



VCE BIOLOGY 2015

YEAR 12 PRACTICE EXAM UNIT 3

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Time allowed: 150 minutes

Total marks: 120

40 Multiple Choice Questions

12 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 2015 Year 12 Practice Exam Unit 3

There are **40 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	Question 26	A	B	C	D
Question 27	A	B	C	D	Question 28	A	B	C	D
Question 29	A	B	C	D	Question 30	A	B	C	D
Question 31	A	B	C	D	Question 32	A	B	C	D
Question 33	A	B	C	D	Question 34	A	B	C	D
Question 35	A	B	C	D	Question 36	A	B	C	D
Question 37	A	B	C	D	Question 38	A	B	C	D
Question 39	A	B	C	D	Question 40	A	B	C	D

VCE Biology 2015 Year 12 Practice Exam Unit 3

SECTION A – Multiple Choice Questions

Question 1

Which of the following would be regarded as a monomer? All

- A. enzyme molecules.
- B. carbohydrate molecules.
- C. glucose molecules.
- D. sugar molecules.

Question 2

Another term that has a similar meaning to ‘anabolic reaction’ would be

- A. respiration.
- B. endergonic reaction.
- C. energy releasing reaction.
- D. exergonic reaction.

Question 3

Lysosomes are organelles that are responsible for the

- A. removal of waste products that accumulate during photosynthesis.
- B. process of endocytosis occurring when foreign micro-organisms enter the cell.
- C. digestion of material that is found in food vacuoles by enzymes.
- D. synthesis and repair of cell structures, such as the cell membrane, when they no longer perform their usual function.

Question 4

The atoms that are absent in phospholipid molecules but present in enzyme molecules are

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

Question 5

Figure 1 below shows the results of an experiment in which four identical celery sticks were weighed and one celery stick was placed in each of the four salt solutions.

Solutions of salt.	Weight at start of experiment (grams).	Weight 24 hours after start of experiment (grams).
A	100.0	105.5
B	100.0	94.5
C	100.0	90.0
D	100.0	110.0

Figure 1

From the information provided in **Figure 1** and your own knowledge, one could conclude that the most concentrated salt solution is salt solution

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

Question 6

Which one of the following is the correct sequence of events that brings about a specific immune response?

- A. B-cells activated, antigen detection, plasma cells formed, agglutination and antibodies produced.
- B. Antigen detection, antibodies produced, agglutination, B-cells activated and plasma cells formed.
- C. Antigen detection, B-cells activated, plasma cells formed, antibodies produced and agglutination.
- D. Antigen detection, agglutination, B-cells activated, plasma cells formed and antibodies produced.

Question 7

A major role of the smooth endoplasmic reticulum is the synthesis of

- A. polysaccharides such as glycogen in plants.
- B. proteins.
- C. phospholipids.
- D. enzymes.

Use the following information to answer Question 8.

Figure 2 below is a diagrammatic representation of a fish that normally lives in seawater, showing the body fluids of the fish and seawater.

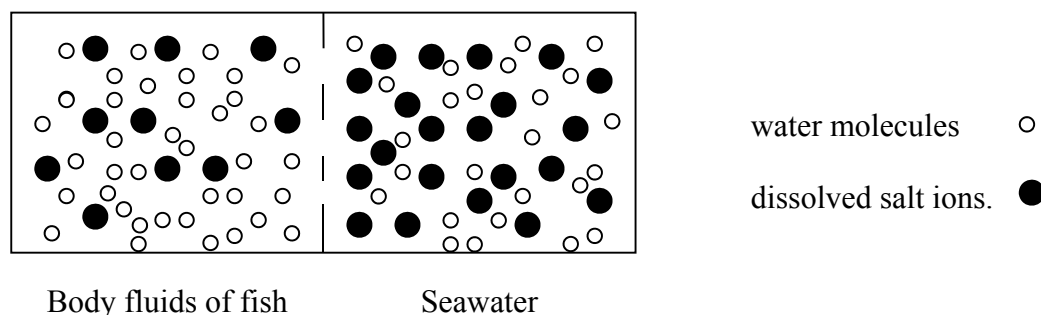


Figure 2

Question 8

From your own knowledge and the information provided in **Figure 2**, one could conclude that tissues of the fish could

- A. gain both water and salt ions.
- B. lose both water and salt ions.
- C. lose water and gain salt ions.
- D. gain water and lose salt ions.

