Neap

VCE Biology Unit 1

Question and Answer Booklet

2024 Trial Examination

Reading time: 15 minutes

Writing time: 1 hour and 30 minutes

Student's Name: _____

Teacher's Name: _____

Approved materials

- Pens, pencils, highlighters, erasers, sharpeners and rulers

Materials supplied

- Question and Answer Booklet of 20 pages
- Answer Sheet for multiple-choice questions
- Additional space is available at the end of the booklet if you need extra space to complete an answer.

Instructions

- Write your responses in English.
- Write **your name** and your **teacher's name** in the space provided above on this page.
- Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.
- Place the Answer Sheet for multiple-choice questions inside the front cover of this booklet after the examination.

Students are **not** permitted to bring mobile phones and/or any unauthorised electronic devices into the examination room.

Contents pages

Section A – Multiple-choice questions

Instructions

- Answer **all** questions in pencil on the Answer Sheet provided for multiple-choice questions.
- Choose the response that is **correct** or that **best answers** 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.
- Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Question 1

Prokaryotic organisms are classified as a different group to eukaryotic organisms because

A. they were the earliest organisms on Earth.

B. they are the only group that contains single-celled organisms.

C. all their cellular reactions occur in the cytosol.

D. they are more advanced than eukaryotic organisms in terms of cellular structure and function.

Question 2

Which one of the following is a feature of all prokaryotic cells?

A. the presence of only a single membrane

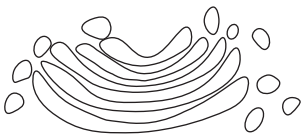
B. the ability to perform photosynthesis

C. the carrying out of all cellular reactions in organelles

D. the ability to perform aerobic cellular respiration

Use the following information to answer Questions 3 and 4.

The following diagram illustrates an organelle that is abundant in cells in the pancreas and salivary glands.



Question 3

This organelle is made of

A. endoplasmic membranes and vesicles.

B. internal folded membranes and vacuoles.

C. membrane channels and vacuoles.

D. folded membrane channels and vesicles.

Question 4

If this organelle were absent from a cell, the cell would **not** be able to

A. produce glucose via photosynthesis.

B. modify and package substances for secretion.

C. carry out cellular respiration to produce ATP for energy storage.

D. synthesise proteins that are required for cellular structure and function.

Question 5

Plasmolysed green leaf cells in a concentrated salt solution would

A. have vacuoles that are reduced in size.

B. not have chloroplasts.

C. have no cytoplasm.

D. have a rigid plasma membrane.

Use the following information to answer Questions 6–8.

The act of chewing bones provides dogs with calcium and cleanses their teeth. Additionally, dogs can obtain the soft bone marrow inside the hard bones. Bone marrow contains stem cells that can become different types of blood cells.

Question 6

Bone marrow stem cells are formed by

A. mitosis.

B. meiosis.

C. differentiation.

D. specialisation.

Question 7

Since bone marrow stem cells can become different types of blood cells, they are categorised as

A. multipotent.

B. unipotent.

C. pluripotent.

D. totipotent.

Question 8

Raw lamb-leg bones are often given to dogs to chew. These bones are made of hard, calcified bone material that has holes in it. These holes contain bone cells (osteocytes) and canals that house the nerve fibres and blood capillaries required to maintain these cells.

Based on this information, the lamb-leg bone can be described as

A. a cell.

B. a tissue.

C. an organ.

D. a system.

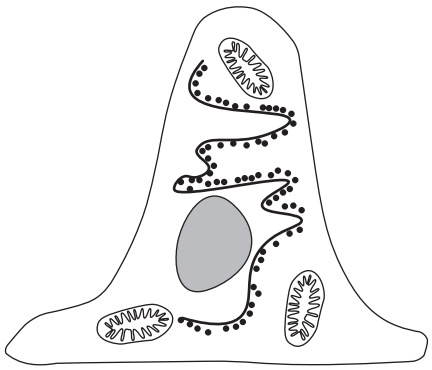
Question 9

Which of the following combinations is essential for facilitated diffusion to occur?

