VCE BIOLOGY 2008

YEAR 12 TRIAL EXAM UNIT 3

Time allowed: 90 minutes
Total marks: 75

Multiple Choice Questions
Extended Response 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 2008 Year 12 Trial Exam Unit 3

Student Answer Sheet

Instructions for completing test. Use only an HB 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.

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 2008 Year 12 Trial Exam Unit 3

Multiple Choice Section

Question 1
Which one of the following would not be regarded as a polysaccharide?
A. Glycogen.
B. Starch.
C. Cellulose.
D. Sucrose.

Question 2
An example of a catabolic reaction would be
A. photosynthesis.
B. glycolysis.
C. protein synthesis.
D. an endergonic reaction.

Question 3
Mitochondria are the organelles responsible for the complete breakdown of glucose. In mitochondria
A. glucose is broken down to pyruvate.
B. energy released from glucose is used to manufacture ADP.
C. oxygen is needed for respiration to continue after glycolysis.
D. glycogen is broken down to glucose due to the presence of aerobic enzymes.

Use the following information to answer Questions 4 and 5.
Figure 1 below is a diagrammatic representation of a chloroplast.

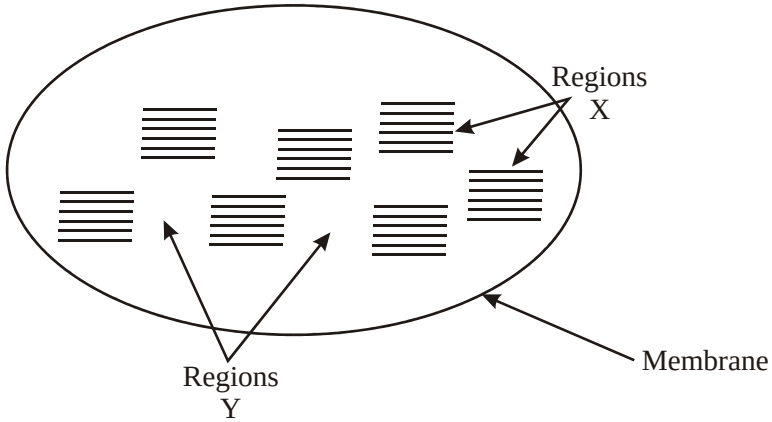

Figure 1

Question 4
From your own knowledge and the information provided above in **Figure 1** one can conclude that
A. region X represents the grana.
B. region Y represents the grana where the stroma is found.
C. grana are where the Calvin cycle takes place.
D. region X represents the area where the light independent reaction takes place.

Question 5
A number of chemical reactions occur during photosynthesis. Which one of the following is correct?
A. The light dependent reaction occurs in region Y.
B. Chlorophyll is needed for any reactions to proceed in region Y.
C. Oxygen is produced as a result of reactions occurring in region X.
D. Carbon dioxide is needed as a reactant for reactions to proceed in region X.

Question 6
Which combination of atoms would represent a protein molecule?
A. Carbon, hydrogen, phosphorus and oxygen atoms.
B. Carbon, hydrogen and oxygen atoms.
C. Carbon, hydrogen, sulphur and oxygen atoms.
D. Carbon, hydrogen, nitrogen and oxygen atoms.

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

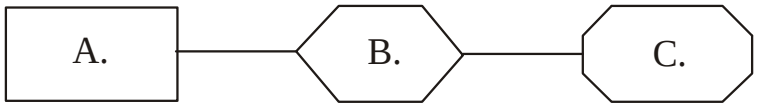

Figure 2

Question 7
The nucleotide above in **Figure 2** could be identified as part of an RNA molecule if sub-unit
A. **B** is a phosphate molecule.
B. **C** is a uracil base.
C. **A** is a deoxyribose sugar.
D. **A** represents a ribose sugar and phosphate molecule combining to form a nucleoside.

Question 8
For life-long immunity to be found in an individual against a particular disease the individual must have
A. been given an injection of immunglobulins against that disease.
B. released histamines in response to antigens that they were given.
C. produced specific antibodies against the antigens associated with the particular disease.
D. produced specific interferons and complement proteins against the antigens associated with the particular disease.

Figure 3 below is a flow chart illustrating an example of homeostasis in action.