Question 9

Fresh water fish are unlikely to survive when placed in seawater because

- A. there is not enough oxygen present in seawater that would allow freshwater fish to survive.
- B. seawater is hypotonic relative to the body fluids of freshwater fish, which means the freshwater fish will lose water.
- C. freshwater fish do not have any salt ions in their body fluids and this will result in a build-up of osmotic pressure.
- D. water will move out of the freshwater fish due to the differences in salt ion concentration between the seawater and the body fluids of the freshwater fish.

Question 10

Active transport refers to the movement of substances

- A. passively along a concentration gradient from low to high levels of concentration.
- B. actively along a concentration gradient from low to high levels of concentration.
- C. passively against a concentration gradient from low to high levels of concentration.
- D. actively against a concentration gradient from low to high levels of concentration.

Question 11

Which one of the following statements best describes the structure and function of the cell membrane? Cell membranes are

- A. made up mainly of phospholipid receptors which enable the immune system to detect foreign antigens.
- B. a phospholipid bilayer in which are embedded protein channels, and this structure enables the membrane to control what enters and leaves the cell.
- C. always surrounded by a carbohydrate layer so that the cell has a firm structure and doesn't dry out.
- D. composed of a protein bilayer throughout which there is a phospholipid channel for water soluble molecules to pass through.

Question 12

When an individual is given an injection of a particular vaccine against a specific disease, the vaccine may contain

- A. attenuated cells.
- B. plasma cells.
- C. only antibodies.
- D. B-lymphocytes.

Question 13

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

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

Question 14

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

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

Question 15

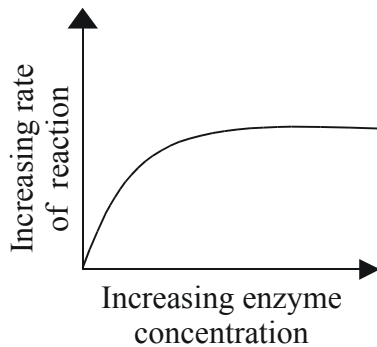
Which one of the following statements would best describe the term "proteomics"? The

- 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.

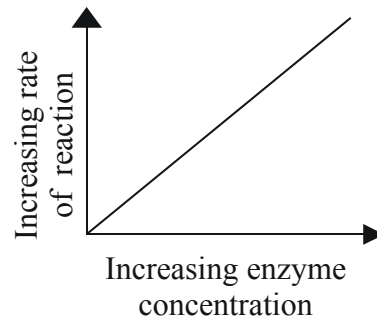
Question 16

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?

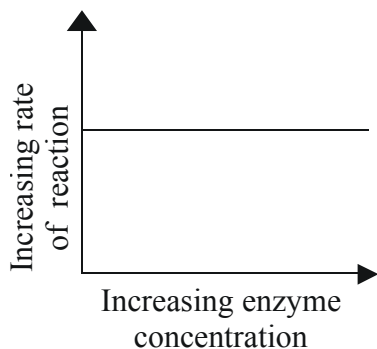
A.



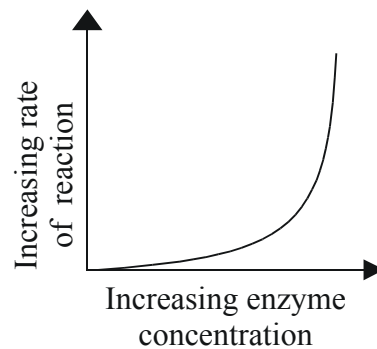
B.



C.



D.



Question 17

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.

Use the following information to answer Question 18.

Figure 3 below is a diagrammatic representation of a concentrated glucose solution separated from water by a semi-permeable membrane at the start of an experiment.

