



VCE BIOLOGY 2010

YEAR 12 TRIAL EXAM UNIT 3

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Time allowed: 90 minutes
Total marks: 75

25 Multiple Choice Questions
7 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 2010 Year 12 Trial Exam Unit 3

Student Answer Sheet

Instructions for completing test. Use only a 2B pencil. If you make a mistake erase and enter the correct answer. Marks will not be deducted for incorrect answers.

Write your answers to the Short Answer Section in the space provided directly below the question. There are 25 Multiple Choice questions to be answered by circling the correct letter in the table below.

<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 2010 Year 12 Trial Exam Unit 3

Multiple Choice Questions – Section A

Question 1

A single polypeptide molecule that makes up a protein consists of the following structure(s):

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

Question 2

Which one of the following would be regarded as an example of an anabolic reaction? The formation of

- A. carbon dioxide and water during respiration.
- B. fatty acids and glycerol after the digestion of lipids.
- C. glucose during photosynthesis.
- D. amino acids after the synthesis of proteins.

Question 3

Which of the following organelles is the site where the synthesis of enzymes takes place?

- A. Lysosome.
- B. Golgi body.
- C. Mitochondrion.
- D. Ribosome.

Use the following information to answer Questions 4 and 5.

Figure 1 below is a graph representing the relationship between increasing carbon dioxide concentration and the increasing rate of photosynthesis in a particular plant.

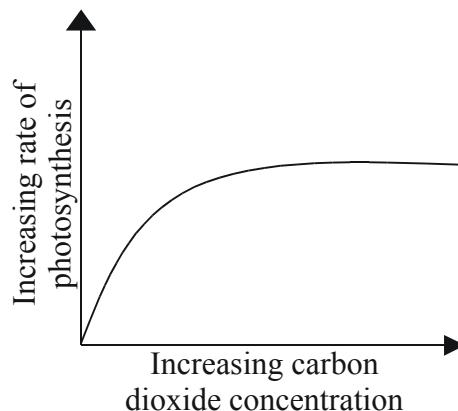


Figure 1

Question 4

From your own knowledge and the information provided in **Figure 1**, one can conclude that the rate of photosynthesis increases initially and then remains constant because

- A. there is not enough carbon dioxide present for the photosynthetic rate to keep on increasing.
- B. carbon dioxide levels have become a limiting factor in the rate of photosynthesis.
- C. this particular plant can only increase its rate of photosynthesis up to a certain level of carbon dioxide concentration.
- D. the concentration of carbon dioxide and the rate of photosynthesis are not dependent on each other.

Question 5

Which one of the following statements about photosynthesis is correct? Photosynthesis

- A. results in the transformation of light energy into chemical energy.
- B. does not need to have enzymes present to speed up the process because it is driven by the release of energy from glucose.
- C. is dependent on the presence of oxygen since it is an anabolic reaction.
- D. uses green wavelengths of light because the pigment chlorophyll, in chloroplasts, is green.

Question 6

Which one of the following organic compounds would be classified as a polysaccharide?

- A. Lactose.
- B. Cellulose.
- C. Glucose.
- D. Maltose.

Figure 2 below is a diagrammatic representation of a nucleotide with 3 sub-units **A**, **B** and **C**.

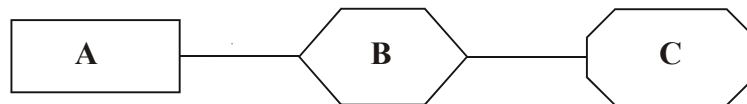


Figure 2

Question 7

If **A** represents a phosphate group, **B** represents a sugar molecule and **C** represents thymine, which one of the following diagrams shows the correct arrangement of the components in a nucleotide that will pair with thymine.

- A.
- B.
- C.
- D.

Question 8

Oxygen is needed during aerobic respiration because

- A. ATP cannot be synthesized in a cell without the presence of oxygen.
- B. enzymes in the cytoplasm will not function if there is no oxygen.
- C. oxygen is needed to combine with the final product of the electron transport chain.
- D. oxygen is needed for the pyruvate to move from the cytoplasm to the mitochondria.

Figure 3 below is a flow chart showing how a particular hormone found in humans is regulated.

