 48 hours. At the end of 48 hours, one would expect:

- A. solution A to be hypertonic relative to solution B.
- B. solutions A and B to be isotonic.
- C. solution A to be hypotonic relative to solution B.
- D. solutions A and B to be hypertonic.

Question 20.

The biological processes being modelled in **Figure 2** are:

- A. facilitated diffusion and osmosis.
- B. active transport and osmosis.
- C. diffusion and osmosis.
- D. active transport and diffusion.

Use the following information to answer question 21.

Figure 3 below is a diagrammatic representation of two structures found in the nervous system.

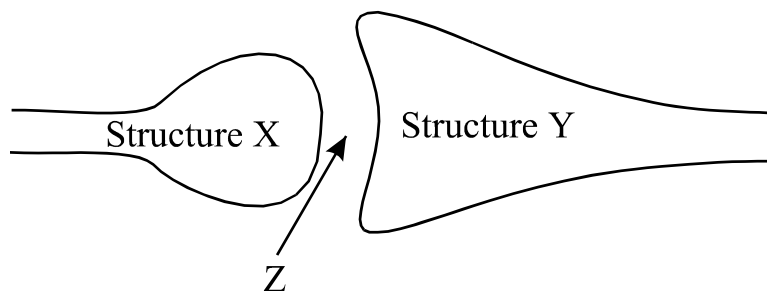


Figure 3

Question 21.

When an electrical impulse is travelling along structure X, for an electrical impulse to be generated in structure Y, the following must happen:

- A. an electrical impulse travels across Z from structure X to structure Y.
- B. a refractory period occurs in structure X which causes structure Y to be stimulated.
- C. vesicles in structure X release a neurotransmitter, which causes structure Y to generate an electrical impulse.
- D. mitochondria in structure X provide the energy for structure Y to generate an electrical impulse.

Question 22.

During signal transduction, the type of molecule that can act as an intermediate, relay or secondary messenger molecule is:

- A. a steroid hormone.
- B. an immunoglobulin G.
- C. a G-protein.
- D. a complement protein.

Use the following information to answer question 23.

Figure 4 diagrammatically represents an example of homeostasis.

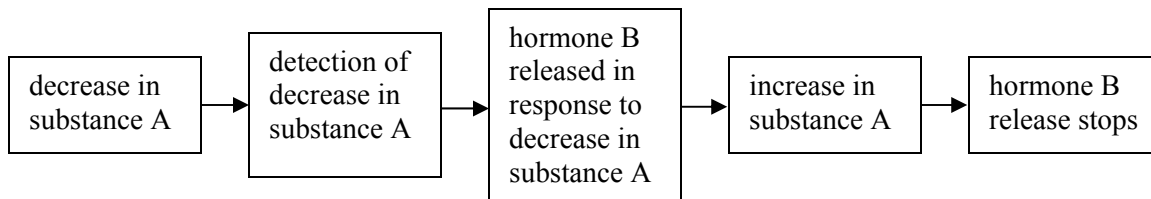


Figure 4

Question 23.

The example of homeostasis in **Figure 4** shows the operation of a

- A. transduction pathway within a cell.
- B. stimulus-response mechanism in the nervous system.
- C. feedback mechanism involving the endocrine system.
- D. nervous and endocrine systems acting together to maintain a constant internal environment.

Question 24.

Antibiotics are naturally synthesized by particular types of:

- A. prions.
- B. fungi.
- C. viruses.
- D. bacteria.

Question 25.

In order to give an individual life-long immunity against a particular disease, it would be appropriate to:

- A. administer a vaccine containing antibodies against the disease.
- B. inject immunoglobulins into the bloodstream of the individual.
- C. inject a suitable antigen of the disease into the individual to stimulate their immune system.
- D. inject an attenuated antigen into the individual so that histamines produce an inflammatory response to desensitize the individual against the disease.

Short Answer Section

Question 1.