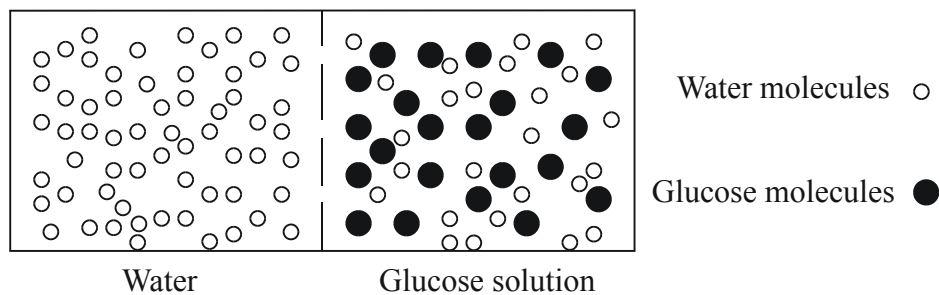


Figure 3

Question 18

From your own knowledge and the information provided in **Figure 3**, 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.

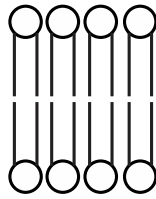
Question 19

Which one of the following biological terms could be used to describe a type of artificially acquired active immunity?

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

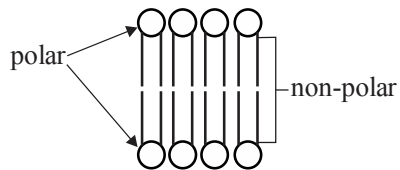
Question 20

A phospholipid bilayer can be represented as:

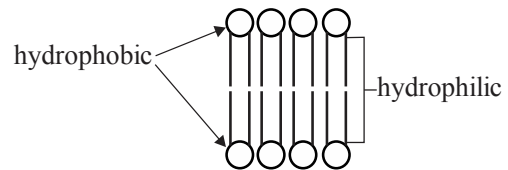


Which labelled diagram most closely resembles the correct polarity of the phospholipid arrangement in a plasma membrane?

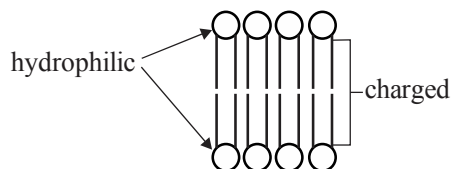
A.



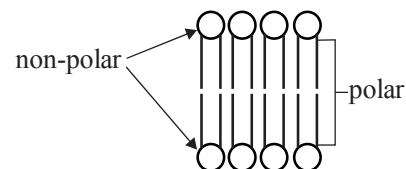
B.



C.



D.



Question 21

The activation energy for a biochemical reaction can best be described as the energy that is

- A. needed to form the enzyme which will speed up the biochemical reaction.
- B. needed to break the chemical bonds that exist in the reactant molecules.
- C. released during the biochemical reaction.
- D. required and helps to form the new chemical bonds in the product molecules.

Question 22

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 23

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 24

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 25

Which one of the following statements explains how immunisation against infectious diseases helps to limit their spread in the human population? Immunisation

- A. enables complement protein and interferon to be released into the bloodstream.
- B. decreases the ability of pathogens to increase their numbers in the immunised host, which then reduces the chance of other individuals becoming infected.
- C. decreases the chance of other individuals in the population becoming infected, because the immunised host stops antibodies being released into their surroundings.
- D. results in the immunised host developing barriers on the surface of their skin, which reduces the chance of the pathogen being transmitted to other individuals.

Question 26

Figure 4 below is a diagram of an antibody.

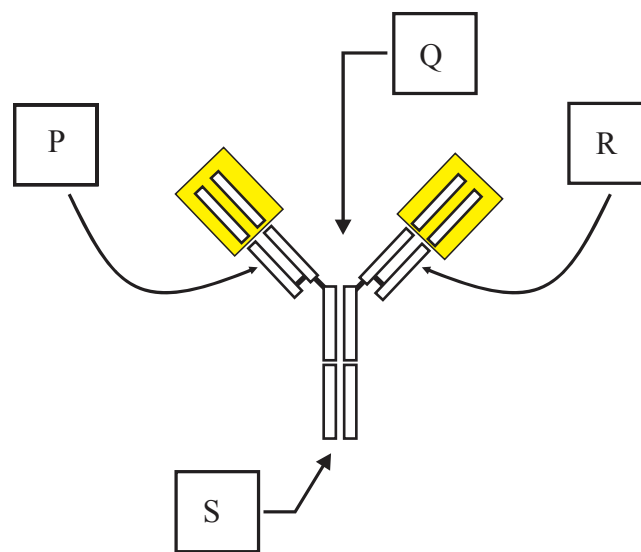


Figure 4

The variable region is

- A. the non-shaded region.
- B. Q.
- C. the shaded region.
- D. P and R.

