

SECTION A - Multiple-choice questions

Instructions to students

Use a **PENCIL** for ALL entries. For each question, shade the box which indicates your answer. All answers must be completed like **THIS** example:

A	B	C	☒
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Marks will **NOT** be deducted for incorrect answers. **NO MARK** will be given if more than **ONE** answer is completed for any question. If you make a mistake, **ERASE** this incorrect answer - **DO NOT** cross it out. A correct answer scores 1, an incorrect answer scores 0.

ONE ANSWER PER LINE

USE PENCIL ONLY

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D

6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D

Question 1

Which of the following plant processes is not influenced by gibberellins?

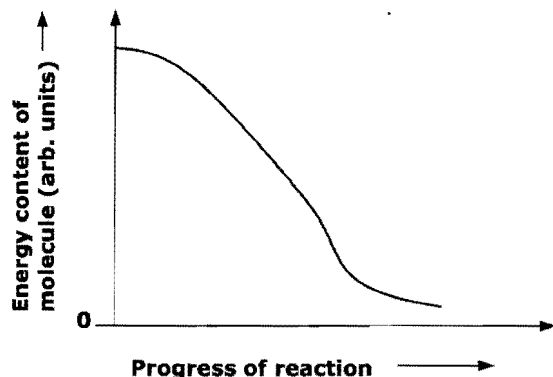
- A. growth
- B. flowering
- C. fruiting
- D. senescence

Question 2

Steroid hormones:

- A. must bind with membrane proteins in order to enter a target cell.
- B. enter target cells by active transport.
- C. may enter a target cell's nucleus.
- D. produce rapid responses in target cells.

The following graph shows the change in energy content of a molecule during a biochemical reaction.



Question 3

The molecule could be:

- A. a molecule of glucose in photosynthesis.
- B. a molecule of glucose in aerobic respiration.
- C. a molecule of glucose in anaerobic fermentation.
- D. an amino acid molecule during protein synthesis.

Question 4

The oxygen released in the process of photosynthesis comes from:

- A. the breakdown of water molecules in the light dependent reactions.
- B. the breakdown of carbon dioxide in the light dependent reactions.
- C. the breakdown of water molecules in the light independent reactions.
- D. the breakdown of carbon dioxide in the light independent reactions.

Question 5

In examining a sample of a nucleic acid taken from a cell, the following sequence of bases was established.

UCACCAUGUCACUCCAGU

This nucleic acid sample could have been:

- A. a DNA sample from a prokaryotic cell.
- B. part of a DNA molecule which codes for a protein.
- C. a segment of RNA which codes for a phospholipid.
- D. an RNA molecule found in the cytoplasm of a eukaryotic cell.

Question 6

Kuru, also called "the laughing death", is a rare disease found only in Papua New Guinea. It is caused by prions. A prion is a pathogenic agent composed of:

- A. DNA.
- B. lipid.
- C. protein.
- D. RNA.

Question 7

A function of all lymph nodes is:

- A. to secrete hormones involved in the immune response.
- B. to initiate the inflammatory response.
- C. to filter the lymph as it flows through lymph vessels.
- D. to clean the blood as it flows through lymph vessels.

Question 8

The order of amino acids in a protein is determined by:

- A. the base sequence in the corresponding section of DNA.
- B. the tRNA in the cytoplasm.
- C. the ribosome.
- D. the golgi body.

Question 9

Protein threads responsible for the formation of secondary clots are composed of:

- A. factor VIII
- B. thrombin
- C. fibrin
- D. fibrinogen

ONE ANSWER PER LINE

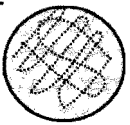
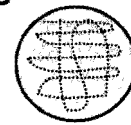
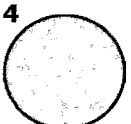
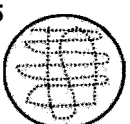
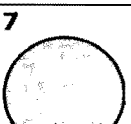
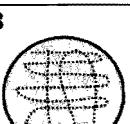
USE PENCIL ONLY

10	A	B	C	D	13	A	B	C	D
11	A	B	C	D	14	A	B	C	D
12	A	B	C	D	15	A	B	C	D

The following information is relevant to questions 10-13

Bacteria often contain small segments of DNA, other than the DNA in their chromosomes. These small DNA molecules are known as plasmids. Plasmids are able to pass from one bacterium to another. Plasmids can carry genes for resistance to antibiotics. They code for the production of proteins which block the action of the antibiotics.

In order to investigate whether resistance to the antibiotics *Ampicillin* and *Bactrim* could be passed between bacteria in this way, bacteria known to be sensitive (not resistant) to both antibiotics were cultured with plasmids extracted from bacteria resistant to both antibiotics. Bacteria from the original cultures and the new culture were then transferred to nutrient agar plates and allowed to grow for several days. The table below shows the agar plates as they appeared after four days.

	Sensitive bacteria	Resistant bacteria	Sensitive bacteria + plasmids
Nutrient Agar only	1 	2 	3 
Agar + Ampicillin	4 	5 	6 
Agar + Bactrim	7 	8 	9 

Question 10

Which of the plates shows evidence that DNA can be taken up by bacterial cells?

- A. Plate 3 only.
- B. Plate 6 only.
- C. Plates 3 and 6.
- D. Plates 6 and 9.

Question 11

Bacteria which are sensitive to *Bactrim* and resistant to *Ampicillin* would be found on:

- A. any of plates 1, 2 or 3.
- B. plate 6 only.
- C. plates 3 or 6.
- D. none of the plates.

Question 12

Which of the following conclusions can you make about the bacteria growing on plate 3?

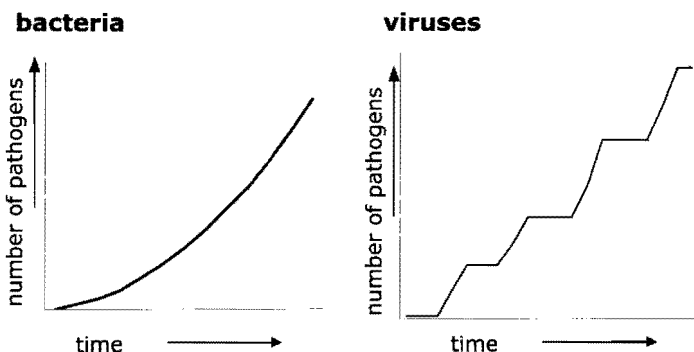
- A. The bacteria have no resistance to the antibiotics *Bactrim* and *Ampicillin*.
- B. Some will be resistant to both *Bactrim* and *Ampicillin*.
- C. Some will be resistant to *Bactrim* but not *Ampicillin*.
- D. Some will be resistant to *Ampicillin* but not *Bactrim*.

Question 13

With respect to the genes which make bacteria resistant to antibiotics, it is reasonable to state that:

- A. The same gene is responsible for resistance to *Bactrim* and *Ampicillin*.
- B. Resistance to *Bactrim* and *Ampicillin* involves at least two genes.
- C. The presence of the same protein will provide resistance to both *Bactrim* and *Ampicillin*.
- D. The genes for resistance to *Bactrim* and *Ampicillin* are found on the same bacterial plasmid.

The following graphs show the number of pathogens in the blood of two individuals suffering from respiratory infections. One is infected with bacteria, the other with a virus.



Question 14

The different growth patterns shown in these graphs could be due to the fact that:

- A. viruses regulate their reproductive rate.
- B. bacteria grow in the intercellular environment whereas viruses multiply within the cell.
- C. viruses mutate faster than the immune system is able to respond.
- D. the immune system takes longer to recognize bacterial infection.

Question 15

Haemophilia is due to the absence of:

- A. fibrinogen.
- B. thrombin.
- C. platelets.
- D. Factor VIII.

SECTION B - Short-answer questions: Instructions to students
Answer this section in pen. Answer all questions in the spaces provided.

Question 1

Enterobius vermicularis is a small, white, thread-like worm between 2 and 13 mm long which lives in the intestines of infected persons. The mature female worm is white, with a blunt head and a fine, hair-like, pointed tail. The male is shorter and is rarely seen, as it remains in the intestine. Adult worms live for up to 6 weeks.

The female worm lays many tiny eggs around the anus, and around the vagina and urethra in girls. This usually happens at night, when the infested person is asleep. When laying the eggs, the female worm also secretes irritant mucus, which causes the person to scratch the itchy area. Eggs then stick under fingernails and on fingertips.

The usual treatment is a single, oral dose of a chemical which kills the adult worms. All household members should be treated at once.

- a. What is the biological term used to describe the relationship the threadworm has with humans?

1 mark

- b. What two features of this threadworm species enhance its survival?

2 marks

- c. Why is reinfestation common with this worm?

1 mark

- d. What could be done to prevent reinfestation with the threadworm?

2 marks

- e. Why should all household members be treated together?

1 mark

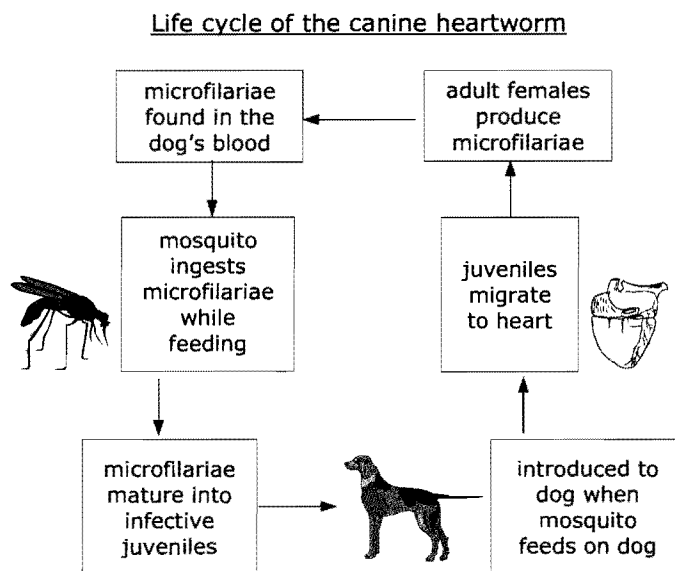
- f. Show a likely pathway for the transmission of threadworms in children.