In order to find out the effectiveness of an antibiotic on four different (W,X,Y,Z) strains of a particular pathogen that causes infections in humans, the following experiment was performed as shown in **Figure 5**. Each strain of pathogen was spread all over the agar plate and the same antibiotic disc placed in the middle of each agar plate.

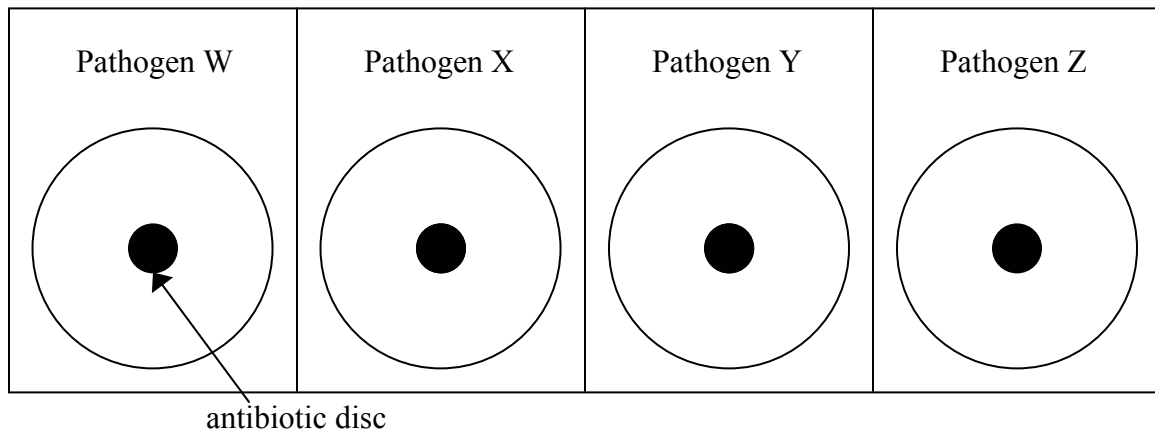


Figure 5

Figure 6 below shows the results obtained after 72 hours at an incubation temperature of 37°C. Clear zones (not shaded) on the agar plate indicate no pathogen growth or presence.

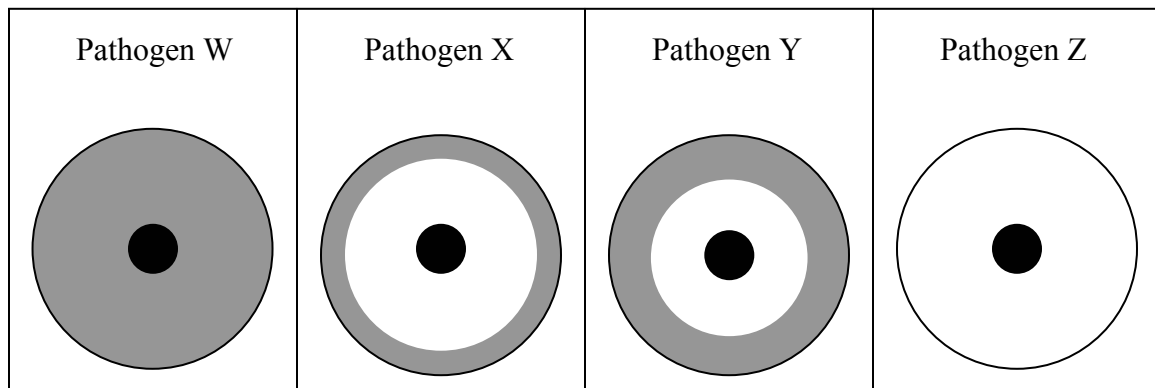


Figure 6

- a. Write down a hypothesis that this experiment could have been testing.

(1 mark)

b. Is a control involved in this experiment? Explain.

(1 mark)

c. Name the type of pathogen that antibiotics are effective against.

(1 mark)

d. Which strain of pathogen was the antibiotic most effective against? Explain

(2 marks)

e. Explain why the experiment was carried out at 37°C.