Question 27

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 28

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 29

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 30

Figure 5 shows the effect of pH on enzyme activity for two different digestive enzymes.

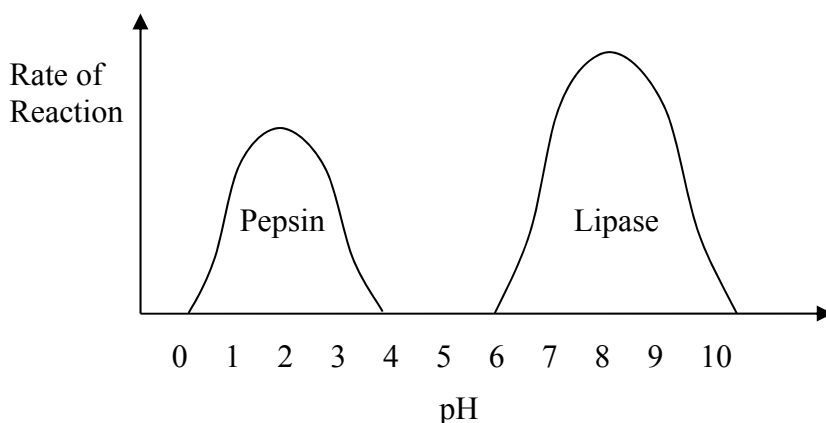


Figure 5

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 31

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 32

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 33

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 dorzolamide.

Which one of the following statements is incorrect? Dorzolamide

- 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 34

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 35

The lipid bilayer of the cell membrane would normally prevent the passage of ions. However, during the electrical transmission through an axon, the passage of ion is facilitated by

- A. Na^+/K^+ pumps.
- B. Ca^+ pumps.
- C. O^{-2} pumps.
- D. NADH^+ pumps.

Question 36

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 necator* that causes powdery mildew in grapes.
- D. The mite, *Pediculus capitis* that causes scalp inflammation.

Question 37

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, an antibiotic, 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 38

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 39

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 40

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 2015 Year 12 Practice Exam Unit 3

SECTION B – Short Answer Questions

Question 1 (8 marks)

Enzymes are organic catalysts which speed up the rate at which biochemical reactions can occur. A particular enzyme called maltase is involved in the breakdown of the sugar maltose to two glucose molecules. Maltase functions at its optimum when the pH is 6.8.

- a. Name the organelle in a cell that would be responsible for the synthesis of maltase. **1 mark**

- b. Even though both maltose and sucrose are disaccharides, explain why maltase breaks down maltose but not sucrose. **2 marks**

- c. Explain what is likely to happen to the breakdown of maltose if the pH level at which maltase has to function is reduced to 1.8? **2 marks**

Another enzyme called amylase, which is involved in the breakdown of starch, is found in human saliva.

- d.** A very small volume of saliva is combined with a much larger volume of starch solution. Explain why the saliva is able to break down all of the starch solution.

1 mark

The enzyme cyclooxygenase speeds up the synthesis of prostaglandins which may result in tissues becoming painful and inflamed. To relieve this inflammation and pain, ibuprofen can be taken because ibuprofen inhibits the enzyme cyclooxygenase.

- e.** Explain how ibuprofen can inhibit the enzyme cyclooxygenase and therefore provide relief from pain and inflammation.

2 marks

Question 2 (4 marks)

Figure 6 below is a diagrammatic representation of how a signal molecule may interact with the cell membrane.