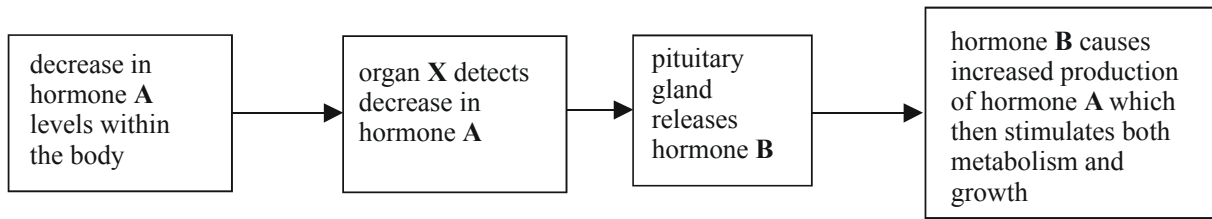


Figure 3

Question 9

From your own knowledge and the information above in **Figure 3**, one could conclude that hormone **A** most likely is

- A. insulin.
- B. thyroxine.
- C. aldosterone.
- D. antidiuretic hormone.

Question 10

Which one of the following statements would best describe the term “proteomics”? The

- A. complete collection of proteins that are found in any particular organism or cell.
- B. total number of amino acids and peptides that make up the proteins in any particular cell or organism.
- C. use of information that is obtained from an organism’s DNA to study its protein make up.
- D. use of techniques to systematically study the proteins in any particular organism or cell.

Question 11

The main difference between cytotoxic T-cells and natural killer cells is that natural killer cells

- A. destroy bacteria, while cytotoxic T-cells destroy viruses.
- B. do not form memory cells, while cytotoxic T-cells do form memory cells.
- C. are involved in destroying cancer cells, while cytotoxic T-cells are not involved in destroying cancer cells.
- D. mature in the spleen and thymus gland, while cytotoxic T-cells mature in the bone marrow.

Question 12

Both the endocrine and nervous systems use negative feedback in some of their control mechanisms. Which one of the following statements could be used to describe a negative feedback system? A

- A. stimulus that results in both the nervous and endocrine systems increasing their activity.
- B. response to a particular stimulus results in the stimulus generating a response in the nervous system but not the endocrine system.
- C. stimulus results in the response initially increasing and then either increasing further or decreasing depending on the strength of the stimulus.
- D. response to a particular stimulus that results in the stimulus decreasing over time.

Question 13

A group of students wanted to find out if the colour of light has an affect on the growth of a particular species of plant. Which one of the following is the most suitable hypothesis that the students could be testing?

- A. A sample of same sized pea plants will grow taller in blue light than in red light.
- B. All same sized plants will grow faster in sunlight.
- C. A sample of same sized pea plants will grow faster in sunlight than a sample of same sized lettuce plants.
- D. A sample of same sized plants will grow better in blue light than in red light.

Question 14

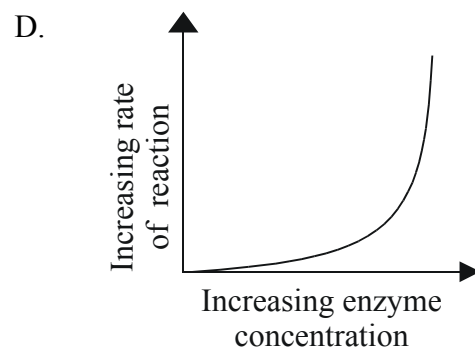
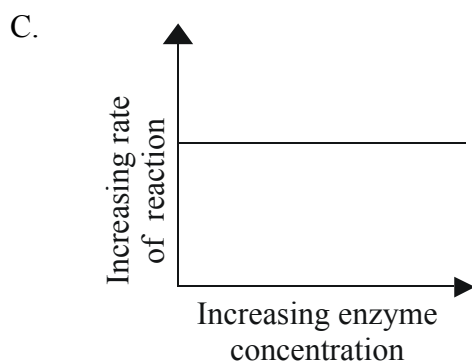
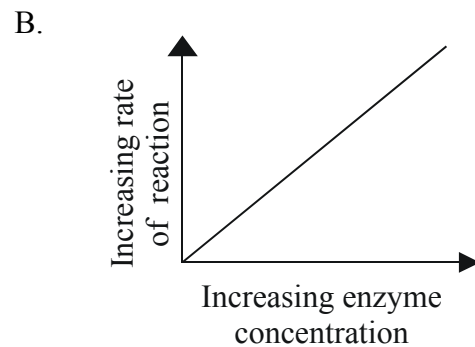
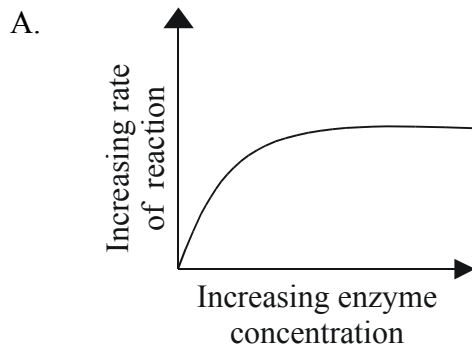
Which one of the following could explain why cells contain many different enzymes?