1 mark

Total 8 marks

Question 2

Dirofilaria immitis is a roundworm found in the heart and large adjacent vessels of infected dogs. One dog may have as many as 300 worms. The female worm is 2.3 to 5.5 cm long and 5 mm wide; the male is about half the size of the female. The life cycle of the heartworm is shown below.



- a. i. Which organism is the primary host?

- ii. Explain your answer.

1 + 1 = 2 marks

- b. Which organism is the vector?

1 mark

- c. What materials of the dog would the heartworm be using?

1 mark

- d. Name two adaptations you expect to find in an adult heartworm to aid its survival as a parasite in the heart.

2 marks

- e. More dogs are infected with the microfilariae during the summer months. Explain this observation.

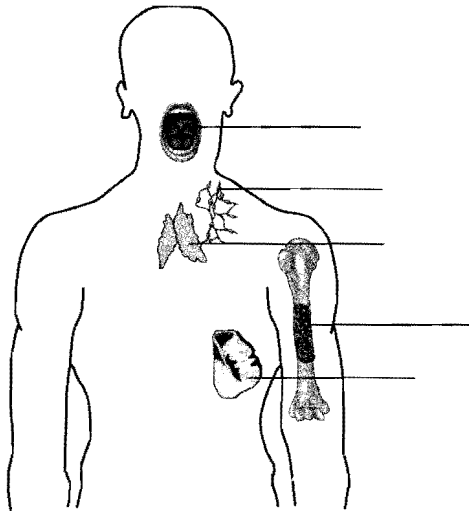
1 mark

f. What is a likely symptom of heartworm infestation?

1 mark
Total 8 marks

Question 3

Location of various lymphoid organs/tissues



a. Using the names provided, label the above diagram of the lymphoid tissues of the body.
bone marrow, thymus, tonsils, spleen, lymph nodes
5 marks

b. What are 2 functions of the lymphoid tissues?

2 marks

c. When would you expect the lymph nodes to be enlarged?

1 mark

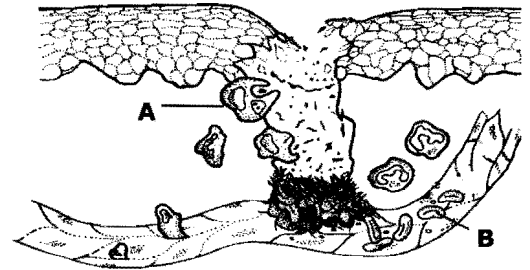
d. As lymph flows through these organs, some foreign matter is removed from it. What is responsible for this removal?

1 mark
Total 9 marks

Question 4

The following diagram illustrates some of the body's responses to the entry of a foreign object.

The body's response to a foreign object such as a splinter



When you get a splinter in your finger as seen in the diagram above, the body responds to the foreign object in a number of ways.

a. What part of the body's defense system responds quickly to the entry of a foreign object?

1 mark

b. Identify the cells labeled A and B.

i. Cell A

ii. Cell B

1 + 1 = 2 marks

c. i. After a short time the area becomes swollen. Explain why the area becomes swollen.

ii. After a period of time the swelling disappears. How does the body remove the excess fluid from the affected area?

2 + 1 = 3 marks

d. Name two other symptoms you would expect to see in the affected area. For each explain why that symptom would be present.

Symptom 1: _____

Reason: _____

2 marks

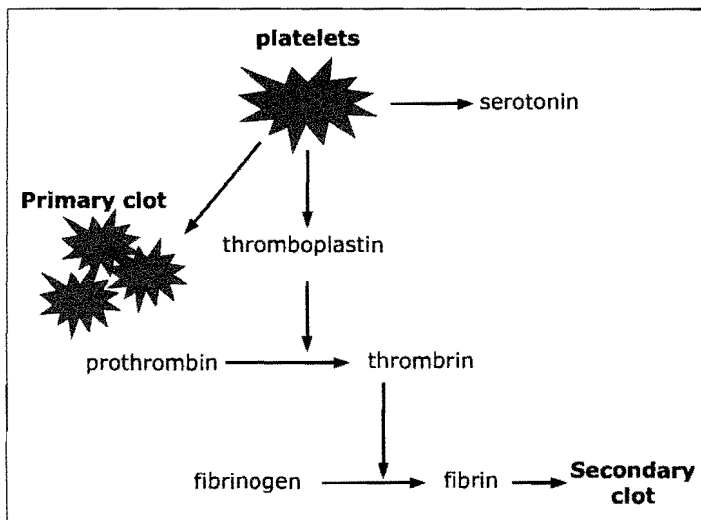
Symptom 2: _____

Reason: _____

2 marks
Total 10 marks

Question 5

The diagram below summarises the formation of a blood clot following an injury.



a. What is the purpose of the primary clot?

1 mark

b. Why is the clotting reaction called a cascade of reactions?

1 mark

c. Some patients suffer from a condition where clots are formed in intact blood vessels. What is a likely cause of this?

1 mark

d. What treatment could be given to the patient to limit clot formation?

1 mark

e. What would be one of the problems with this treatment?

1 mark

Total 5 marks

SECTION A - Multiple-choice questions

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5	A	B	C	D
6	A	B	C	D

Question 1

A basic difference between animal and plant cells is that animal cells do *not* have:

- A. a cell membrane.
- B. ribosomes.
- C. a cell wall.
- D. vacuoles.

Question 2

Hydatid disease is caused by an adult tapeworm found in the small intestine of the dog. A feature of the tapeworm that is likely to assist its survival is:

- A. the production of pheromones that assist with finding a mate.
- B. a multi-organ digestive system.
- C. well-developed light sensitive tissue.
- D. the ability of the adult to produce eggs and sperm.

Measles is an infectious disease caused by a virus. Symptoms usually appear 6-10 days after exposure to the virus and include a rash, headache and fever. In a proportion of cases the patient is affected by secondary bacterial infections, especially of the lungs. Antibiotics are often prescribed.

Question 3

Antibiotics are likely to:

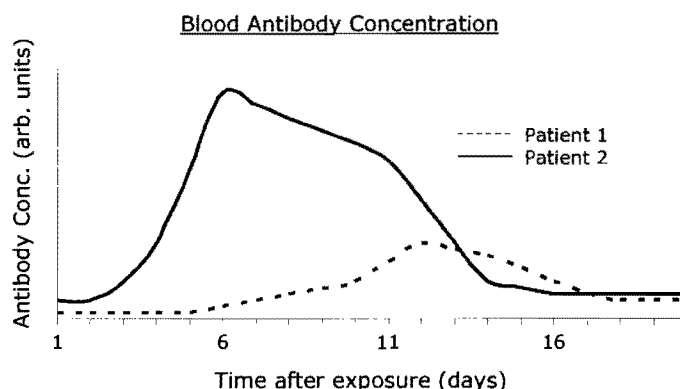
- A. decrease the rate of DNA synthesis by the measles virus.
- B. reduce fever by resetting the body's thermostat.
- C. disrupt the synthesis of new bacterial cell components.
- D. all of the above.

Question 4

When suffering from measles and a secondary bacterial lung infection, antibodies are produced by a patient's immune cells. Which of the following statements is true of these antibodies?

- A. The same antibody is capable of attacking measles viruses and the bacteria infecting the lung.
- B. The antibodies which attack the virus are produced by helper T-cells, whereas the antibodies which attack the bacteria are produced by B-cells.
- C. Virus antibodies and bacteria antibodies are produced in the same plasma cells.
- D. Large quantities of antibodies specific to the measles virus remain in the circulation for a short time.

The following graph shows the amount of circulating antibody in two patients exposed to the measles virus at the same time.



Question 5

On the basis of this information it is reasonable to conclude that:

- A. Patient 2 had been immunized against measles whereas Patient 1 had not.
- B. Patient 2 will suffer from measles for a shorter time than Patient 1.
- C. On day 12, Patient 1 had more circulating antibody than Patient 2.
- D. Patient 1 is likely to suffer from measles in the future.

Question 6

As part of the body's specific immune response, human cells infected by viruses may be killed by:

- A. antibodies.
- B. helper T-cells.
- C. complement proteins.
- D. cytotoxic T-cells.

ONE ANSWER PER LINE

USE PENCIL ONLY

7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D

12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D

Question 7

Long term immunity may be provided by:

- A. an injection of antivenin following a spider bite.
- B. ingestion of antibodies in breast milk.
- C. vaccination with a solution containing killed viruses.
- D. antibodies which cross the placenta during foetal development.

Question 8

Lymphocytes:

- A. are responsible for cell mediated immunity but not humoral immunity.
- B. develop in the thymus.
- C. circulate in the blood but not the lymph.
- D. develop from bone marrow cells.

Question 9

Diseases which occur when the body fails to distinguish self from non-self antigens are known as:

- A. hypersensitivities.
- B. allergies.
- C. auto-immune.
- D. tissue rejection.

Question 10

When a person reacts to environmental antigens such as dust, pollens or food constituents, it is said that they have a:

- A. response.
- B. condition.
- C. disease.
- D. hypersensitivity.

Question 11

An allergic reaction occurs as an over-reaction to a common environmental antigen. This reaction is induced by the release of:

- A. cortisol.
- B. histamine.
- C. phagocytes.
- D. complement.