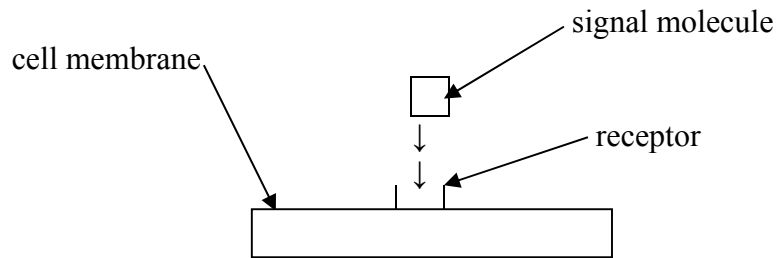


Figure 6

- a.** Why do signal molecules interact only with specific cells and not with any other types of cells? **1 mark**

- b.** Explain two different ways that a signal molecule's message can be received by cells. **2 marks**

- c.** What biological term is used to describe a series of sequential events that results when signal molecules interact with cells? **1 mark**

Question 3 (6 marks)

Transplanting organs such as lung, heart, liver and kidney have become routine operations over recent years. Only the shortage of donors limits the number of transplants that can be performed.

- a.** What is the name of the specific type of cell that can identify an organ that has been transplanted? **1 mark**
-
- b.** Briefly explain how the rejection of transplanted organs is minimised in humans. **1 mark**
-
-
-
-
- c.** Outline two disadvantages that can occur while a patient is taking treatment to minimise rejection of their organ transplant. **2 marks**
-
-
-
-
-
-
- d.** Name the type of diseases that are characterised by antibodies being made against particular tissues in an individual's own body. **1 mark**
-
- e.** Name the non-specific immune response that results in large numbers of phagocytes entering an injured or infected area of the human body. **1 mark**
-

Question 4 (6 marks)

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.** What is the ratio of an adenosine to phosphate in ATP? **1 mark**

- c.** Identify the substrate/s for the reaction that ATP synthase speeds up. **1 mark**

- d.** 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**

- e.** Name the process that produces 2 ATP molecules whether oxygen is present or not. **1 mark**

Question 5 (6 marks)

Figure 7 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.

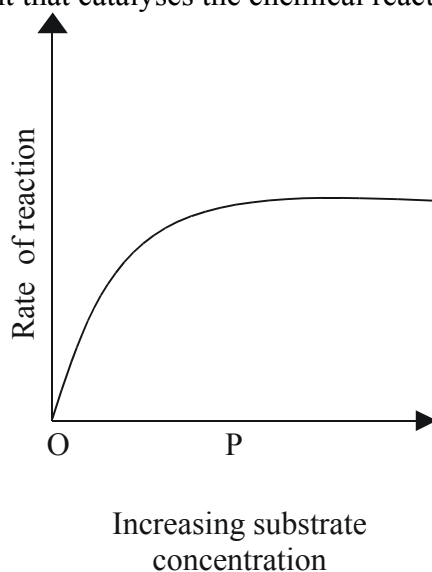


Figure 7

- 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 conditions. **2 marks**

Question 6 (4 marks)

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**

- c.** Briefly explain why viral diseases are difficult to treat with medication. **1 mark**

Question 7 (6 marks)

In some individuals a severe attack of hay fever 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**

Question 8 (10 marks)

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 1

- d.** Using **Table 1** 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**
-
-
-

Question 9 (4 marks)

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**

Question 10 (12 marks)

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**

Question 11 (7 marks)

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 8**. **Questions 2a - 2e refer to the reaction in Figure 8.**