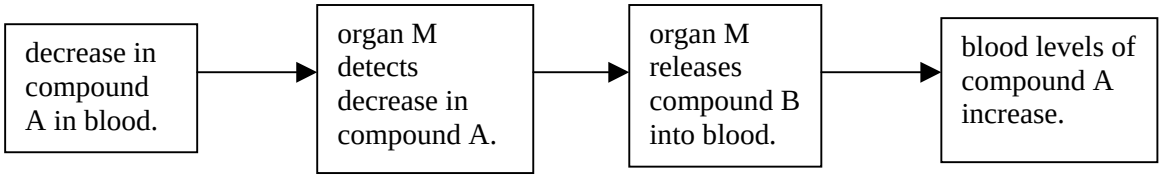

Figure 3

Question 9

From the information above in **Figure 3** one can conclude that

A. the nervous system is involved in this example of homeostasis.
B. neurotransmitters are released in the process that results in an increase in compound A.
C. compound B is most likely a hormone which results in an increase in compound A.
D. feedback mechanisms are not involved in the above example but stimulus-response mechanisms are.

Question 10

The role of the antidiuretic hormone (ADH) in homeostasis is to

A. increase the amount of salt reabsorbed in the kidney tubules.
B. increase the amount of sugar reabsorbed in the kidney tubules.
C. increase the amount of water reabsorbed in the kidney tubules.
D. decrease the amount of salt reabsorbed in the kidney tubules.

Question 11

Which one of the following lists of cells and proteins are all involved in specific immune responses?

A. HelperT-cells, interferons, IgE antibodies and antigens.
B. IgE antibodies, plasma cells, complement and cytotoxic T-cells.
C. Plasma cells, natural killer cells, phagocytes and memory cells.
D. Plasma cells, IgE antibodies, helper T-cells and cytotoxic T-cells.

Question 12

Waste substances produced by metabolic processes have to be constantly removed from cells because

A. waste products causes diffusion to increase across the cell membrane.
B. metabolic processes produce carbon dioxide which decreases the acidity inside the cell.
C. they can alter the internal environment of cells which can then interfere with metabolic processes.
D. waste products prevent the entry of nutrients needed for the cell to function.

Use the following information to answer Question 13 and 14.
The action of particular enzymes converts most of the sugar to starch in corn after it is picked. In order to preserve the sweet taste of corn after it is picked, the corn is immediately put into boiling water and then cooled and packaged.

Question 13
Which one of the following statements best explains why corn will remain sweet after boiling?
A. Boiling destroys starch molecules which results in them being converted to sugar.
B. The enzyme responsible for converting sugar to starch cannot carry out its function.
C. There is not enough substrate present to carry out the proper conversion of starch to sugar.
D. The enzyme responsible for the sweet taste cannot function once the corn has been picked.

Question 14
The organelle responsible for the production of the enzyme that can convert sugar to starch is the
A. golgi body.
B. endoplasmic reticulum.
C. nucleus.
D. ribosome.

Use the following information to answer Questions 15 and 16.
Figure 4 below is a table showing the results submitted by four students who were investigating the concentration of urine produced by 3 animals in their natural environment.

Student	Freshwater fish	Marine or saltwater fish	Terrestrial mammal
A.	**Dilute urine.**	**Concentrated urine.**	**Concentrated urine.**
B.	**Dilute urine.**	**Dilute urine.**	**Concentrated urine.**
C.	**Concentrated urine.**	**Dilute urine.**	**Dilute urine.**
D.	**Concentrated urine.**	**Concentrated urine.**	**Dilute urine.**

Figure 4

Question 15
From the information shown in **Figure 4** above and your own knowledge which student submitted the correct results for the 3 animals studied. Student
A. **A**.
B. **B**.
C. **C**.
D. **D**.

Question 16
Which one of the following combination of processes could have been involved in the production of mammalian urine?

A. Endocytosis, diffusion and osmosis.
B. Active transport, diffusion and exocytosis.
C. Diffusion, active transport and osmosis.
D. Osmosis, diffusion and secretion.

Question 17
Diseases that can be treated most appropriately with antibiotics are those diseases caused by

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

Use the following information to answer Questions 18 and 19.
Figure 5 below is a model that shows an important biological process.