	Molecules	Direction of concentration gradient
A.	ATP and protein carrier molecules	high to low
B.	neither ATP nor protein carrier molecules	high to low
C.	ATP and protein carrier molecules	low to high
D.	protein carrier molecules but not ATP	high to low

Use the following information to answer Questions 10–13.

The following diagram represents a particular type of cell as seen under a light microscope at a magnification of ×800. It shows the cell's shape and several organelles in the cell.



Question 10

Which of the following have cells of this shape?

A. prokaryotic organisms only

B. plants and animals

C. all plants

D. fungi

Question 11

The shape of this cell is beneficial as it provides a

A. large surface area.

B. large volume.

C. small surface area to volume ratio.

D. large surface area to volume ratio.

Question 12

Which one of the following is **not** a function of a cell of this shape in the human body?

A. digestion

B. absorption

C. exchange

D. excretion

Question 13

Which one of the following organelles shown in the diagram above would be found in a prokaryotic bacterial cell?

A. nucleus

B. ribosomes

C. mitochondria

D. endoplasmic reticulum

Question 14

Which one of the following is **not** a stage in binary fission in a prokaryotic cell?

A. replication of the chromosome in the parent cell

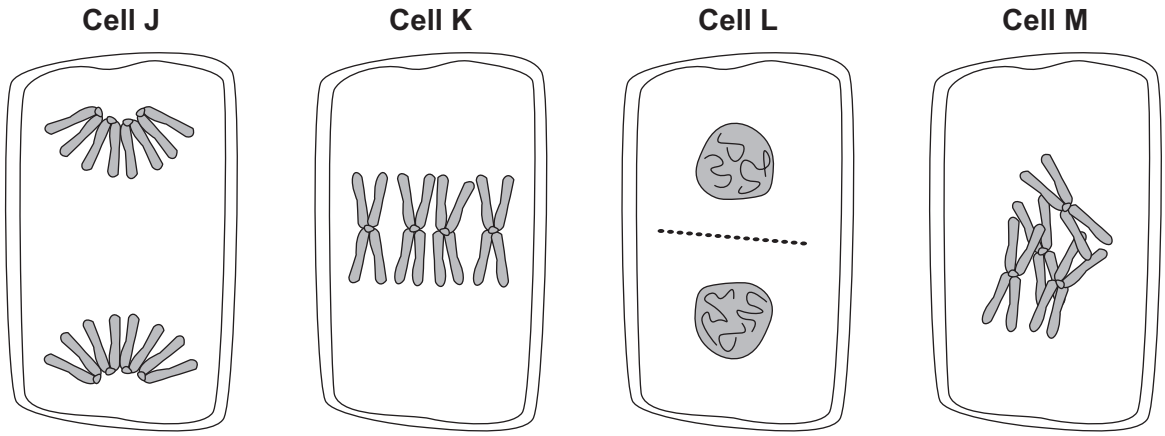
B. duplication of other cellular components that exist within the cell

C. mitosis of the chromosomes such that the daughter cells are genetically identical

D. enlargement of the parent cell

Use the following information to answer Questions 15 and 16.

The following diagram shows four cells, J–M, that represent different stages of the mitosis process of a parent cell. The cells are not in the order in which they would occur during mitosis.



Question 15

Which one of the following statements is correct?

A. In cell J, there are different chromosomes at each end of the cell.

B. In cell K, the chromosomes are lined up along the pole.

C. In cell L, the chromosomes at one end will be maternal and the chromosomes at the other end will be paternal.

D. In cell M, each chromosome consists of two chromatids.

Question 16

Which cell provides evidence that the mitosis process is occurring in a plant cell, not an animal cell?