(1 mark)

The strains of pathogen mentioned above can sometimes penetrate the skin with the result that not only does puss begin to form around the point of entry, but the area also becomes inflamed.

f. Name the cells mainly involved when puss forms under the skin.

(1 mark)

g. Briefly explain how inflammation helps the body to fight a pathogen that has penetrated the skin covering.

(2 marks)

Total = 9 marks.

Question 2.

Proteins play an important part not only in the structure of living things, but also in how they function. Proteins are complex molecules with a number of different structures.

- a. Briefly explain the difference between primary and secondary structures as it applies to protein molecules.

(1 mark)

- b. When heat is supplied to most proteins, they lose their ability to carry out their particular function. Explain.

(2 marks)

- c. Explain the meaning of the term proteome.

(1 mark)

Neuraminidase is a protein found on the influenza virus that is necessary for the influenza virus to leave infected respiratory cells. Relenza is a designer drug that blocks the active site of neuraminidase.

- d. Briefly explain why Relenza helps to prevent the spread of the influenza virus.

(2 marks)

Total = 6 marks.

Question 3.

Immunity can be defined as being resistant against a specific pathogen or disease. If pathogens progress through several lines of defence, the body may start to have more specific responses and produce immunoglobulins to fight infections and the disease, thereby providing a degree of immunity.

- a. Name the cells that produce and release immunoglobulins.

(1 mark)

- b. Explain the meaning of specific immune response.

(2 marks)

- c. Which organelle of a cell has the information that allows the immune system to detect self from non-self?

(1 mark)

- d. Explain what can happen if helper T-cells are not produced during a specific immune response.

(1 mark)

- e. Briefly explain the role of suppressor T-cells in the immune response.

(1 mark)

Total = 6 marks.

Question 4.

Life on planet earth is possible because certain organisms, mainly plants, are capable of converting light or radiant energy into chemical energy through the process of photosynthesis. Chlorophyll is the main pigment normally used by plants.

- a. Name the main energy-rich compound that is produced during the light dependent reaction of photosynthesis.

(1 mark)

- b. Briefly explain the process that occurs during the light dependent reaction of photosynthesis.

(2 marks)

- c. Write down the balanced chemical equation for photosynthesis.

(1 mark)

- d. Why can the rate of photosynthesis decline when carbon dioxide (CO₂) levels are reduced or fall below normal levels?

(1 mark)

- e. During photosynthesis, where does the Calvin cycle occur?

(1 mark)

Total = 6 marks.

Question 5.

Signal transduction is a series of sequential events that begins when a signal molecule is received by a cell and the cell responds in a particular way.

- a. What is a signal molecule?

(1 mark)

- b. Name a steroid hormone that acts as a signal molecule.

(1 mark)

- c. Explain why only signal molecules that are lipid soluble are able to enter a cell and pass directly into the cytoplasm.

(1 mark)

- d. How do signal molecules that are not lipid soluble transfer their message into the cell?

(2 marks)

- e. Explain the role of secondary messenger molecules in signal transduction.

(1 mark)

Total = 6 marks.

Question 6.

Cellular respiration is the process by which organisms break down energy-rich molecules so that useable energy in the form of ATP is released. The ATP molecule is the universal energy carrier for the cell and ATP releases its energy quickly in the presence of the catalyst ATPase. Living cells can respire with or without oxygen.

- a. Where in the cell is glucose initially broken down during glycolysis?

(1 mark)

- b. How many pyruvate molecules are produced for each glucose molecule when glucose is broken down during cellular respiration?

(1 mark)

- c. Briefly explain the process which produces the largest amount of ATP when pyruvate is broken down aerobically.

(2 marks)

A student stated that since 2 ATP molecules are produced during anaerobic respiration in both plant and animal cells, there is no difference between plant and animal cells during anaerobic respiration.

- d. Explain whether you agree or disagree with the student.

(2 marks)

- e. Briefly explain how water is formed during aerobic respiration.

(1 mark)

If during cellular respiration the temperature rises dramatically, the breakdown of ATP slows dramatically.