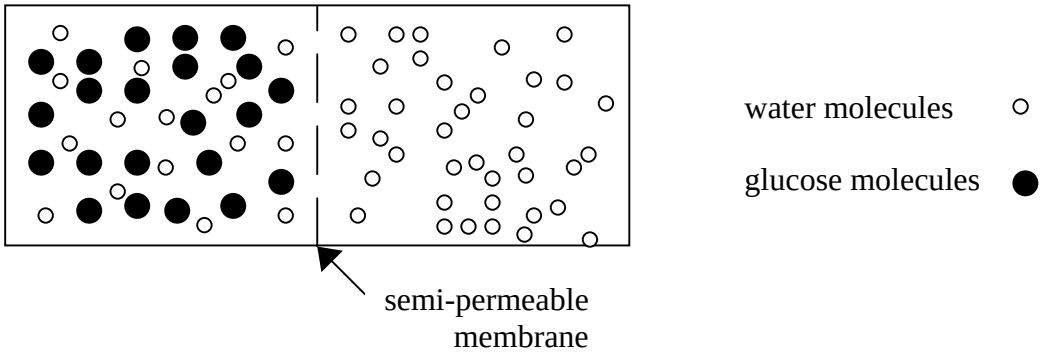

Figure 5

Question 18
Which one of the following statements would correctly predict how this model in **Figure 5** above could operate?

A. Glucose molecules would move by active transport from an area of high concentration to an area of low concentration.
B. Glucose molecules would move by osmosis from an area of high concentration to an area of low concentration.
C. Water molecules would move by osmosis from an area of low solute concentration to an area of high solute concentration.
D. Water molecules would move by diffusion from an area of high solute concentration to an area of low solute concentration.

Question 19
From the information provided in **Figure 5** one can conclude that the solution of water and glucose on the left hand side of the semi-permeable membrane is
A. hypertonic relative to the water on the right hand side of the semi-permeable membrane.
B. hypotonic relative to the water on the right hand side of the semi-permeable membrane.
C. isotonic relative to the water on the right hand side of the semi-permeable membrane.
D. has a low osmotic pressure relative to the water on the right hand side of the semi-permeable membrane.

Question 20
Which one of the following combinations of responses would be appropriate in an endotherm whose core body temperature decreased?
A. Increased urine production and vasoconstriction.
B. Increased sweating and vasodilation.
C. Decrease in metabolic rate and increase in blood flow.
D. Vasoconstriction and shivering.

Question 21
Which one of the following can be regarded as a non specific response to a pathogen?
A. Helper T-cells being activated.
B. B lymphocytes cloning to form plasma cells.
C. Inflammation and phagocyte activity.
D. Cytotoxic T-cells destroying viral infected cells.

Question 22
When an individual is given an injection of a particular serum against a specific disease, the serum contains
A. attenuated cells.
B. plasma cells.
C. antibodies.
D. antidotes.

Question 23
A group of four students were asked to design an experiment to test the effects of pH on enzyme activity. Which one of the four students A, B, C or D most likely had the best design for this experiment?
A. Single variable, small sample, experiment not repeated, and controls.
B. Multiple variables, large sample, experiment repeated, and no controls.
C. Single variable, large sample, experiment repeated, and controls.
D. Multiple variables, small sample, experiment repeated, and controls.

Question 24
In an allergic response, which one of the following triggers the release of histamines?
A. Antihistamines.
B. Antigens.
C. Inflammation.
D. Lymphokines.

Question 25

Drugs given to organ transplant patients are taken by the recipient so that the possibility of the transplanted organ being rejected can be minimized. These drugs work by

A. acting on antigens in the recipients immune system so that antibodies are not produced by B lymphocytes.
B. inhibiting the production of proteins that can repair the transplanted organ in the recipient.
C. suppressing the immune system so that it does not detect antigens on the transplanted organ.
D. increasing the production of antibodies to protect the transplanted organ from foreign antigens.

Short Answer Section

Question 1
The diagram below in **Figure 6** represents a model showing the production of a particular chemical compound.

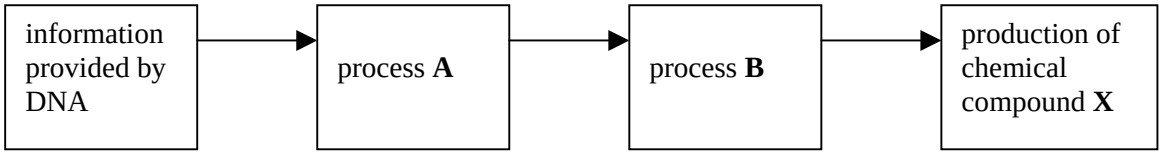

Figure 6

a. Name the process **A** and the monomers used in the production of chemical compound **X**.