A. cell J

B. cell K

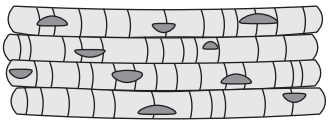
C. cell L

D. cell M

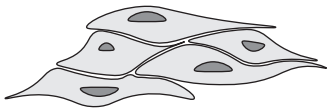
Use the following information to answer Questions 17 and 18.

Muscle cells play a role in homeostasis. The three types of muscle cells found in the human body are shown in the diagrams below.

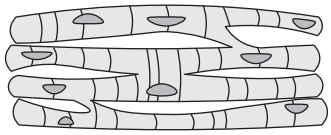
Skeletal muscle cells



Smooth muscle cells



Cardiac muscle cells



Question 17

The illustrations of the three muscle cell types provide evidence of

A. cell division.

B. cell elongation.

C. cell specialisation.

D. cell apoptosis.

Question 18

Shivering is a homeostatic mechanism that helps humans to regulate their body temperature when it falls below the optimum temperature by several degrees.

Which one of the following statements describes what is occurring when a person shivers?

A. Heat is gained from muscle cells contracting.

B. Heat output is reduced as body hair is erected.

C. Heat loss is reduced by fat insulation beneath the skin.

D. Heat is generated by cellular respiration occurring in muscle cells.

Question 19

If an athlete soaks in a very hot bath after spending many hours training outside in cold weather, they may sweat/perspire as they sit in the bath.

Which one of the following statements best describes how sweating/perspiration from their face and upper body aids the athlete's thermoregulation?

A. The diffusion of hot water into body cells increases body temperature.

B. The transformation of water vapour into liquid water increases body temperature.

C. The conduction of heat out of the body decreases body temperature.

D. The evaporation of water from the skin decreases body temperature.

Question 20

A first aid kit may contain a small packet of jelly beans.

These jelly beans are given to diabetic individuals if they experience an episode of

A. hyperglycaemia.

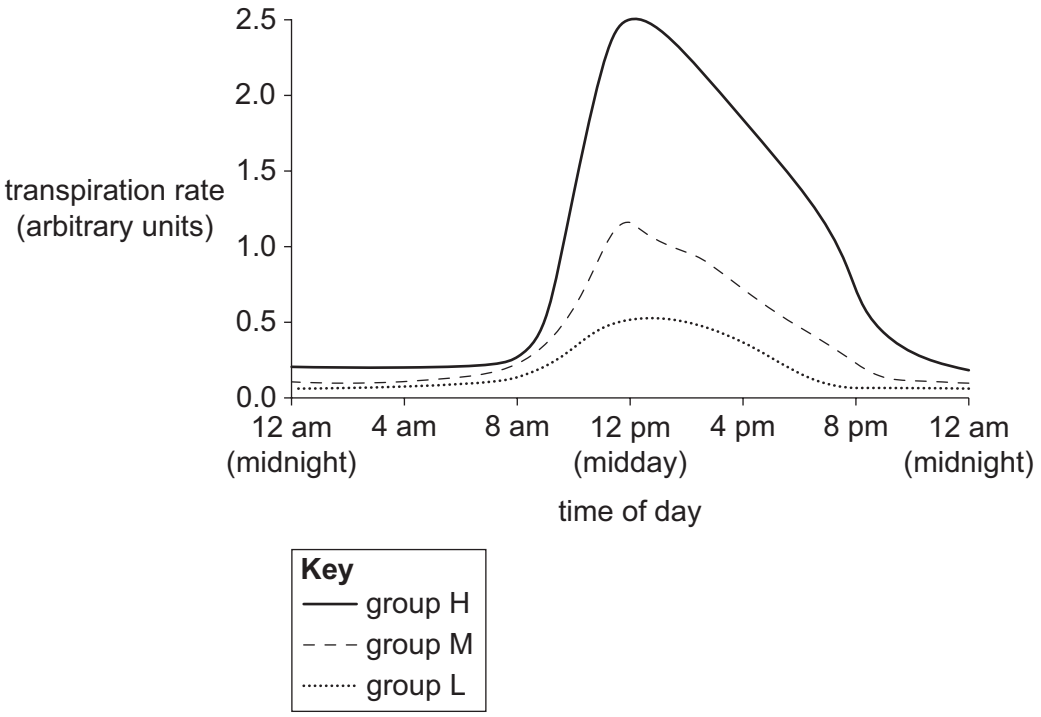
B. hypotension.