Question 12

One form of diabetes is thought to be the result of an autoimmune disease, where antibodies produced attack and destroy the insulin producing cells in the pancreas. Which of the following best explains the events leading to this form of diabetes?

- A. Microbes, with antigens close in structure to pancreatic proteins, cause the body to produce antibodies which also attack the pancreas.
- B. Antibodies formed as a result of infection change, and are then able to attack the pancreas.
- C. Antibodies are produced which are able to bind to two different types of antigen.
- D. The insulin producing cells are infected by a pathogen and antibodies are made against the cells.

Question 13

A five-year old child in a family was diagnosed as having severe peanut allergy when he had a strong allergic reaction on his first ingestion of peanuts. The best explanation for the allergic response is:

- A. The child had already eaten some hazel nut products and developed antibodies.
- B. The child received the antibodies to the peanut allergen from his mother during breast feeding.
- C. The child developed antibodies to the peanut protein when the mother ate peanuts while breastfeeding him.
- D. The antibodies developed in response to another allergen happened to also react with the peanut allergen.

Question 14

Non-specific defences in mammals includes

- A. the mucus lining in the respiratory tract.
- B. the production of memory cells.
- C. attachment of cytotoxic T cells to infected cells.
- D. the production of antibody molecules by plasma cells.

Question 15

An enzyme that has been denatured:

- A. has the same shape as before.
- B. has the same amino acid sequence as before.
- C. will only function if the temperature is increased.
- D. has fewer amino acids than before.

Question 16

Which of the following is the neurotransmitter which acts at the connection between a neuron and a muscle cell?

- A. acetylcholine.
- B. pyruvate.
- C. serotonin.
- D. glycoprotein.

17 A B C D

18 A B C D

Question 17

Diarrhea is a common symptom of infection in the intestine. Intestines may be infected by viruses, bacteria or protozoa such as *Giardia* or *Amoeba*. Which of the following sets of test results would support a diagnosis of viral infection?

Organisms observed in faeces.		Blood test results
A. No organisms observed		Elevated T and B lymphocytes.
B. Organisms of diameter 0.8 mm.		Elevated T and B lymphocytes.
C. Organisms of diameter 0.8 mm		Elevated B lymphocytes.
D. Organisms of diameter 10 mm		Elevated B lymphocytes.

Question 18

All lymphocytes are originally derived from precursor cells found in:

- A.** the thymus.
- B.** the spleen.
- C.** the lymph nodes.
- D.** the bone marrow.

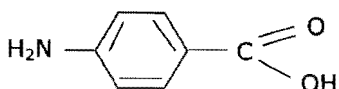
SECTION B - Short-answer questions: Instructions to students
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Question 1

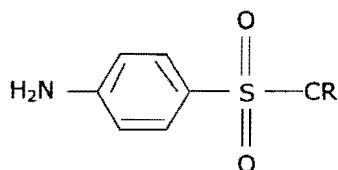
Folic acid is a nutrient essential for cell growth. Animals obtain folic acid from their diets. Bacteria must synthesize folic acid from a precursor called PABA (para-aminobenzoic acid). The synthesis of folic acid from PABA relies on an **enzyme, present only in bacterial cells**.

Bacterial infections can be treated with antibiotics known as sulfonamides. They prevent the production of folic acid by bacterial cells. The following diagrams show the structures of PABA and of sulfonamides.

PABA



Sulphonamide



- a. What is the mechanism by which sulfonamides prevent the synthesis of folic acid in bacterial cells?

1 mark

- b. What information in the above paragraph and diagrams supports your answer to a. above?

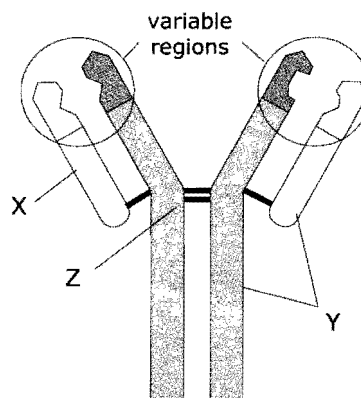
2 marks

- c. Why are sulfonamides safe for humans but fatal for bacteria?

2 marks
Total 5 marks

Question 2

The following diagram represents an antibody.



- a. Name the labeled parts of the antibody.

- i. X _____
 ii. Y _____
 iii. Z _____

1 + 1 + 1 = 3 marks

- b. i. What is the function of the regions labeled "variable regions"?

- ii. What is the significance of the fact that these regions are variable?

1 + 1 = 2 marks

- c. Explain two ways in which antibodies contribute to the removal of pathogens.

2 marks
Total 7 marks

Question 3

Meningococcal disease is caused by the bacterium *Neisseria meningitides*. *N. meningitides* are found in the throat and nasal passages of about 10% of the population. These carriers of *N. meningitides* suffer no disease symptoms. In susceptible individuals however, the bacteria can pass into the bloodstream and cause disease. The disease may take the form of:

- Meningitis (an infection of the membranes covering the brain and spinal cord)
- Septicaemia (a blood infection)

There are many strains of meningococci, but the strains that cause almost all disease in Victoria are called serogroup B and serogroup C.

a. i. Is the organism *N. meningitides* prokaryotic or eukaryotic?

ii. Name 2 features which distinguish prokaryotic from eukaryotic cells.

1 + 2 = 3 marks

b. Meningococcal infection is treated with antibiotics. What are two ways in which antibiotics can act to eradicate bacterial infection?

2 marks

Children and young adults are now routinely vaccinated against one strain of *N. meningitides*. Meningococcal C vaccine is effective in providing protection against bacteria of serogroup C. An effective vaccine against serogroup B has not yet been produced. In serogroup B bacteria, the key polysaccharide is identical to polysaccharides found in the body and so is recognized as self by the body's immune system.

c. i. What term is used to describe molecules such as polysaccharides identified by the immune system?

ii. What property of cells enables the body to distinguish self from non-self?

1 + 1 = 2 marks

d. i. Outline the response of B lymphocytes to the meningococcal C vaccine.

ii. Explain 2 ways in which routine immunization for meningococcal C may cause a decrease in the incidence of the disease in Victoria.

2 + 2 = 4 marks

e. Why is the meningococcal C vaccine unable to provide protection against other strains of meningococcal bacteria?

1 marks
Total 12 marks

Question 4

The defence barriers erected by plants are a co-ordinated system of molecular, cellular and tissue-based responses to pathogen attack. Protection from a pathogen's initial invasion is achieved via passive defences, such as physical and/or chemical barriers

a. Why do plants need a defence system?

1 mark

b. Name two physical barriers, which protect the plant from invasion.

2 marks

c. Name, and outline the action of two chemical barriers, which protect the plant from invasion.

2 marks

d. When would the cellular and tissue-based responses to pathogen attack be activated?

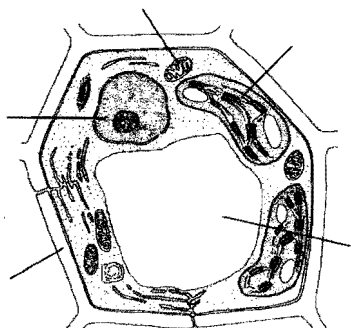
1 mark

e. Explain one other response that plants can use to limit damage after pathogenic invasion.

1 mark

Total 7 marks

Question 5



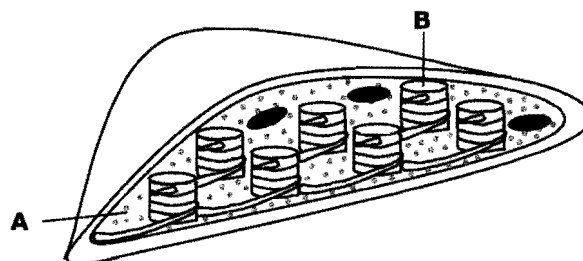
a. Label the structures marked on the diagram.

2 marks

b. What type of plant tissue is this cell taken from?

1 mark

The following diagram is of a chloroplast from a plant cell. The internal structures are labelled.



c. i. What name is given to fluid region A in a chloroplast?

ii. What name is given to the membrane structure B in a chloroplast?

iii. What occurs on structure B?

1 + 1 + 1 = 3 marks

In a series of experiments, the leaf structure of two plant groups was compared.

Feature	Plant 1	Plant 2
Thickness of leaves	Very thin	Thicker
Number of chloroplasts per cell	12	5
Density of chlorophyll	3	1

d. i. Which of the plants is most likely to be found in low light intensity environments?

ii. Explain your answer to d. i. above.

1 + 2 = 3 marks

Total 9 marks

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5	A	B	C	D

6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D

Question 1

Which of the following activities is not found in all living cells?

- A. movement.
- B. aerobic respiration.
- C. growth.
- D. synthesis.

Question 2

Which statement best describes the relationship between cells, DNA and protein?

- A. Cells are linked together by proteins to make different kinds of DNA molecules.
- B. DNA is composed of proteins that carry coded information for how cells function.
- C. Proteins are used to produce cells that link amino acids together into DNA.
- D. Cells contain DNA that controls the production of protein.

Question 3

Which of the following groups of molecules consists only of proteins?

- A. albumin, collagen, glucose.
- B. keratin, protease, glycerol.
- C. insulin, amylase, gibberellin.
- D. RNA, collagen, testosterone.

Question 4

Proteins are made in the:

- A. mitochondria.
- B. nucleus.
- C. golgi apparatus.
- D. ribosomes.

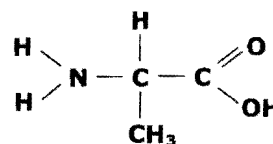
Question 5

Essential amino acids are amino acids that:

- A. must be added as a supplement to vegetarian diets.
- B. are synthesised in the body.
- C. must be obtained from the food eaten.
- D. are essential for body processes.