Process **A**. – _____

Monomers used in the production of chemical compound **X.** –_____

(1 mark)

b. Briefly explain how the 3-dimensional structure of a protein with one polypeptide chain differs from a protein with two or three polypeptide chains.

_____

_____

_____

_____

_____

_____

(2 marks)

c. How does the structure of RNA molecules differ from DNA molecules?

_____

_____

_____

_____

_____

(2 marks)

d. Name the three principal forms of RNA.

_____

_____

(1 mark)

Total marks = 6 marks

Question 2

Root hair cells of flowering plants are the structures through which water and mineral ions are absorbed. Root hair cells have a large surface area to volume ratio and are quite thin.

a. Why does having a large surface area to volume ratio help root hair cells absorb mineral ions?

_____

_____

_____

(1 mark)

b. Briefly explain how mineral ions that are in a low concentration in the soil can be absorbed into root hair cells that have those same mineral ions at high concentrations inside the root hair cells.

_____

_____

_____

_____

_____

_____

(2 marks)

c. Explain why if the salinity around root hair cells gets too high this can result in some flowering plants dehydrating and dying.

_____

_____

_____

_____

_____

_____

(2 marks)

d. Name the passive process that enables movement across cell membranes with the help of transport proteins.

_____

(1 mark)

Total marks = 6 marks

Question 3
Signal transduction is a series of events that are started by signal molecules and result in a cell producing a particular response.
Figure 7 below is a diagrammatic representation of how signal transduction can take place.

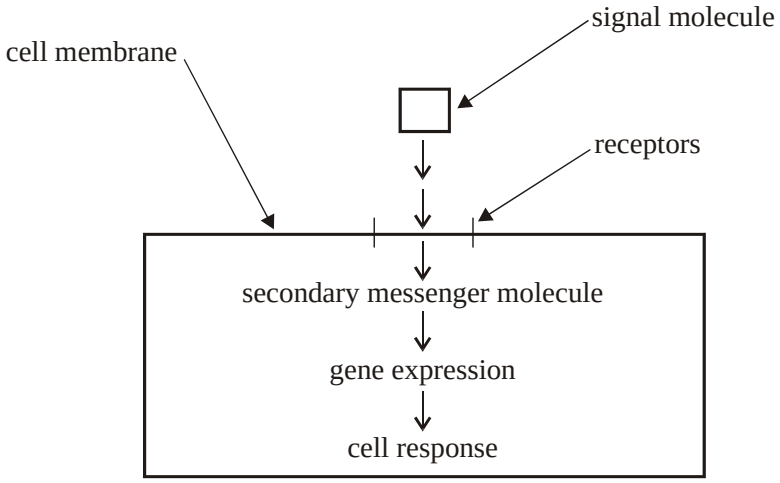

Figure 7

a. Name the chemical compound that acts as a receptor on the surface of a cell membrane for signal molecules.

_____

(1 mark)

b. Explain how water soluble signal molecules and fat soluble signal molecules differ in their interaction with the cell membrane.

_____

_____

_____

_____

_____

_____

(2 marks)

c. Give one example of a water soluble signal molecule and one example of a fat soluble signal molecule.

Water soluble signal molecule – _____

Fat soluble signal molecule – _____

(1 mark)

d. Briefly explain the role of secondary messenger molecules.

_____

_____

_____

(1 mark)

e. Name one example of a secondary messenger molecule.

_____

(1 mark)

Total marks = 6 marks

Question 4

Despite the external environment of mammals constantly changing, the components that make up the internal environment of mammalian cells stays within the tolerance limits that enable cells to function efficiently.

a. What term is used when referring to the maintenance of a constant internal environment of mammals?

_____

(1 mark)

b. Explain the meaning of "internal environment of mammals."

_____

_____

_____

_____

(1 mark)

Both the endocrine and nervous systems play an important role in maintaining the internal environment of mammals fairly constant.

c. Briefly explain how the endocrine and nervous systems are similar in their actions; when regulating and coordinating the various functions that maintain a fairly constant internal environment within mammals.

_____

_____

_____

_____

_____

_____

(2 marks)

d. Name the type of mechanism that is involved when a response results in the original stimulus being reduced.

_____

(1 mark)

e. Briefly explain how a monosynaptic reflex arc operates in the nervous system.