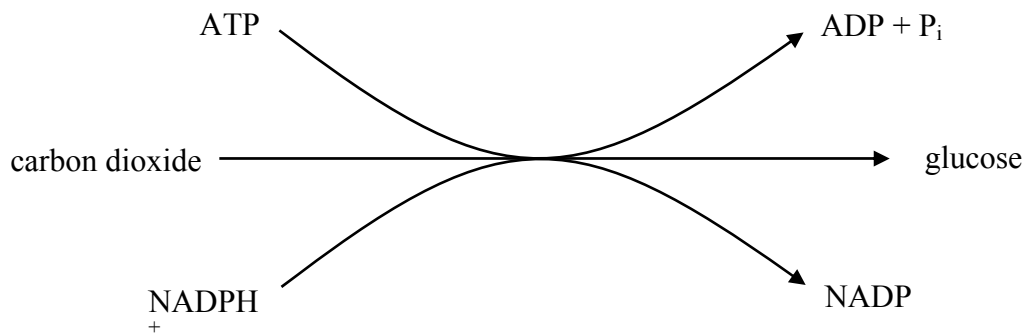


Figure 8

- a.** Is the reaction catabolic or anabolic? How do you know? **1 mark**
- _____
- _____
- b.** What term describes the group of reactions shown in **Figure 8**? **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**
- _____
- _____
- _____

Question 12 (7 marks)

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**

End of Section B

End of Practice Exam

Suggested Answers

VCE Biology 2015 Year 12 Practice Exam Unit 3

SECTION A – Multiple Choice Answers

1. C	2. B	3. C	4. D	5. B	6. C	7. C
8. C	9. D	10. D	11. B	12. A	13. D	14. B
15. D	16. B	17. A	18. C	19. D	20. A	21. B
22. A	23. C	24. A	25. B	26. C	27. B	28. C
29. C	30. B	31. D	32. C	33. B	34. D	35. A
36. B	37. A	38. C	39. B	40. D		

SECTION B – Short Answer (Answers)

Question 1 (8 marks)

- a. Ribosome **(1 mark)**.
- b. Maltase breaks down the substrate maltose but not the substrate sucrose because enzymes are highly specific in their actions **(1 mark)**. The three dimensional shape of maltase and its active site means that only a specific substrate, in this case maltose, can fit into the active site. **(1 mark)**.
- c. The breakdown of maltose will be greatly reduced or stopped if the pH level is 1.8 **(1 mark)**. A pH level of 1.8 which is significantly less than the optimal pH level for maltase, will change the shape of the enzyme maltase and its active site. This would result in the maltase not being able to combine with its substrate maltose effectively **(1 mark)**.
- d. A small volume of saliva, containing amylase, may break down all of the starch because the enzymes involved in chemical reactions are continually reused **(1 mark)**.
- e. The ibuprofen inhibits the enzyme cyclooxygenase because the shape of the ibuprofen molecule allows it to combine with the active site of the enzyme cyclooxygenase **(1 mark)**. The ibuprofen interferes with the normal substrate enzyme reaction and inhibits the production of prostaglandins, resulting in relief from both inflammation and pain **(1 mark)**.

Question 2 (4 marks)

- a. The signal molecule can only interact and bind with cells that have the appropriate receptors **(1 mark)**.
- b. If the signal molecule is water soluble, then the message is first received by receptors on the outside of the cell membrane, and then transferred inside the cell **(1 mark)**. Alternatively, if the signal molecule is lipid soluble, then the message is received first by receptors found inside the cell **(1 mark)**.
- c. Signal transduction **(1 mark)**.

Question 3 (6 marks)

- a. Helper T lymphocyte **(1 mark)**. T lymphocyte not specific enough.
- b. Rejection of transplanted organs is minimised by giving the recipient patient immunosuppressant drugs, which reduces the ability of Helper T lymphocytes to identify the transplanted organ **(1 mark)**.
- c. The patient is more susceptible to infections because the immune system is suppressed **(1 mark)**. By inhibiting the immune system's role of detecting and destroying abnormal cells, such as cancer cells, patients with organ transplants are more vulnerable to cancer **(1 mark)**.
- d. Autoimmune diseases **(1 mark)**.
- e. Inflammatory response **(1 mark)**.

Question 4 (6 marks)

- a. Endoplasmic reticulum **(1 mark)**.
- b. 1:3 **(1 mark)**.
- c. Adenosine diphosphate and inorganic phosphate **(1 mark)**.
- d. 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)**.
- e. Glycolysis **(1 mark)**.

Question 5 (6 marks)

- a. Between O and P, as the substrate concentration increases, there is a corresponding increase in the rate of reaction. Near the point P, the rate of reaction has decreased in comparison **(1 mark)**.
- b. At and beyond point P, the rate of reaction has plateaued **(1 mark)**. Increasing the substrate further will not affect the reaction because all of the enzyme molecules present are combining with the substrate in the chemical reaction **(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 the low temperatures do not denature the enzyme **(1 mark)**.