Question 6

The following diagram represents the amino acid alanine.



Amino acids contain four chemical groups connected to a central carbon atom. Which of the following atoms or groups of atoms is not connected to the central carbon in **all** amino acids?

- A. NH_2
- B. COOH
- C. CH_3
- D. H

Question 7

Where does transcription take place in the cell?

- A. The cytosol /cytoplasm
- B. The plasma membrane
- C. The ribosomes
- D. The nucleus

Question 8

Molecules which act as catalysts in biological systems are known as:

- A. substrates.
- B. enzymes.
- C. catalase.
- D. antigens.

Question 9

The three-dimensional structure of a protein:

- A. is determined by its sequence of amino acids.
- B. varies depending on the interaction of the protein molecule with other molecules.
- C. is irrelevant to the function of the protein molecule.
- D. is determined by the active site.

ONE ANSWER PER LINE					USE PENCIL ONLY				
10	A	B	C	D	15	A	B	C	D
11	A	B	C	D	16	A	B	C	D
12	A	B	C	D	17	A	B	C	D
13	A	B	C	D	18	A	B	C	D
14	A	B	C	D	19	A	B	C	D

Question 10

A host is known as an intermediate host when:

- A. parasites reproduce asexually there.
- B. parasites reproduce sexually there.
- C. parasites do no damage there.
- D. parasites are at the larval stage of development.

Question 11

In the formation of a clot, the event transforming blood into a solid gel around an original platelet plug is:

- A. the conversion of Factor VIII to Factor IX.
- B. the conversion of fibrinogen to fibrin.
- C. the accumulation of the white blood cells.
- D. the action of plasma proteins adhering to capillaries.

Question 12

A parasite is an organism that:

- A. exploits another organism.
- B. causes disease.
- C. needs two hosts for its life cycle.
- D. does no harm to its host.

Question 13

In humans, specific immune responses include:

- A. production of antibodies by plasma cells.
- B. production of histamine by mast cells.
- C. phagocytosis by monocytes.
- D. lysing of bacterial cell walls by complement proteins.

Question 14

Which of the following types of leukocytes are responsible for part of the body's specific immune response?

- A. monocytes.
- B. helper T-cells.
- C. mast cells.
- D. phagocytes.

Question 15

Which of the following roles best describes the function of cytotoxic T-cells?

- A. They produce antibodies which circulate and bind with foreign antigens.
- B. They are key cells in the body's cellular immune response.
- C. They are important in the inflammatory response.
- D. They are required to activate B-cells.

Question 16

Which of the following **is not** a function of protein molecules found in the membranes of cells?

- A. They act as channels for the transport of lipid soluble molecules.
- B. They act as receptor sites for some signaling molecules.
- C. They facilitate the diffusion of charged particles.
- D. They are the site of active uptake of glucose molecules.

Question 17

A chemical messenger, produced in one organism, which affects the function of another organism is known as:

- A. a hormone.
- B. a pheromone.
- C. a neurotransmitter.
- D. a stimulant.

Question 18

Which of the following acts as a chemical barrier to the entry of pathogens into body tissues?

- A. hydrochloric acid in the stomach.
- B. histamine produced by mast cells.
- C. complement proteins in the blood.
- D. interferon produced by virus-infected cells.

Question 19

Long term immunity may be conveyed by:

- A. injection of antivenin following a snake bite.
- B. the ingestion of antibodies in breast milk.
- C. infection by a living pathogen.
- D. injection of an antitoxin to treat bacterial infection.

ONE ANSWER PER LINE

USE PENCIL ONLY

20 A B C D

21 A B C D

22 A B C D

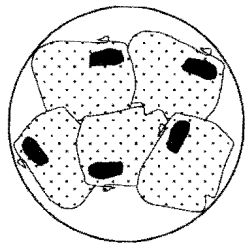
23 A B C D

24 A B C D

25 A B C D

26 A B C D

The following drawing of a group of cells was made by a student using a light microscope. The diameter of the field of view was 40 μm .

**Question 20**

The approximate diameter of the cells he drew is:

- A. 40 μm .
- B. 120 μm .
- C. 15 μm .
- D. 4 μm .

Question 21

The aerobic pathways involved in ATP production:

- A. produce ATP without oxygen.
- B. occur in the cytoplasm of the cell.
- C. produce ATP without glucose.
- D. produce more ATP than anaerobic pathways.

Question 22

Features of the nervous system in a mammal include:

- A. myelinated nerve fibres which assist with the transfer of neurotransmitters.
- B. dendrites which synapse with the next dendrite in the nervous pathway.
- C. nerve cells which may stimulate a muscle, gland or another nerve.
- D. neurotransmitter being stored in vesicles in the dendrite.

Question 23

The part of the human central nervous system that conducts messages within the brain is the:

- A. sensory neurons.
- B. interneurons.
- C. motor neurons.
- D. peripheral neurons.

Question 24

Which of the following molecules is **not** a neurotransmitter?

- A. acetylcholine
- B. gibberellin
- C. serotonin
- D. dopamine

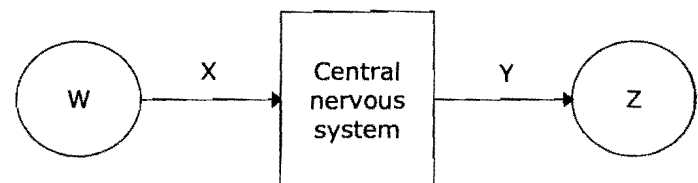
Question 25

The sequence of events, which is initiated by a painful stimulus to the toe, leads to removal of the foot from the source of injury. This withdrawal reflex has which of the following features?

- A. The withdrawal reflex is designed to prevent infection from the object causing the stimulus.
- B. The withdrawal occurs after the message is conveyed to the brain and back to the foot.
- C. The withdrawal reflex is brought about by only one nerve.
- D. The message of pain reaches the brain after the foot has been withdrawn.

Question 26

The following diagram shows the nerves involved in feeling a cold object and then removing the hand from it. The arrows indicate the direction of travel of the message.



In the diagram,

- A. structure W is a sensory nerve and structure Y is an interneurone.
- B. structure W is a receptor and structure Y is a motor nerve.
- C. structure X is a motor nerve and structure Y is an effector.
- D. structure Y is a motor nerve and structure Z is receptor.

SECTION B - Short-answer questions: Instructions to students
Answer this section in pen. Answer all questions in the spaces provided.

Question 1

African Sleeping Sickness, or Trypanosomiasis, is a disease caused by a protozoan microorganism of the genus *Trypanosoma*. The disease is transmitted by the tsetse fly and hence occurs only in tropical regions where these flies breed. The *Trypanosomas* also infect domestic cattle.

The disease passes through three phases in infected people. Initially there is localised pain, inflammation and itching at the site of the infection, followed by systemic infection causing fever, chills, fluid buildup and enlarged lymph glands. Finally the organism invades the brain and spinal cord, causing sleepiness, coma and, if untreated, death. It may take several years for the disease to reach this final phase.

- a. What name is given to an organism which carries a parasite between hosts?**

1 mark

- b.** What process is responsible for the initial localised reaction to infection by *Trypanosoma*?

1 mark

Trypanosomas avoids complete destruction by the host's immune system by antigenic variation. At present there are no vaccines to protect against infection by *Trypanosomas*.

- c. i.** How does antigenic variation enable the parasite to survive?

[illegible]

- ii. Suggest why attempts to develop a vaccine have been unsuccessful?**

[illegible]

- iii. Suggest another possible means to control the spread of Trypanosomiasis.

.....

2 + 1 + 1 = 4 marks

Like Trypanosomiasis, many other diseases transmitted by insects are mild in their initial effects, often taking years to reach a fatal phase of the disease. Where the transmission of a disease is more direct the progress of the disease is usually more rapid (see table below).

Mode of Transmission	Example	Time taken for the disease to reach its most serious stage.
Airborne	Cold, flu	Several days to weeks
Direct Transmission	Gonorrhea	Several weeks to months
Insect Transmission	Trypanosomias	Months to years

- d.** What advantage is there for disease organisms carried by insects to take several months to years to produce life threatening symptoms in the hosts?

1 mark

Total 7 marks

Question 2

Complement proteins are a group of 20 proteins present in body fluids. They may be activated to fight infection by the presence of the pathogen itself or when antigens and antibodies combine. Activated complement molecules may disrupt the cell wall of pathogens or coat pathogens making them easier for phagocytes to ingest. They also attract leukocytes to the site of infection and stimulate the release of histamine.

- a. What part of the pathogen does the body detect?**

1 mark

- b. What part of the immune system is being used when complement is activated?**

1 mark

1 mark

- c. Where are the complement proteins found in the body?

1 mark

- d.** What two changes would be observed in tissue exhibiting the effect of complement?

2 marks

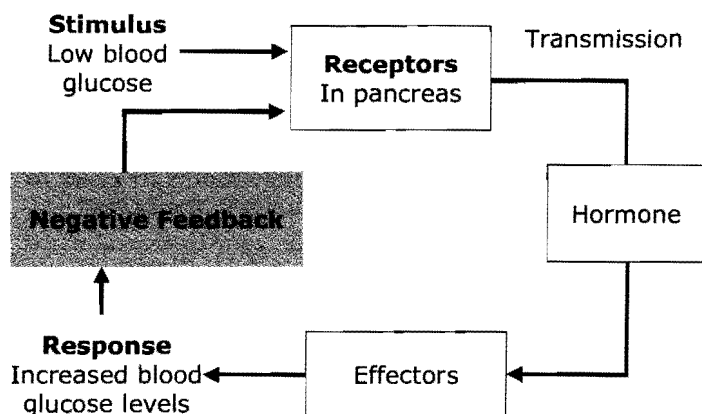
Total 5 marks

Question 3

Control of blood glucose levels is achieved by the action of two hormones: insulin and glucagon.