_____

_____

_____

_____

(1 mark)

Total marks = 6 marks

Question 5

a. Define the term pathogen.

_____

_____

(1 mark)

b. Complete the table below using structural features to distinguish between viruses and bacteria.

	Structural features
Viruses	
Bacteria	

(2 marks)

c. Explain how a vaccine given to an individual can result in them having life long immunity.

_____

_____

_____

_____

_____

_____

(2 marks)

d. Name the component that is present in a vaccine but missing in a serum when injections are given against specific pathogens.

_____

(1 mark)

e. Briefly explain how viruses reproduce.

_____

_____

_____

_____

(1 mark)

Total marks = 7 marks

Question 6

Carbon dioxide levels in the blood have to be regulated and kept within a very narrow range in human blood. Carbon dioxide is reasonably soluble in water and will increase the levels of acidity (lowering pH) in blood.

a. What is likely to be the most immediate response in human beings to rises in the acidity of their blood?

_____

(1 mark)

b. Name the control system that is most likely involved in the response in **6a** above.

_____

(1 mark)

c. Explain why it is necessary for mammals to remove metabolic waste products such as carbon dioxide.

_____

_____

_____

_____

_____

_____

(2 marks)

d. Which biochemical process in human cells releases energy but not carbon dioxide?

_____

(1 mark)

e. How does the biochemical process in **6d** differ in plants?

_____

_____

_____

(1 mark)

Total marks = 6 marks

Question 7

The following graph in **Figure 8** below shows the absorption of different wavelengths of light for chlorophyll.

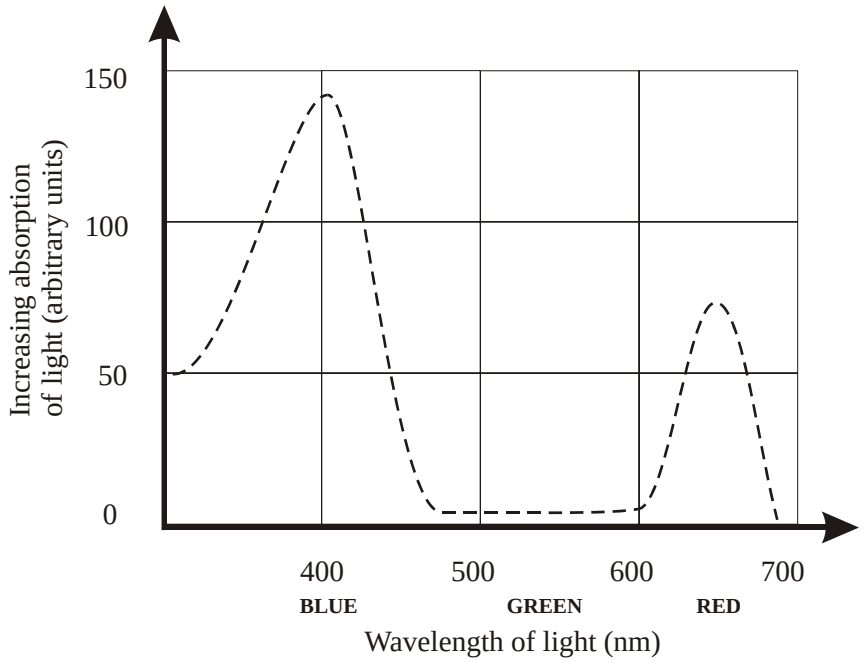

Figure 8

a. Where would one expect to find chlorophyll in a chloroplast?

_____

(1 mark)

b. Which wavelengths of light would you expect to be used during the light dependent stage of photosynthesis?

_____

(1 mark)

c. Write down the balanced chemical equation for photosynthesis.

_____

(1 mark)

d. Explain the role played by chlorophyll in the light dependent reaction.

_____

_____

_____

_____

_____

_____

(2 marks)

e. Explain what happens to the ATP that is produced during the light dependent stage of photosynthesis.

_____

_____

_____

_____

_____

_____

(2 marks)

Total marks = 7 marks

Question 8

Allergies are most likely the result of an over-reaction by the human immune system to a foreign substance or organisms such as mites, nuts, pollen and dairy products. They can be referred to as allergens. In most cases the organisms or substances causing the allergy are harmless.

Figure 9 below shows the sequence of steps that may be involved in an over-reaction by the immune system.