Question 6 (4 marks)

- a. 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)**. B and T memory cells are also produced, allowing 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. 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 access the virus. **(1 mark)**.

Question 7 (6 marks)

- a. Proteins and carbohydrates **(1 mark)**.
- b. Plasma cells **(1 mark)**.
- c. Ribosomes **(1 mark)**.
- d. The antigens bind 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)**.

Question 8 (10 marks)

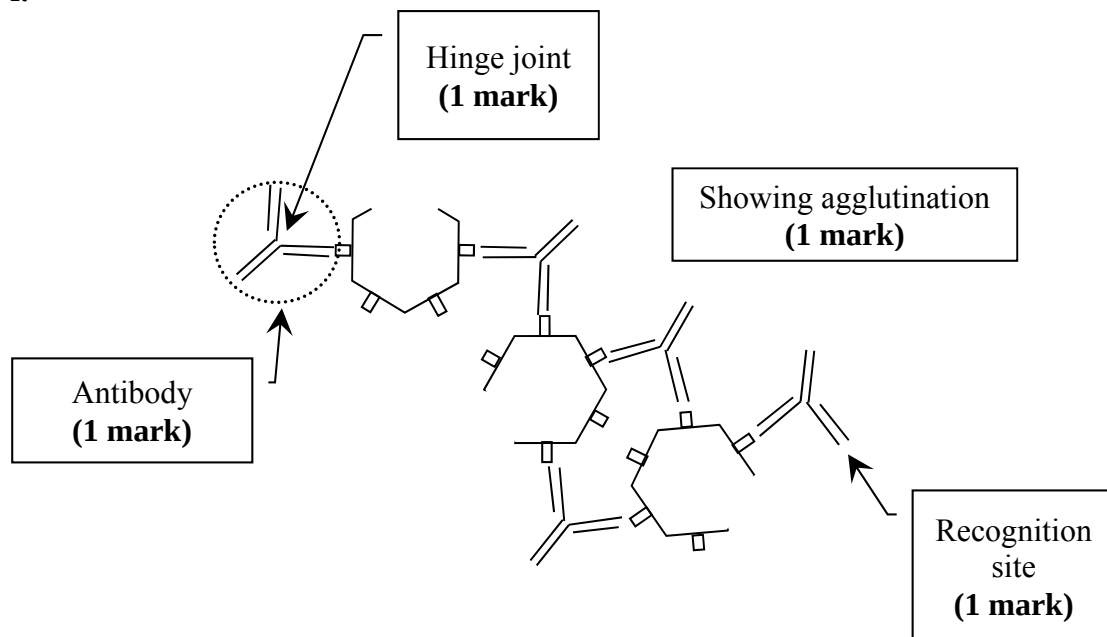
- a. Messenger RNA (mRNA) is made using the DNA strand as a template **(1 mark)**. The product is an mRNA strand with a base sequence G G A U C C A U C **(1 mark)**.
- b. Ribosome **(1 mark)**.
- c. Three **(1 mark)**.
- d. Glycine, Serine, Isoleucine.
(2 marks for 3 correct, 1 mark for 1 or 2 correct, 1 mark if all 3 correct but abbreviated).
- e. 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)**.
- f. 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 9 (4 marks)

- a. Signal transduction **(1 mark)**.
- b. Lipids **(1 mark)**.
- c. Being composed of lipids, testosterone is lipid-soluble and passes easily across the plasma membrane. **(0 marks, see Question 9b)**. 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 10 (12 marks)

- a. Viruses lack the organelles for protein synthesis **(1 mark)**.
- b. Skin creates a physical barrier **(1 mark)**, mucus can trap the viruses and carry them out **(1 mark)**. 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)**.

Question 11 (7 marks)

- a. Anabolic 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)**.

Question 12 (7 marks)

- a. Fermentation (**1 mark**).
- b. Glucose $\rightarrow$ carbon dioxide + ethanol (**1 mark**)
- c. $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ (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.

End of Suggested Answers