- Insulin acts to lower blood glucose levels by stimulating all cells to take up glucose from the blood, and by stimulating the cells of the liver and skeletal muscles to convert glucose to glycogen.
- Glucagon acts to raise blood glucose levels by stimulating liver and muscle cells to break down glycogen and release glucose into the circulation.

The action of one of these hormones is summarized in the diagram below.



a. i. Which hormone is represented in this diagram?

ii. What are the effectors for the action of this hormone?

iii. The diagram shows the operation of negative feedback in this example of hormonal regulation. Outline the importance of negative feedback in the regulation of blood glucose levels.

1 + 1 + 2 = 4 marks

Insulin is composed of two polypeptide chains: an A chain of 21 amino acid residues and a B chain of 30 amino acid residues, linked by two inter-chain (disulphide) bonds.

The sequences of human and cow insulin differ solely at amino acid residue B30, which is threonine in human insulin and alanine in bovine insulin. Insulin exerts its biological effects by binding to another protein, the insulin receptor.

b. Would you expect the human and cow insulin to be the same, similar or different?

1 mark

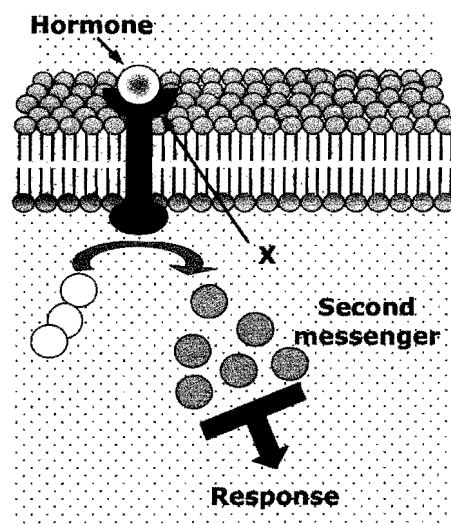
c. Explain your answer to b. above.

1 mark

d. What factors are likely to govern whether cow insulin would be biologically active in humans?

1 mark

The following diagram represents the action of insulin on a human cell.



e. i. What is the name given to structure X?

ii. Explain on what type of body cells would you expect to find structure X?

iii. On the above diagram label, the cytoplasm and the extracellular fluid.

1 + 1 + 1 = 3 marks

- f. The diagram shows molecules labeled second messenger. Explain the importance of second messengers in hormonal regulation.

2 marks
Total 12 marks

Question 4

A biologist carried out a series of experiments to investigate the rate of anaerobic respiration in yeast cells under different conditions. The reactions of fermentation are catalysed by about 12 different enzymes. In addition to these enzymes, yeasts also contain the enzyme *invertase* which converts sucrose, into glucose and fructose, which can then be used in fermentation. Four flasks were set up with the following contents and conditions.

Flask Number	Contents of Flask	Temperature	pH
1	100 ml sucrose solution, 0.5 g yeast	38 C	7
2	100 ml sucrose solution, 0.5 g yeast	38 C	4
3	100 ml sucrose solution, 0.5 g yeast	15 C	7
4	100 ml sucrose solution, 0.5 g yeast	75 C	7

The rate of fermentation was measured by recording the volume of gas given off from each flask.

- a. What two variables are being investigated in this series of experiments?

1 mark

- b. Explain what gas is being produced in this set of experiments?

1 mark

The volume of gas produced was recorded at 10 minute intervals over the course of an hour. The results are shown below.

Time in Minutes	Flask 1 (ml)	Flask 2 (ml)	Flask 3 (ml)	Flask 4 (ml)
0	0	0	0	0
10	0.5	0	0.1	0.1
20	1.1	0	0.3	0.1
30	3.8	0	0.8	0.1
40	5.6	0	1.1	0.1
50	6.0	0	1.5	0.1
60	6.0	0	1.7	0.1

- c. On the basis of these results, what conditions were most favourable for fermentation?

1 mark

- d. How could you explain the lack of any gas production in flask 2?

1 mark

- e. i. Describe the effect of temperature on the rate of fermentation.

- ii. Outline an explanation to account for the differences in fermentation rates in Flasks 1, 3 and 4.

1 + 2 = 3 marks

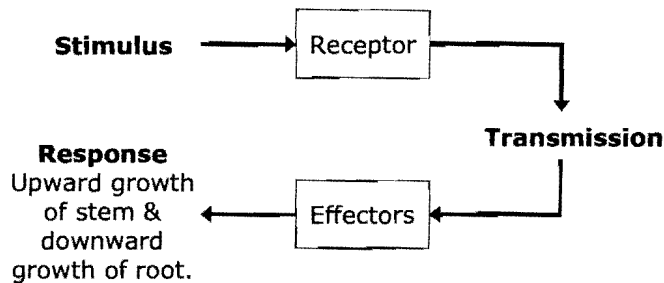
The experiment was repeated using disaccharides other than sucrose. Lactose (glucose + galactose) and maltose (glucose + glucose) were used. These were placed in separate flasks with 0.5 grams of yeast as in the initial experiment. Both flasks were adjusted to a pH of 7 and kept at 38 C. To the experimenter's surprise no fermentation occurred in these flasks.

- f. Give two possible explanations to account for the lack of fermentation in these flasks.

2 marks
Total 9 marks

Question 5

When seeds germinate, the shoots of the young plants grow upwards and the roots grow downwards. The bending of the shoot and root tissue is due to the action of the plant hormone auxin. This response can be understood in terms of a stimulus-response model.



- a. In terms of the above model, what is the stimulus for the downward growth of the young root?

1 mark

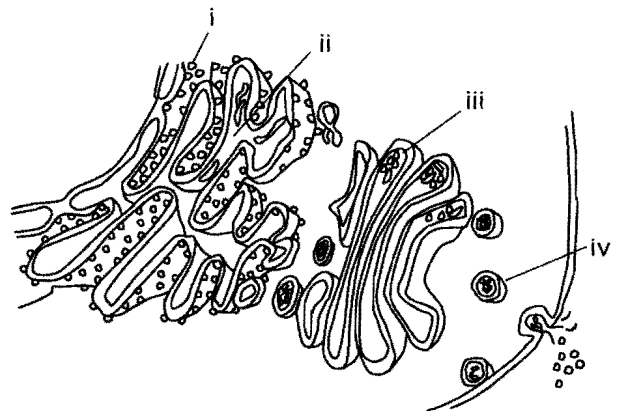
- b. i. What effect does auxin have on plant cells?

- ii. In a labeled sketch, show how auxin may cause the upward bending of a young shoot.

1 + 2 = 3 marks
Total 4 marks

Question 6

The pathway that leads to the release of protein from a secretory cell is shown in the following diagram.



- a. What name is given to this process by which protein is released from the cell?

1 mark

- b. Name the organelles in the diagram above which are involved in production and transport of the material to be exported in this process.

- i. _____
ii. _____
iii. _____
iv. _____

2 marks

- c. Large quantities of the protein to be secreted can be stored in the cell until needed for secretion. What is the advantage of this storage?

1 mark

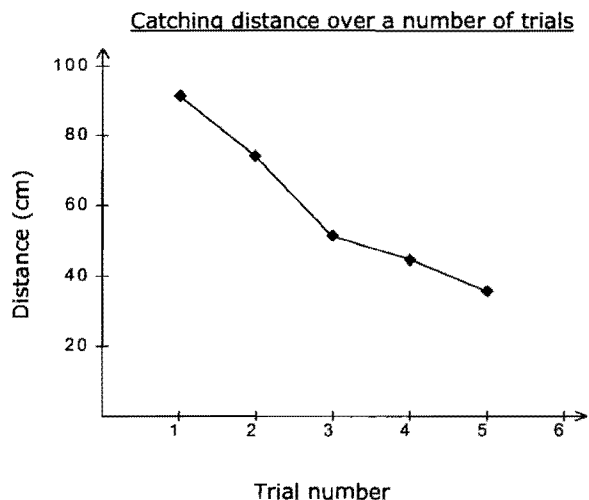
- d. What cellular event would cause the secretion of the protein?

1 mark

Total 4 marks

Question 7

An activity was performed to measure the reaction time of a student. To do this, one student held the zero end of a one-metre ruler between the thumb and forefinger of another student. The ruler was dropped and the distance the ruler dropped before the student caught the ruler was measured. The results are displayed in the following graph.



- a. State the relationship between the number of trials and the distance the ruler dropped.

1 mark

- b. Explain which of the body's control systems is involved in the catching of the ruler by the student?

1 mark

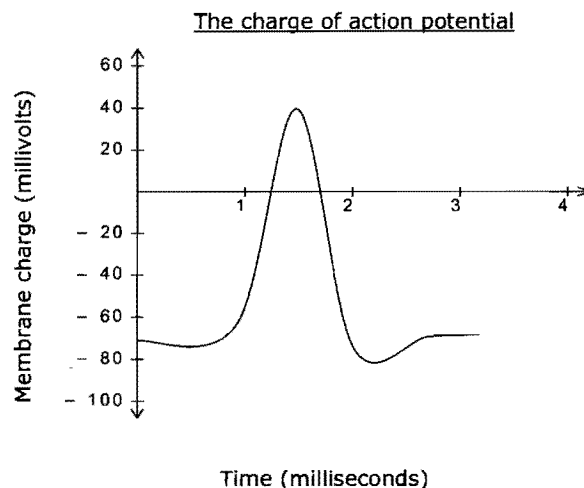
Hormones and the nervous system are both used for communication within the body.