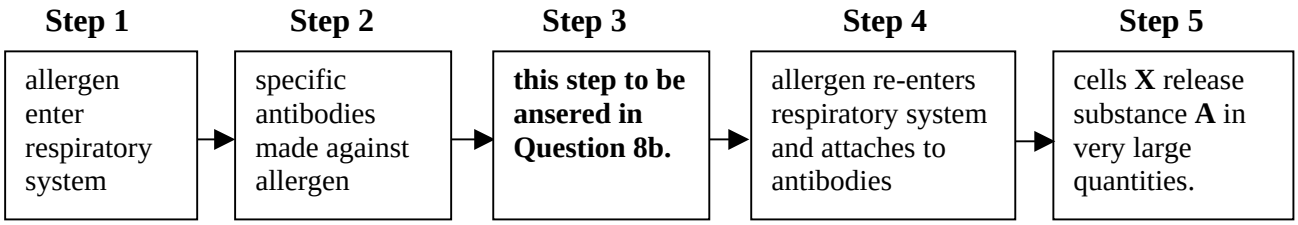

Figure 9

a. Name the organelles that are involved in the production of these antibodies

_____

(1 mark)

b. Explain what most likely happens in **Step 3** of the sequence of events in **Figure 9.**

_____

_____

_____

(1 mark)

c. What is the name of substance **A** that is released in **step 5** of **Figure 9?**

_____

(1 mark)

d. What cells are involved in the production of the specific antibodies against a particular allergen?

_____

(1 mark)

e. Name the specific class or type of antibodies that are made against allergens

_____

(1 mark)

f. What term is used to describe the response by the body when histamines are released after a bee sting or an ant bite that may cause redness and swelling?

_____

(1 mark)

Total marks = 6 marks

End of Trial Exam

Suggested Answers VCE Biology 2008 Year 12 Trial Exam Unit 3

Multiple Choice Section

MULTIPLE CHOICE ANSWERS:

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

SHORT ANSWER SECTION – ANSWERS

Question 1

a. Process **A** – transcription . Monomer used – amino acids. **(1 mark)**

b. Protein molecules with one polypeptide form a 3 – dimensional shape based on three structures; namely the primary, secondary and tertiary structures. **(1 mark)** However, if a protein has more than one polypeptide a fourth structure the quaternary is involved in the protein's 3-dimensional shape. The individual polypeptides associate or interact with each other and form a protein molecule with a specific shape. **(1 mark)**

c. RNA molecules are single stranded, have a ribose sugar and contain the base uracil **(1 mark)**. While DNA molecules are double stranded, have deoxyribose sugar and contain the base thymine. **(1 mark)**

d. Transfer RNA, messenger RNA and ribosomal RNA. **(1 mark)**

Question 2

a. Having a large surface area to volume ratio allows root hair cells to efficiently and quickly absorb the mineral ions by diffusion or active transport. **(1 mark)**

b. When mineral ions that are needed are in low concentrations in the soil but high concentrations inside the root hair cells, the plant uses active transport to move these mineral ions into the root hair cell from the soil. **(1 mark)** Active transport is used since ATP molecules release their energy to move these mineral ions against a concentration gradient, that is from low to high concentrations and into the root hair cells. **(1 mark)**

c. When salinity levels are very high around root hair cells this results in the osmotic pressure surrounding the root hair cells increasing substantially. **(1 mark)** If this osmotic pressure rises to high levels, water will move by osmosis from the root hair cells and into the surrounding soil. As a result the root hair cells will dehydrate. If this process continues there will be too much water loss and the root hair cells will eventually die, and as a result the plant itself will die. **(1 mark)**

d. Facilitated diffusion. **(1 mark)**

Question 3

a. Protein. **(1 mark)**

b. Since the cell membrane is substantially composed of a lipid bilayer, water soluble signal molecules not being lipid soluble cannot easily pass through the membrane, therefore they have their protein receptors located on the outside of the cell membrane. **(1 mark)** However, fat soluble signal molecules being lipid soluble can easily pass through the membrane and therefore have their receptors located within the cytoplasm in the cell, rather than on the outside of the membrane. **(1 mark)**

c. Water soluble signal molecule – insulin; fat soluble signal molecule – progesterone. **(1 mark)** *Any other correct answer would be acceptable*.