Enzymes are

- A. sensitive to different concentrations of the same substrate.
- B. temperature specific in mammals.
- C. only able to function in a narrow pH range.
- D. specific for particular biochemical reactions.

Question 15

Which one of the following graphs below best illustrates the relationship between increasing rate of reaction and increasing enzyme concentration, with more than enough substrate available so that it is not a limiting factor?



Question 16

An important difference between active and passive transport is that active transport

- A. requires an input of energy, while passive transport does not require an input of energy.
- B. occurs only in animals because they move around, which requires energy, while passive transport occurs only in plants because they are stationary.
- C. is necessary so that substances are able to move through membranes into a cell.
- D. is associated with endocytosis, while passive transport is associated with exocytosis.

Question 17

The synthesis of ATP from ADP and inorganic phosphate results

- A. from an input of energy when glucose is being synthesised.
- B. in an output of energy as glucose is being broken down.
- C. from an input of energy as glucose is being broken down.
- D. in an output of energy when glucose is being synthesised.

Use the following information to answer Question 18.

Figure 4 below is a diagrammatic representation of a concentrated glucose solution separated from water by a semi-permeable membrane at the start of an experiment.

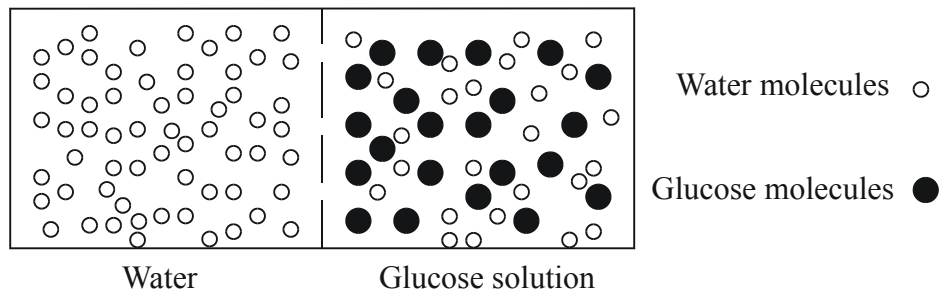


Figure 4

Question 18

From your own knowledge and the information provided in **Figure 4**, one could conclude that to begin with

- A. facilitated diffusion would allow glucose molecules to move through the membrane into the water.
- B. active transport would allow glucose molecules to move through the membrane into the water.
- C. osmosis would allow water molecules to move through the membrane into the glucose solution.
- D. there would be no movement of either glucose molecules or water molecules through the membrane.

Question 19

Which one of the following model diagrams could be used to represent a reflex arc?

- A. stimulus → receptor → effector → response
- B. receptor → stimulus → effector → response
- C. stimulus → receptor → response → effector
- D. receptor → response → effector → stimulus

Question 20

Which one of the following statements best describes why a vaccination against small pox can be effective? A vaccination against small pox causes an

- A. inflammation response resulting in the production of antibodies that engulf the small pox virus.
- B. immune response resulting in the production of phagocytes that bind to any small pox viral particles that are present.
- C. immune response that results in the production of memory B-cells that can provide a rapid response if an individual is again infected with small pox.
- D. inflammatory response resulting in the production of memory T-cells that will engulf any small pox viral particles present.

Question 21

Which one of the following statements could be applied to an action potential?

- A. The membrane is initially depolarised with the result that potassium ions move inside the neurone.
- B. A threshold potential has to be reached before an action potential can be generated.
- C. The refractory period is the time that it takes the action potential to reach its target neurone.
- D. During an action potential, the inside of a neurone remains neutral due to the positive and negative charges moving along the neurone.

Question 22

Which one of the following biological terms could be used to describe the engulfing and destruction of pathogenic organisms like bacteria?