- c. i. State one advantage of a hormonal message.

- ii. State one advantage of a nervous message.

1 + 1 = 2 marks

A series of action potentials is used to transmit a message along a nerve fibre. The charge inside the cell membrane of a nerve cell can be measured, as an action potential passes a point on the nerve. A graph of this is shown below.



- d. What happens to the charge across the membrane as the action potential travels down the nerve?

1 mark

- e. Explain whether the above graph would vary if the neuron was responding to a sensation such as a sudden, sharp pain.

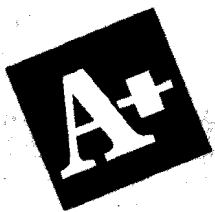
1 mark

When an action potential reaches the end of an axon, the message may pass to the next nerve in the pathway.

- f. Describe the process that occurs to transmit the message to the next nerve.

2 marks

Total 8 marks



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Figures

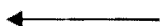
Words

Letter

--

IMPORTANT

You can detach
this practice
examination at
the perforations.



BIOLOGY

Practice written examination 1

Reading Time: 15 minutes

Writing Time: 1 hour 30 minutes

QUESTION BOOK AND ANSWER BOOK

Structure of Booklet

Section	Number of questions	Number of questions to be answered	Number of marks	Suggested times (minutes)
A	25	25	25	30
B	7	7	50	60
Total 75			Total 90	

Directions to students

Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers. Students are **not** permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape. No calculator is allowed in this examination

Material supplied

Question and Answer booklet of 12 pages.

Answer sheet for multiple-choice questions

Instructions

Write your **student number** in the space provided on this page

Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, and sign your name in the space provided to verify this.

All written responses must be in English.

At the end of the examination

Place the answer sheet for multiple-choice questions inside the front cover of this book.



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BIOLGY

Written Examination 1

ANSWER SHEET

STUDENT NAME: YOUR NAME WILL BE PRINTED HERE

INSTRUCTIONS

USE PENCIL ONLY

Sign here if your name and number are printed correctly.

Signature: _____

If your name or number on this sheet is incorrect, notify the Supervisor.

Please use a **PENCIL** for **ALL** entries. For each question, shade the box which indicates your answer.

All answers must be completed like this example:

A	B	☒	D
---	---	-------------------------------------	---

Marks will **not** be deducted for incorrect answers.

No mark will be given if more than **one** answer is completed for any question.

If you make a mistake, **ERASE** it - **DO NOT** just cross it out.

STUDENT NUMBER

Your number will be printed here

0 0 0 0 0 0 0 0 A

1 1 1 1 1 1 1 1 E

2 2 2 2 2 2 2 2 F

3 3 3 3 3 3 3 3 G

4 4 4 4 4 4 4 4 J

5 5 5 5 5 5 5 5 L

6 6 6 6 6 6 6 6 R

7 7 7 7 7 7 7 7 T

8 8 8 8 8 8 8 8 W

9 9 9 9 9 9 9 9 X

**YOUR STUDENT
NUMBER WILL BE
SHADED IN HERE**

SUPERVISOR USE ONLY

USE PENCIL ONLY

Shade the **ABSENT** box if the student is absent from the examination.

ABSENT

Supervisors initials

ONE ANSWER PER LINE

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D

ONE ANSWER PER LINE

10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D

ONE ANSWER PER LINE

19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

Please **DO NOT** fold, bend or staple this form

SECTION A - Multiple-choice questions

Instructions for Section A

Answer all questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Prokaryotes include:

- A. plants and animals.
- B. bacteria and fungi.
- C. bacteria and cyanobacteria.
- D. protists and cyanobacteria.

Question 2

Which of the following statements is true of the molecule messenger RNA?

- A. It consists of two strands of linked nucleotides held together by hydrogen bonds.
- B. It may be found in the nucleus and the cytosol of cells.
- C. It is formed in the nucleus and is unable to pass through the nuclear membrane.
- D. It is composed of chains of linked amino acids.

The following information is relevant to **Questions 3 and 4**. Within multicellular animals the concentration of ions in cells' cytoplasm often differs from that in the surrounding interstitial fluid. Two examples of these differences are shown in the table below.

Ion	Ion Concentration (mg/l)	
	Cytoplasm	Interstitial Fluid
Calcium (Ca^{2+})	2	4
Potassium (K^+)	150	5

Question 3

Cells obtain calcium ions from the surrounding interstitial fluid by the process of:

- A. diffusion through the lipid bilayer.
- B. facilitated diffusion through protein channels.
- C. active uptake via protein channels.
- D. pinocytosis.

Question 4

By what process would cells obtain potassium ions from the surrounding fluid?

- A. diffusion through the lipid bilayer.
- B. facilitated diffusion through protein channels.
- C. active uptake via protein channels.
- D. phagocytosis.

The following information is relevant to **Questions 5 to 7**.

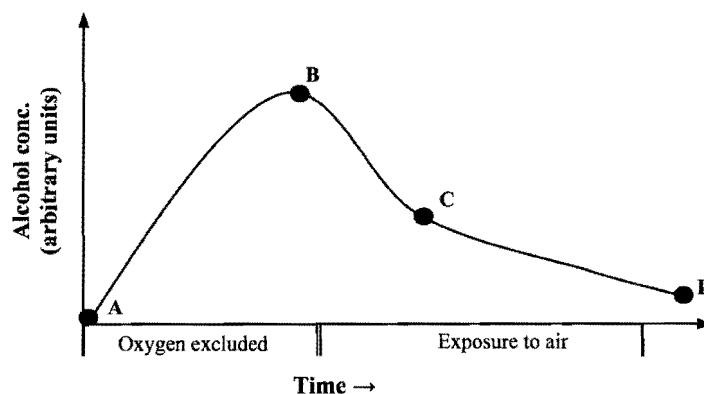
Wine vinegar is a popular ingredient in many salad dressings. The production of wine vinegar involves the use of two different microorganisms. *Saccharomyces*, a yeast, is used to ferment grape juice. In the absence of oxygen the yeast cells metabolize the grape sugar (glucose), producing alcohol and carbon dioxide.



Another microorganism, *Acetobacter* bacteria, converts alcohol to acetic acid, the sour tasting chemical that gives vinegar its distinctive taste. This enzyme-catalysed reaction requires oxygen.



At the beginning of the process a suspension of *Saccharomyces* and *Acetobacter* is added to grape juice in a fermentation tank. The fermentation tank is deprived of oxygen for a period of time. Later in the process the fermented juice is exposed to air to complete the production of vinegar. The yeast and bacteria are later removed from the liquid. The following graph shows the change in alcohol concentration during the production of wine vinegar.



Question 5

The rate of metabolism of alcohol was greatest between:

- A. Point A and point B.
- B. Point B and point C.
- C. Point C and point D.
- D. After point D.

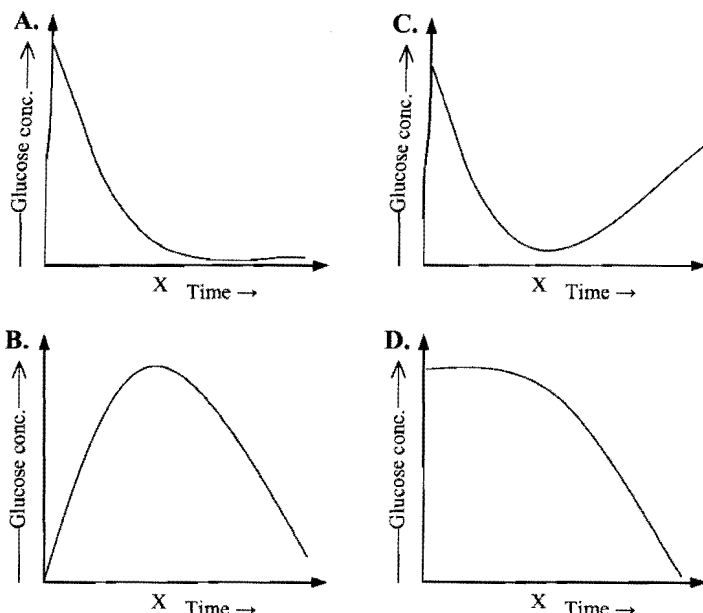
Question 6

It is reasonable to conclude that the decline in alcohol concentration after Point B is due to:

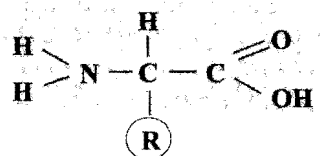
- A. the death of the yeast cells.
- B. the absence of any glucose in the solution.
- C. the denaturing of yeast enzymes in the presence of oxygen.
- D. the metabolism of alcohol by *Acetobacter*.

Question 7

Which of the following graphs best represents the concentration of glucose in the liquid over the same time period shown? The point X on the graphs represents the point at which the liquid is exposed to air.



The following diagram shows the generalised structure of an amino acid.



Question 8

When a dipeptide is formed by a peptide bond between two amino acids, the bond occurs between:

- the amino groups of the amino acids.
- the amino group of one amino acid to the acid group of the other amino acid.
- the acid groups of the amino acids.
- the middle carbon atoms of each amino acid.

Question 9

The R group of an amino acid is:

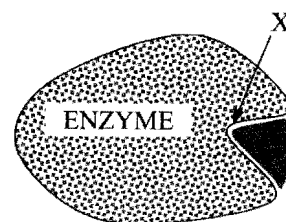
- different for each amino acid.
- composed of oxygen and hydrogen atoms only.
- the same for each amino acid.
- composed of carbon atoms only.