- f. Name the compounds that are affected if the temperature rises dramatically during the release of energy from ATP.

(1 mark)

- g. Explain the meaning of the term phosphorylation.

(1 mark)

Total = 9 marks.

Question 7.

In order for mammals to survive in a constantly changing external environment, they have to maintain the components of their internal environment within certain tolerance limits so that their cells can function efficiently.

- a. What term describes the maintenance of a mammal's internal temperature environment at a relatively constant level?

(1 mark)

Aldosterone and the antidiuretic hormone are two hormones that play a role in the chemical composition of blood in mammals. Aldosterone influences sodium levels and the antidiuretic hormone influences water levels. Both hormones have their effect on the kidney's tubules.

- b. Name the functional unit of the kidney.

(1 mark)

Both aldosterone and the antidiuretic hormone exert their control over sodium and water level respectively through a negative feedback system.

- c. Briefly explain how this negative feedback system operates in the case of the antidiuretic hormone.

(2 marks)

- d. Which control system in mammals has the fastest response time to stimuli?

(1 mark)

Total = 5 marks.

Question 8.

Pheromones are highly volatile chemical substances that are released by many organisms. Furthermore, pheromones can be divided into releaser and primer pheromones.

- a. Briefly explain why the effects of releaser pheromones on members of the same species can be almost instantaneous.

(1 mark)

- b. Explain the difference in effects that releaser and primer pheromones can have on members of the same species.

(1 mark)

- c. In animals, how do hormones and pheromones differ?

(1 mark)

Total = 3 marks.

End of Task

Suggested Answers VCE Biology 2007 Year 12 Trial Exam Unit 3

Multiple Choice Section.

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

Short Answer Section.

Question 1.

- There are many possible hypotheses; however anything along this line of thought: the antibiotic used in this experiment will result in some strains of the pathogen being unable to grow on the agar plates (1).
- No. There is no agar plate with no antibiotic, so it is not possible to compare results of agar plates with antibiotics and agar plates without antibiotics (1).
- Bacteria (1).
- Pathogen Z (1). The agar plate that has pathogen Z on the plate has had no growth of the pathogen after 72 hours, which would indicate that the antibiotic is most effective against pathogen Z (1).
- Since these pathogens cause infections in humans and the body temperature of humans is 37°C, the experiment was carried out at the same temperature as that found in humans (1).
- Phagocytes (1).
- Inflammation results in dilation of blood vessels, which results in more blood flowing to the site, delivering large numbers of phagocytes to engulf foreign pathogens (1). Furthermore, inflammation enables more anti-pathogenic substances in the blood to reach the area of infection (1).

Question 2.

- The primary structure of a protein molecule refers to chains of amino acids joined together by peptide bonds. The secondary structure refers to the polypeptide forming a helix or sheet linked by hydrogen bonds (1).
- In order to carry out their particular functions, proteins need to maintain their three dimensional shape, which is held together by weak hydrogen bonds. When heat is applied these weak bonds are broken and disrupted and the protein loses its three dimensional shape (1). As a result, the protein is denatured and loses its ability to carry out its particular function (1).
- The term proteome refers to all the proteins found, produced and functioning in a particular cell, tissue, organ or whole organism (1).
- Neuraminidase is necessary for the influenza virus to leave the cell. However, Relenza, by blocking the active site of neuraminidase stops neuraminidase from

functioning with the result that the flu virus cannot leave the cell it has infected (1). Therefore, with the virus unable to leave the cells, the virus is prevented from spreading to other cells or individuals (1).

Question 3.

- a. Plasma cells (1).
- b. The specific immune response is due to the action of lymphocytes. When foreign antigens penetrate the body and enter the bloodstream, this is detected by the immune system, which brings about a specific immune response (1). As a result, T-lymphocytes and B-lymphocytes become active and specific antibodies are produced against the particular antigen that has entered the body (1).
- c. Cell membrane (1).
- d. When helper T-cells are not produced there is no stimulation of cytotoxic T-cells to destroy body cells infected with pathogens; or B-cells would not clone to form plasma cells and as a result antibodies would not be made and released (1).
- e. The role of suppressor T-cells is to slow down the activity of other T and B cells of the immune system once the pathogen or antigen has been removed from the body (1).