- A. Vaccination.
- B. Inflammatory response.
- C. Agglutination.
- D. Phagocytosis.

Question 23

The organelle involved in the synthesis of phospholipids is the

- A. endoplasmic reticulum.
- B. vesicle.
- C. mitochondrion.
- D. vacuole.

Question 24

In order for short day plants to flower they need to

- A. be subjected to short periods of light so that plant hormones which bring about flowering can be activated.
- B. spend less time in the dark so that they can maximize the short time they spend in daylight.
- C. be exposed to intense but short periods of bright light during the winter months of the year.
- D. spend most of the twenty four hour daily cycle in total and uninterrupted darkness.

Question 25

When a light source, which is directly overhead a plant, is detected by the tip of the growing shoot of the plant and indoleacetic acid released, what would the response of the plant be?

- A. Bending of the shoot towards the light source due to cell elongation on only one side of the plant.
- B. Growth of the plant's shoot by cell elongation directly towards the light source.
- C. Bending of the shoot towards the light source due to cell division on only one side of the plant.
- D. Growth of the plant's shoot towards the light source as a result of the bending not being equal on both sides of the shoot.

End of Section A

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Short Answer Questions – Section B

Question 1

DNA and RNA are nucleic acids that are involved in protein synthesis. A small section of messenger RNA has the following sequence of bases:

UACGAACUGUGCGCA

- a. Which base is found in DNA but not RNA?

_____ (1 mark)

- b. Explain two ways in which RNA and DNA differ, apart from their base difference.

_____ (2 marks)

- c. What is the maximum number of amino acids that this small section of messenger RNA above could code for?

_____ (1 mark)

Apart from messenger RNA, there is also transfer RNA and ribosomal RNA.

- d. How do the roles of transfer RNA and ribosomal RNA differ?

_____ (2 marks)

- e. Where is ribosomal RNA synthesized within the cell?

_____ (1 mark)

A length of DNA that codes for a polypeptide contains 369 base pairs.

- f. How many codons are associated with this piece of DNA and what is the maximum number of amino acids that could be present in the polypeptide?

(1 mark)

Total = 8 marks

Question 2

ATP is an important organic molecule and is necessary for the normal functioning of cells, like supplying the energy needed for intracellular transport.

- a. Name the structure that is responsible for the transport of proteins from ribosomes to golgi bodies.

(1 mark)

ATP synthase is an enzyme that speeds up the synthesis of ATP within cells.

- b. Identify the substrate/s for the reaction that ATP synthase speeds up.

(1 mark)

- c. Name and briefly explain which organelle is likely to be found in large numbers near parts of the cell membrane that are involved in active transport.

(2 marks)

- d. Name the process that produces 2 ATP molecules whether oxygen is present or not.

(1 mark)

e. Briefly explain which metabolic pathway releases the most energy in the form of ATP molecules during cellular respiration.

(2 marks)

f. What advantage does an animal cell gain by converting pyruvate to lactic acid? Explain.

(1 mark)

g. Briefly explain why ATP molecules are made from the substrate/s in **Question 2b** and not as completely new ATP molecules without the substrate/s.

(1 mark)

h. Why is glucose broken down in a series of chemical reactions and not in a single step? Explain.

(1 mark)

- i. Of what advantage are the cristae of mitochondria to a cell when aerobic respiration takes place?

(1 mark)

Total = 11 marks

Question 3

Year 12 students prepared three fully sealed pieces of dialysis tubing, **X**, **Y** and **Z**, with each piece containing the same volume, but differing concentrations of glucose solution. All three pieces of dialysis tubing were then put into a large beaker that contained an 8% glucose solution. After one hour the students noticed that the volume in **X** had decreased, the volume in **Z** had increased and the volume in **Y** had stayed the same.

- a. Name the process that resulted in the volume changing in **X** and **Z**.

(1 mark)

- b. Explain your answer to **Question 3a**.

(2 marks)

- c. Is energy needed for the process in **Question 3a**? Explain.

(1 mark)

- d. Which dialysis tubing had the highest concentration of glucose solution?

(1 mark)

e. Briefly explain why the solution in dialysis tubing Y did not change in volume.

(1 mark)

f. What biological term is used to describe a plant cell so full of water that no more water can enter that cell?