Question 10

The tertiary structure of a protein is influenced by:

- ionic attractions between various regions of the polypeptide chain.
- peptide bonds between adjacent amino acids.
- the formation of hydrogen bonds between the constant regions of adjacent amino acids.
- the action of the ribosomes on the polypeptide chain.

The following information is relevant to Questions 11 and 12. This diagram is a representation of an enzyme and a substrate molecule.



Question 11

The region marked X on the diagram is known as:

- the antigen binding site.
- the active site.
- the substrate site.
- the enzyme binding site.

Question 12

This region may be denatured by heat. Excessive heat causes:

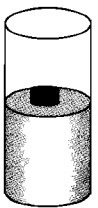
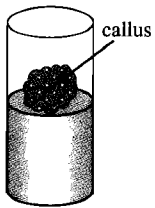
- a change in the secondary and/or tertiary structure of the protein molecule.
- a change in the structure of the amino acid molecules in the protein.
- a change in the amino acid sequence in the peptide chains making up this region.
- particular amino acids to be substituted for less active amino acids.

Question 13

Some stomach cells synthesise and secrete pepsin, an enzyme. Which one of the following sequences correctly lists the cell structures involved, and their order, in the synthesis of pepsin?

- Ribosome, Golgi body, endoplasmic reticulum.
- Mitochondrion, endoplasmic reticulum, Golgi body.
- Mitochondrion, Golgi body, endoplasmic reticulum.
- Ribosome, endoplasmic reticulum, Golgi body.

The following information is relevant to **Questions 14 - 15**. The effects of the plant hormones auxin and cytokinin were investigated by growing plant cells in tissue culture. A sample of undifferentiated plant tissue was placed in each of 3 test tubes containing nutrient agar. The relative concentrations of auxin and cytokinin were varied in the three tubes. The results are summarized in the table below.

			
The initial tissue sample placed on nutrient agar.	Nutrient agar containing: auxin 2 mg/l cytokinin 2 mg/l	Nutrient agar containing: auxin 2 mg/l cytokinin 1 mg/l	Nutrient agar containing: auxin 2 mg/l cytokinin 4 mg/l
	A callus, an undifferentiated mass of cells, develops.	Only root tissue develops.	Only shoot tissue develops.

Question 14

Given the results of this experiment it is reasonable to assume that:

- A. roots will grow in the absence of cytokinin.
- B. a high concentration of cytokinin relative to auxin will stimulate shoot growth.
- C. a high concentration of cytokinin relative to auxin will stimulate root growth.
- D. plants growing in a natural environment will contain the same concentrations of auxin and cytokinin in all cells.

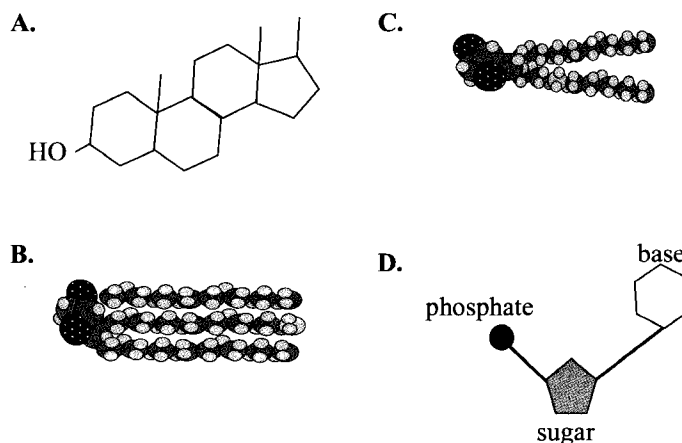
Question 15

Many home gardeners grow new plants from small cuttings taken from existing plants. The cut tip of these cuttings will develop roots more quickly if they are dipped in one of a number of products known as "rooting compounds". It is likely that these rooting compounds contain:

- A. equal concentrations of auxin and cytokinin.
- B. cytokinin only.
- C. a high concentration of auxin and a low concentration of cytokinin.
- D. a low concentration of auxin and a high concentration of cytokinin.

Question 16

Which of the following diagrams represents a lipid involved in cell signaling?



Question 17

Platelets

- A. form a plug by sticking to each other.
- B. release chemicals that stimulate constriction of blood vessels.
- C. provide chemicals needed for wound healing.
- D. all of the above.

Question 18

Which of the following requires a host cell because they are not able to make proteins on their own?

- A. cyanobacteria.
- B. bacterium.
- C. fungus.
- D. virus.

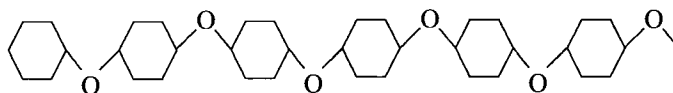
Question 19

Which of the following cellular processes would not require a net input of energy?

- A. Protein synthesis.
- B. Active transport of materials across membranes.
- C. The formation of ATP from ADP and phosphate.
- D. Cellular respiration.

Question 20

The following diagram represents a molecule of cellulose.



- A. Cellulose is composed of many-branched chains of glucose molecules.
- B. Cellulose is a fibrous protein composed of linked amino acid sub-units.
- C. Cellulose is a complex carbohydrate composed of linked glucose molecules.
- D. Cellulose is a component of cell membranes.

Question 21

Chemical barriers that are involved in the resistance of plants to pathogens include:

- A. the vertical alignment of leaves.
- B. a secondary cell wall.
- C. a thick cuticle.
- D. compounds which interfere with pathogen nutrition.

Question 22

An example of an autoimmune response is:

- A. rejection of transplanted tissue.
- B. hay fever in response to grass pollen.
- C. destruction of pancreas cells in diabetes.
- D. production of antibodies in response to bacteria.

Question 23

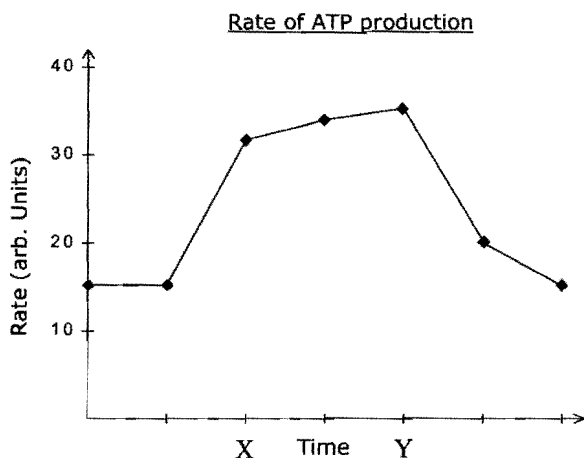
The following base sequence was determined from a single strand of DNA extracted from an animal cell.

TAG GCA TAG TTA

The sequence of bases on its complementary DNA strand would be:

- A. ATC CGT ATC AAT
- B. TAG GCA TAG TTA
- C. AUC CGU AUC AAU
- D. UTC CGT UTC UUT

The following graph shows the rate of production of ATP in a sample of muscle tissue during a period of strenuous exercise.

**Question 24**

During the period of time X → Y the muscle cells are likely to:

- A. produce lactic acid.
- B. produce glycogen.
- C. have a high concentration of oxygen.
- D. produce alcohol and carbon dioxide.

Question 25

Which of the following is not a function of the lymph vessels in humans?

- A. They produce blood cells.
- B. They drain excess fluid from body tissues.
- C. They contribute to the removal of metabolic wastes.
- D. They transport some lipids.

SECTION B - Short-answer questions

Instructions for Section B

Answer this section in pen.
Answer all questions in the spaces provided.

Question 1

In order to investigate biochemical reactions in plant cells, radioactive oxygen (^{18}O) was introduced into the environment of an experimental plant as carbon dioxide (CO_2). The plant was kept in a sealed, transparent container for a period of eight hours in bright light. The soil in which the plant was growing was covered so that molecules in the atmosphere could not enter the soil. At the end of this time, the plant and its environment were examined for the presence of ^{18}O . The results were recorded in the table below.

Presence of ^{18}O after exposure to light.

	Presence of ^{18}O .
Water vapour in the air	✓
Soil water	✗
Carbon dioxide in the air	✓
Oxygen (O_2) in the air	✓
Starch grains in leaf cells	✓
Proteins in leaf cells	✓

a. i. Write a balanced equation for photosynthesis.

ii. By referring to your equation, explain how ^{18}O came to be present in:

1. water vapour in the air.

2. atmospheric oxygen (O_2).

1 + 2 = 3 marks

b. For each of the following, explain how you would account for the presence of ^{18}O .

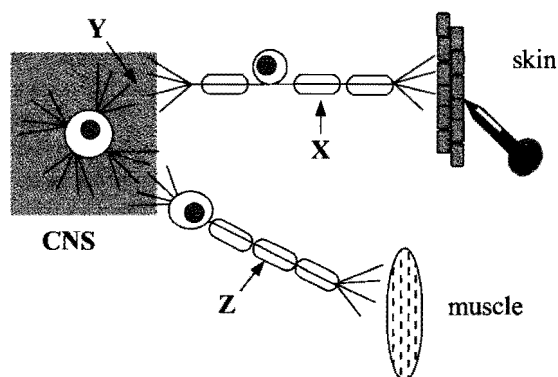
i. starch grains in leaf cells.

ii. proteins in leaf cells.

1 + 2 = 3 marks
Total 6 marks

Question 2

The following diagram represents nerve cells involved in your response to sudden pain, such as might occur if you touch a sharp object. It is not drawn to scale. This type of response is known as a reflex arc.



a. i. What type of signal is being transmitted at point X?

ii. What type of signal is being transmitted at point Y?