d. The role of the secondary messenger molecules is to relay or pass on a signal or message through the cytoplasm after the signal molecule has attached itself to its specific receptor; so that the original signal eventually reaches the nucleus. **(1 mark)**

e. Cyclic AMP. **(1 mark)** *Any other correct answer would be acceptable.*

Question 4

a. Homeostasis. **(1 mark)**

b The internal environment of mammals refers to the components that make up the tissue fluid surrounding and bathing the cells within the mammal's body. **(1 mark)**

c. The actions of the endocrine and nervous systems are similar in that both nerves and hormones are specific in their actions. Motor nerves end in specific areas where the response takes place, and hormones can only act on certain target cells and tissues. **(1 mark)** Also, both the nervous and endocrine systems use chemicals to bring about a response. The endocrine system uses hormones while the nervous system uses neurotransmitters. **(1 mark)**

d. Negative feedback mechanism. **(1 mark)**

e. A monosynaptic reflex arc consists of only two neurones, the sensory and motor. This means that when the sensory neurone is stimulated it synapses directly with a motor neurone in the spinal cord and triggers a response, that is involuntary and cannot be consciously controlled. **(1 mark)**

Question 5

a. A pathogen is an organism that can cause a disease by interfering with the normal functioning of the organism that it has infected. **(1 mark)**

b.

	Structural features
Viruses	They are only made of nucleic acids, either DNA or RNA, which is surrounded by a protein coat.
Bacteria	They can be spherical, rod-like or spiral-shaped cells. The cells consist of a cell membrane, surrounded by a cell wall and inside the cells there are ribosomes but no nucleus.

(2 marks)

c. A vaccine consists of an attenuated pathogen or antigen. When injected into an individual the antigen is detected and different lymphocytes are activated. B-cells are stimulated by helper T-cells to clone into plasma cells which then produce the antibody specifically against the injected antigen. **(1 mark)** T-memory and B- memory cells are also produced in case the same antigen reappears in the future. In this way an individual can be given life-long immunity. **(1 mark)**

d. Antigen. **(1 mark)**

e. A virus can only reproduce inside a living host cell. The virus injects its nucleic acid into the host cell. The host cell then makes many new viral protein coats and many new viral nucleic acids until the host cell ruptures, releasing the new viral particles. These can then infect other host cells and repeat the cycle. **(1 mark)**

Question 6

a. Increased rate and depth of breathing. **(1 mark)**

b. Nervous system. **(1 mark)**

c. Metabolic waste products are the result of biochemical activity and reactions within cells and are not needed by the cells for their functioning. If they are not removed they would accumulate in the cells and also change the surrounding internal environment of the cell. **(1 mark)** Therefore to maintain homeostasis and keep the internal environment at fairly constant levels for optimal cell activity to proceed; waste products are removed by organs such as the kidney and lungs. **(1 mark)**

d. Anaerobic respiration. **(1 mark)**

e. In plants the process differs in that carbon dioxide is produced as well as alcohol. **(1 mark)**

Question 7

a. Grana. **(1 mark)**

b. The blue and red wavelengths or 400nm and 650nm. **(1 mark)**

c. $12H_2O + 6CO_2 \xrightarrow[\text{chlorophyll}]{\text{light}} C_6H_{12}O_6 + 6O_2 + 6H_2O.$ **(1 mark)**

d. When red and /or blue wavelengths of light strike chlorophyll molecules, the chlorophyll's electrons absorb this light energy. This results in these electrons leaving the chlorophyll because of the additional energy they have absorbed. **(1 mark)** Next, the chlorophyll molecules take up electrons from water molecules to replace those electrons that were originally lost. The loss of electrons from water results in the production of oxygen molecules and hydrogen ions. **(1 mark)**

e. The ATP that is produced during the light dependent reaction is transferred into glucose during the light independent reaction of photosynthesis in the stroma. **(1 mark)** In a series of chemical reactions carbon dioxide molecules combine with other organic compounds and the energy required to drive these reactions comes from the ATP produced during the light dependent reaction. The final outcome of these reactions is that the ATP is incorporated into glucose molecules. **(1 mark)**

Question 8

a. Ribosomes. **(1 mark)**

b. After the specific antibodies are made in **step 2** the antibodies become attached to white blood cells called mast cells. **(1 mark)**

c. Histamine. **(1 mark)**

d. Plasma cells. **(1 mark)**

e, Type E antibodies or immunoglobulins, IgE. **(1 mark)**

f. Allergic response. **(1 mark)**

End of Suggested Answers