(1 mark)

Total = 7 marks

Question 4

Figure 5 is a graph of an experiment that was carried out and shows the relationship between the rate of a chemical reaction and increasing substrate concentration, when there is a constant amount of the enzyme present that catalyses the chemical reaction.

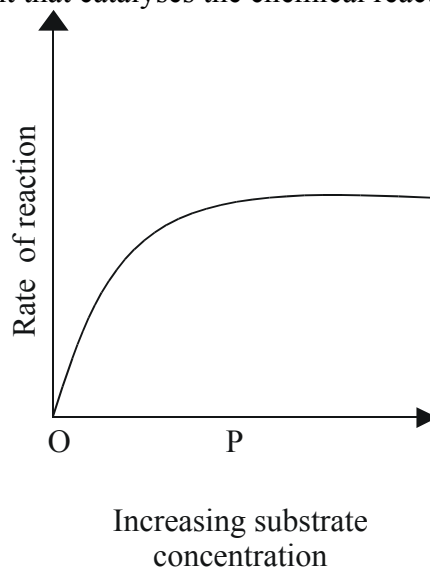


Figure 5

a. Briefly describe the relationship between substrate concentration and the rate of reaction between O and P.

(1 mark)

b. Explain what happens at and beyond P.

(2 marks)

c. What would be the optimum temperature at which this particular enzyme would function, if it was part of a metabolic pathway in humans?

(1 mark)

d. Briefly explain how the enzyme would function if the experiment was carried out at 0°C and then, with the same enzyme, repeated under optimum condition.

(2 marks)

Total = 6 marks

Question 5

While the endocrine and nervous systems appear to be different, they both rely on signalling molecules for information to be transmitted within each system. **Figure 6** is an example of a model which shows how a signal molecule could transfer its information into a cell.

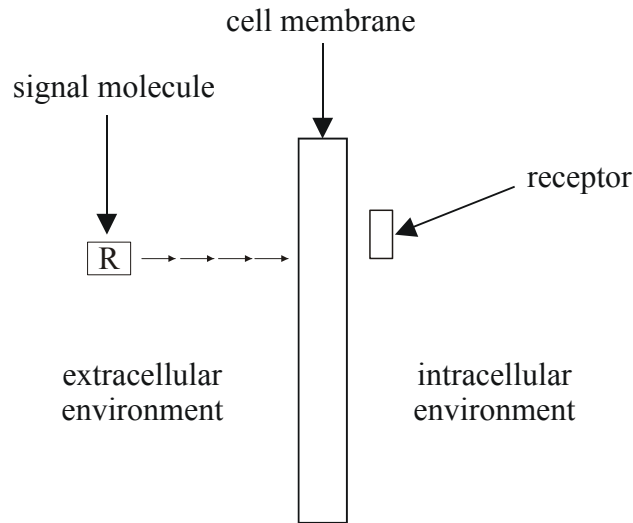


Figure 6

- a. What general term is used for signalling molecules in the nervous and endocrine systems respectively?

(1 mark)

Signalling molecules in the endocrine system are made from either fatty acids or amino acids.

- b. Briefly explain from the information provided in **Figure 6** whether the signal molecule **R** is made from fatty acids or amino acids.

(2 marks)

c. Briefly explain what happens at a synapse in the nervous system.

(2 marks)

d. What biological term is used when a neurone is sufficiently depolarised to cause an electrical impulse to travel along its length?

(1 mark)

Total = 6 marks

Question 6

In order for a person to be treated if they are bitten by a snake whose venom has a deadly neurotoxin, the person is given an anti-venom against the neurotoxin. This anti-venom is first made by injecting tiny amounts of the venom into horses over a period of time, so that their health is not adversely affected, but there is a specific immune response against the venom.

a. Explain what happens when there is a specific immune response against the venom in the horse.

(2 marks)

b. Name the specific type of cell that is mainly involved in slowing down the activity of the immune system, once an infection or pathogen has been eliminated.

(1 mark)

Viruses and viroids are both non cellular agents that can cause a variety of diseases.

c. How does the structure of a virus differ from the structure of a viroid?

(1 mark)

d. Why are viruses regarded as being obligate parasites?

(1 mark)

e. Briefly explain why viral diseases are difficult to treat with medication.