1 + 1 = 2 marks

b. i. Explain how a reflex arc differs from other nervous responses.

ii. Explain the importance of reflex arcs to the body.

1 + 1 = 2 marks

c. i. What type of neuron is cell Z?

ii. Cell Z is surrounded by a myelin sheath. What is the role of the myelin sheath?

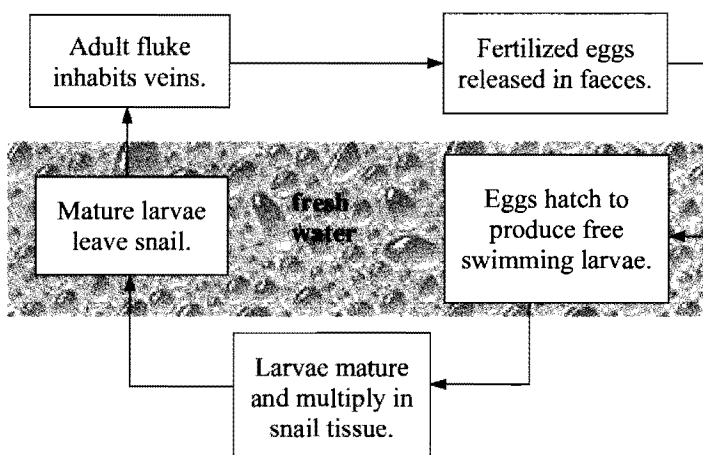
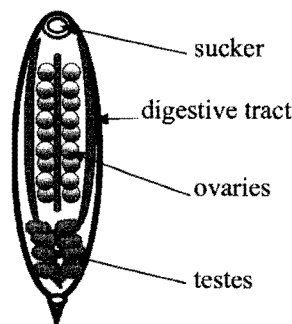
iii. Outline how cell Z causes the muscle to respond.

1 + 1 + 2 = 4 marks
Total 8 marks

Question 3

Flukes are a class of parasitic flat worm. Adult flukes possess a sucker around the mouth and a thick outer cuticle. Flukes have a highly developed reproductive system; reproductive organs fill most of the fluke's body. An adult fluke can produce more than 20,000 eggs. The diagram below shows the basic structure of a human blood fluke. Blood flukes inhabit the veins of a human host.

Blood flukes have a complicated life cycle. Fertilized eggs pass out of infected individuals in faeces and hatch in fresh water. In order to complete their life cycle, developing embryos must burrow into water snails where they multiply and develop into free swimming larvae. These larvae leave the snail. They can infect another person by burrowing into the skin. Blood fluke infection is common in rice growing areas where people often wade barefoot in shallow water.



a. Name two features of the blood fluke and explain how each would help the fluke survive in blood vessels.

i. feature 1

ii. feature 2

1 + 1 = 2 marks

b. Compared with other worms, the fluke has a poorly developed digestive system and a highly developed reproductive system. Explain why these are adaptations to the fluke's way of life?

i. digestive system

ii. reproductive system

1 + 2 = 3 marks

c. What term can be used to describe the role of the snail in the life cycle of the fluke?

1 mark

d. Explain two ways in which the spread of human blood flukes may be reduced.

2 marks
Total 8 marks

This diagram represents a virus of the type which causes Influenza. **In response** to the presence of a virus, interferon is synthesised **and secreted** into the tissue fluid by many different cell types, **including** macrophages and lymphocytes.

A diagram of a virus particle. It is a spherical structure with a dark outer shell and a lighter, textured inner core. The outer shell is covered with small, dark, protruding spikes. Three labels with lines pointing to specific parts of the virus are present: 'neuraminidase' points to one of the spikes; 'hemagglutinin' points to the outer shell; and 'Nucleic acid' points to the inner core.

- 1 mark

- 1 mark

- 1 mark

- 1 mark

- 1 mark

9

- 2 mark

The diagram shows a Y-shaped antibody molecule. Each of the two upper arms of the Y has a dark, rectangular shape attached to its tip. An arrow points from the label "neuraminidase" to one of these dark shapes.

- 1 mark

- 3 marks

Test 9

Question 5

Proteins are a class of molecules which have numerous functions within living things.

- a. Complete the following table of the different functions of proteins. The first one has been done for you.

Protein group	Function	Example
Transport	Carry molecules around the body	haemoglobin
Messenger		insulin
Catalytic		protease
Immunological	Help to fight invading organisms	
Contractile		actin, myosin

$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$ marks

- b. Proteins are found studded in the cell membrane of cells. Which two of the above functions is most likely for these proteins? Explain your answer.

2 marks

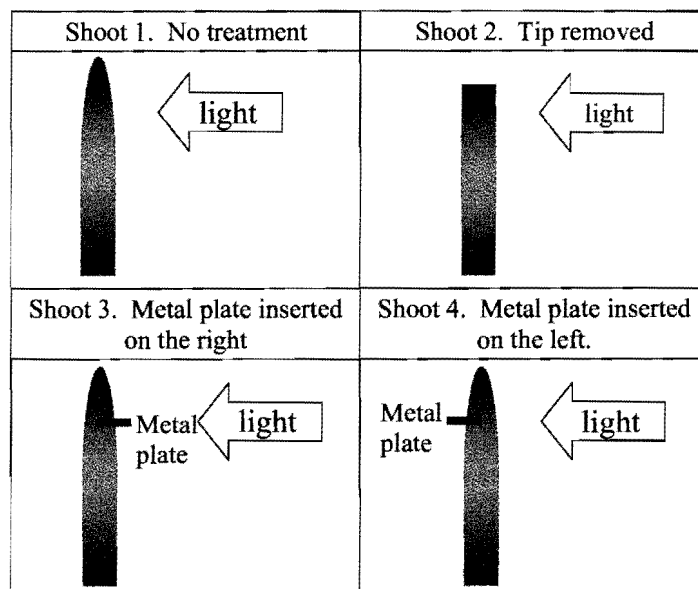
- c. Proteins are classified into two groups on the basis of their structure and function. State the names of the two groups and two features of the proteins classified in that way.

Name	Functions

2 marks
Total 6 marks

Question 6

The following diagram shows four young shoots of wheat plants. Each was treated in a different way (as shown below) and then exposed to light. Their growth was observed over several days.



- a. i. For each of the shoots, indicate (X) in the table whether they will bend towards the light source.

Shoot Number	Bends	Doesn't bend
1		
2		
3		
4		

- ii. For shoot 3, explain your answer to question a. i., above.

1 + 2 = 3 marks

- b. What is the name of the chemical responsible for the bending of shoots towards a light source?

1 mark

- c. In a later experiment the metal plates used in shoots 3 and 4 were replaced with thin sheets of mica, permeable to organic molecules. How would you expect the results for shoots 3 and 4 to be different from those obtained when metal plates were used? Explain your answers.

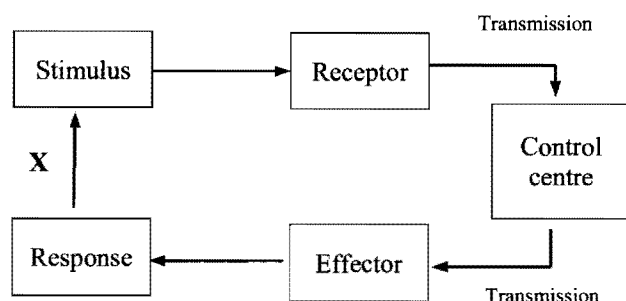
i. Shoot 3

ii. Shoot 4

1 + 1 = 2 marks
Total 6 marks

Question 7

The diagram below shows a generalised model of a homeostatic response.

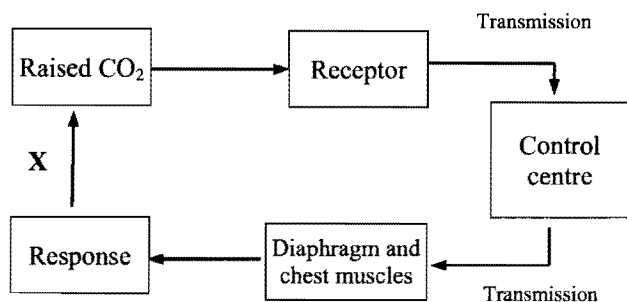


a. i. What name is given to the mechanism labeled X in the diagram?

ii. What is the importance of this mechanism?

1 + 1 = 2 marks

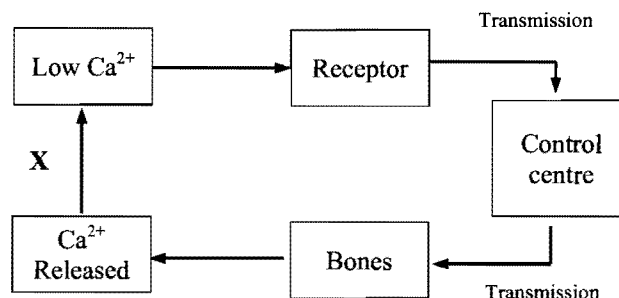
The levels of carbon dioxide (CO_2) and calcium (Ca^{2+}) ions in the blood are both under homeostatic control. In response to raised CO_2 levels you respond by breathing faster and more deeply.



b. Explain which system is responsible for the transmission of the instruction for this response?

1 mark

When blood calcium levels fall, bones in all parts of the body are stimulated to release calcium into the bloodstream. Other body cells do not release calcium.



c. i. Explain which system is responsible for the transmission of the instruction for this response?

ii. Explain why only bones are affected by this instruction.

1 + 1 = 2 marks

Total 5 marks

END OF EXAMINATION

Student

Test No. Result % Co

1

2

3

4

5

6

7

Melbourne High
School

Biology. Exam 1, mid-year
examination : VCE unit 3
2006-2009 : A+ prac



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