Question 4.

- a. Adenosine triphosphate – ATP (1).
- b. During the light dependent stage, the blue and red wavelengths of light are absorbed by the electrons of chlorophyll molecules and results in electrons leaving the chlorophyll (1). This results in water molecules being split into oxygen and hydrogen ions due to water molecules losing their electrons to chlorophyll molecules; and the production of ATP molecules (1).
- c.
$$12\text{H}_2\text{O} + 6\text{CO}_2 \xrightarrow[\text{chlorophyll}]{\text{light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O} \quad (1).$$
- d. Carbon dioxide is one of the essential reactants in photosynthesis. If carbon dioxide levels are reduced below normal levels the rate of photosynthesis will decline, because there will not be enough carbon dioxide to react with hydrogen ions and incorporate energy from ATP molecules, for photosynthesis to proceed at the normal rate (1).
- e. Stroma of chloroplasts (1).

Question 5.

- a. A signal molecule is a chemical that can attach to a receptor either on the cell membrane or inside the cell and produce a response in that cell (1).
- b. Testosterone or progesterone (1).
- c. Since cell membranes are composed of a phospholipid bi-layer, this means that signal molecules that are lipid soluble can easily pass through the cell membrane into the cell (1).
- d. Signal molecules that are not lipid soluble transfer their message by initially attaching themselves to protein receptors in the cell membrane (1). Once the signal molecule binds to the protein receptor, other molecules inside the cell are activated and relay the signal within the cell (1).
- e. The role of secondary messenger molecules is that they only act inside a cell and can transfer messages to the nucleus that can then activate specific genes. The

activated genes can then produce the protein that acts as a response to the initial stimulus of the signal molecule (1).

Question 6.

- a. Cytoplasm (1).
- b. Two (1).
- c. As the pyruvate is being converted and broken down in the mitochondria, this results in co-enzymes (acceptor molecules like NAD and FAD) storing highly energized electrons (1). The energy of the electrons stored in these co-enzymes is transferred and released gradually through an electron transport chain that results in the largest amount of ATP being produced (1).
- d. Disagree with the student (1). Although two ATP molecules are produced in both plant and animal cells, there are significant differences. Alcohol is produced in plant cells and lactic acid in animal cells. Furthermore, carbon dioxide is produced in plant cells but not in animal cells (1).
- e. Water is formed when the electrons in the electron transport chain lose their energy and are finally accepted by oxygen, which then combines with hydrogen ions forming water (1).
- f. Enzymes or ATPase (1).
- g. Phosphorylation is the process in which energy-rich phosphate groups are attached to ADP and form ATP (1).

Question 7.

- a. Homeothermy (1).
- b. Nephron (1).
- c. A negative feedback system is one in which the response to stimulus reduces the stimulus. In this case when water levels fall below normal levels (stimulus), this is detected and the antidiuretic hormone is released, stimulating the kidney tubules to absorb more water (response)(1). As water levels rise back to normal levels (reducing the stimulus), antidiuretic hormone secretion is reduced or stopped and the kidney tubules do not absorb as much water (1).
- d. Nervous system (1).

Question 8.

- a. Since pheromones are highly volatile chemicals when they are released the pheromones will rapidly spread out and quickly come in contact with other members of the same species with the resulting effects being almost instantaneous(1).
- b. Releaser pheromones when released by an organism cause an almost immediate behavioural response in other members of the same species, which is not permanent. On the other hand, when primer pheromones are released, physiological, developmental and behavioural changes to members of the same species that can occur take longer and the resulting changes can be permanent(1).
- c. Hormones are chemicals released by endocrine glands into the bloodstream and have an effect on target cells inside an animal. On the other hand, pheromones are chemicals released into the animal's surroundings to target or signal other animals, usually of the same species (1).