(1 mark)

Total = 6 marks

Question 7

In some individuals a severe attack of hayfever is the result of the immune system's over reaction to the presence of foreign antigens like pollen grains. These individuals have had prior contact with the antigen and specific antibodies have been produced against these antigens. These specific antibodies then become attached to mast cells.

a. Name the two main groups of organic compounds that antigens can be composed of.

(1 mark)

When pollen grains are initially encountered, specific antibodies referred to as IgE are made.

b. Name the cells where IgE antibodies are made.

(1 mark)

- c. Which organelle in the cells mentioned in **Question 7b** would be the site of IgE manufacture?

(1 mark)

- d. Briefly explain why some individuals' immune system can over react to the presence of the same foreign antigens encountered a second time.

(1 mark)

Another type of antibody IgG can also bind with the same antigens present on pollen grains as IgE antibodies but does not attach itself to mast cells.

- e. Briefly explain how an individual, who may have large amounts of the antibody IgG against the antigens on the pollen grains present in their body, may not have the same severe over reaction of their immune system if the pollen grains are encountered a second time.

(1 mark)

- f. What does the symbol Ig stand for in IgE and IgG?

(1 mark)

Total = 6 marks

End of Section B

End of Trial Exam

Suggested Answers

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Multiple Choice Answers – Section A

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

Short Answer (Answers) – Section B

Question 1

- Thymine **(1 mark)**.
- RNA consists of a single nucleotide chain with no base pairing; while DNA is made up of two strands of nucleotides bonded together with base pairing and forming a double helix **(1 mark)**. Furthermore, RNA has ribose sugars present in its structures, while DNA has deoxyribose sugars present **(1 mark)**.
- Five **(1 mark)**.
- Ribosomal RNA, together with proteins, are the compounds which make up the structure of ribosomes, which are the sites for protein synthesis within cells **(1 mark)**. Transfer RNA is involved in the correct sequence of assembling amino acids into a polypeptide chain. Each particular transfer RNA binds only with a specific amino acid, and each particular transfer RNA has a specific anticodon which will only bind with the correct codon on messenger RNA **(1 mark)**.
- Nucleolus **(1 mark)**.
- Codons-123: Amino acids-123. Both answers have to be correct to get one mark **(1 mark)**.

Question 2

- Endoplasmic reticulum **(1 mark)**.
- Adenosine diphosphate and inorganic phosphate. Both answers have to be correct to get one mark **(1 mark)**.
- The organelle found in large numbers when the cell membrane is involved in active transport would be mitochondria **(1 mark)**. For active transport to take place energy is needed. Mitochondria are the organelles which provide the largest amount of energy in the form of ATP that is required for active transport to take place across the cell membrane **(1 mark)**.
- Glycolysis **(1 mark)**.
- The metabolic pathway that releases the most energy during cellular respiration is the electron transport chain **(1 mark)**. High energy electrons are transferred along a series of steps in the electron transport chain and the energy is gradually released from these electrons to make ATP molecules. Finally, the electrons combine with oxygen molecules and hydrogen ions to form water **(1 mark)**.
- The advantage that an animal cell gains by converting pyruvate to lactic acid is that this stops pyruvate from accumulating in the cell and the process of glycolysis can continue releasing ATP molecules. If pyruvate accumulated in the absence of oxygen, glycolysis would stop and no ATP would be available to the cell **(1 mark)**.

- g. ATP molecules are made from ADP and inorganic phosphate and not as a completely new molecule because it is a more efficient use of energy by the cell. Less energy is required to make an ATP molecule from ADP than would be required making a completely new ATP molecule **(1 mark)**.
- h. Glucose is an energy rich molecule and if this stored energy was released in a single step, most would be lost as heat and not much used to make ATP. By breaking glucose down in a series of chemical reactions, more of the stored energy is used to make ATP and much less is lost as heat **(1 mark)**.
- i. The cristae of mitochondria are made up of many folds. This results in a large surface area being available for all the chemical reactions, that must take place during aerobic respiration, so that there is enough ATP for the cell to function at its optimum level **(1 mark)**.

Question 3

- a. Osmosis **(1 mark)**.
- b. In the case of dialysis tubing X, the volume decreased because the solution in X was dilute relative to the glucose solution in the beaker, with the result that water moved from tubing X into the beaker **(1 mark)**. On the other hand, dialysis tubing Z increased in volume because the solution in Z was concentrated relative to the glucose solution in the beaker, resulting in water moving from the beaker into tubing Z **(1 mark)**.
- c. Energy is not needed for this process since water molecules always move along or with their concentration gradient from a dilute solution to a concentrated solution across partially permeable membranes **(1 mark)**.
- d. Dialysis tubing Z **(1 mark)**.
- e. Dialysis tubing Y did not change volume because the glucose concentration in tubing Y was very similar or the same as the glucose solution in the beaker. Therefore water movement out of tubing Y into the beaker would have been balanced by the movement of water from the beaker into tubing Y **(1 mark)**.
- f. Turgor or turgidity **(1 mark)**.

Question 4

- a. The relationship in the graph shows that between O and P, as the substrate concentration increases, there is a corresponding increase in the rate of reaction. Furthermore, near P the rate of reaction is not increasing as quickly as it was midway between points O and P **(1 mark)**.
- b. At and beyond point P, the rate of reaction does not increase as substrate concentration increases, but rather it remains constant **(1 mark)**. Since there is a constant amount of enzyme present, this means that at and beyond P, all of the enzyme molecules are combining with the substrate in the chemical reaction. Increasing the amount of substrate does not make any difference to the rate of reaction, since not all of the substrate molecules can be involved in the chemical reaction, due to not enough enzyme molecules being available **(1 mark)**.
- c. 37°C **(1 mark)**.
- d. If this experiment was carried out at 0°C, there would be very little or no chemical reaction, since enzymes do not function well at these low temperatures **(1 mark)**. However if the same enzyme is returned to its optimum temperature, and the experiment repeated, then the chemical reaction should proceed normally, because no permanent damage is done to the active site and three-dimensional structure of the enzyme after being kept at 0°C **(1 mark)**.

Question 5

- a. Nervous system-neurotransmitters. Endocrine system-hormones. Both answers have to be correct to get one mark **(1 mark)**.
- b. From the information provided in **Figure 6**, the signalling molecule **R** would have been made from fatty acids **(1 mark)**. Since the receptor for molecule **R** is found inside the cell, the signal molecule has to move through the phospholipid bilayer in the cell membrane. For this to occur efficiently the signal molecule would have to be lipid soluble, which means molecule **R** would be made from fatty acids **(1 mark)**.
- c. As an action potential reaches the nerve ending of an axon, the tiny vesicles that are present there and contain a neurotransmitter, release their contents into the synapse **(1 mark)**. This neurotransmitter diffuses across the synapse and interacts with specific receptors on dendrites. As a result another action potential is generated in the next neurone so that the message can continue to its destination **(1 mark)**.
- d. Action potential **(1 mark)**.

Question 6

- a. When tiny amounts of the venom are injected into horses, the specific immune response that occurs is that B-cells clone into plasma cells, which produce the antibodies against the venom with the help of helper T-cells. These antibodies are the anti-venom which is given to individuals bitten by a snake **(1 mark)**. Furthermore, as a result of the specific immune response, B and T memory cells are produced which will allow more of the same antibodies to be made in the future as well as a faster response **(1 mark)**.
- b. Suppressor T-cells **(1 mark)**.
- c. The structure of a virus consists of either the nucleic acids DNA or RNA and a protein coat, while viroids consist only of RNA **(1 mark)**.
- d. Viruses are regarded as obligate parasites because they can only replicate themselves and survive within the cells of living organisms **(1 mark)**.
- e. Viral particles are difficult to treat because when they have infected an individual they are replicating within that individual's cells. As a result any treatment or medication has to penetrate the individual's cell to get at the virus. This is difficult since it can mean breaking down or disrupting the cells of the individual being treated **(1 mark)**.

Question 7

- a. Proteins and carbohydrates. Both answers have to be correct to get one mark **(1 mark)**.
- b. Plasma cells **(1 mark)**.
- c. Ribosomes **(1 mark)**.
- d. The immune system over reacts when the same foreign antigens are encountered a second time because the antigens bind themselves to IgE antibodies that are present and attached to mast cells. This results in massive amounts of histamine being released by mast cells which can lead to a life threatening severe allergic response **(1 mark)**.
- e. When an individual has large numbers of IgG antibodies present, the antigens will bind to both IgE and IgG antibodies. Since IgG antibodies do not attach themselves to mast cells and not as many antigens are attached to IgE antibodies, the intensity of the allergic response is reduced due to less histamine being released **(1 mark)**.
- f. Immunoglobulins **(1 mark)**.

End of Suggested Answers