C. hypoglycaemia.

D. hyperthyroidism.

Use the following information to answer Questions 21–25.

The following graph shows the results of an experiment in which the rate of transpiration of pea plants was measured. Three groups of pea plants were tested. Each group had three plants and was tested in one of three soil moisture levels: high (group H), medium (group M) and low (group L).



Question 21

Which one of the following conclusions can be drawn from the data?

A. All three plant groups carried out photosynthesis from 4 am to 8 pm.

B. All three plant groups had a reduced rate of photosynthesis after 12 pm (midday).

C. The moisture level of the soil does not affect the transpiration rate of plants.

D. No plants lost water via transpiration after 8 pm.

Question 22

Which one of the following indicates that this experiment was controlled?

A. Each group had three plants.

B. The plants in each group were of the same species and identical in terms of size, age and health.

C. The soil in each group was different in terms of type, texture and moisture content.

D. The transpiration rate was recorded at different times for the three groups.

Question 23

Which of the following identifies the independent and dependent variables of the experiment?

	Independent variable	Dependent variable
A.	rate of photosynthesis over 24 hours	moisture content of soil
B.	rate of transpiration over 24 hours	three groups of plants
C.	three groups of plants	rate of photosynthesis over 24 hours
D.	moisture content of soil	rate of transpiration over 24 hours

Question 24

Based on the information and results provided, this experiment shows

A. validity.

B. precision.

C. integrity.

D. accuracy.

Question 25

Since the results of this experiment can be presented in a graph, the results must be

A. qualitative.

B. quantitative.

C. reproducible.

D. repeatable.

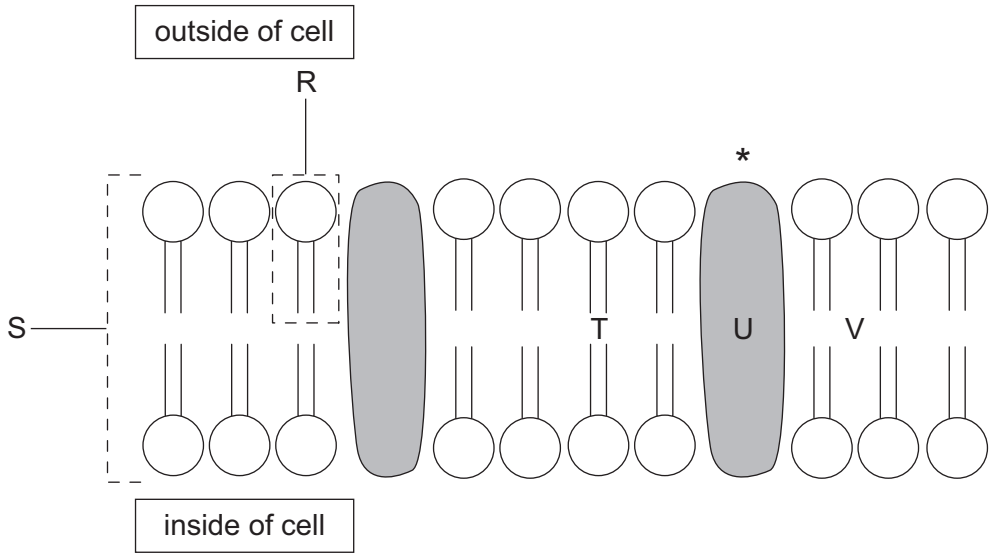
End of Section A

Section B

Instructions

- Answer **all** questions in the spaces provided.
- Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Question 1 (10 marks)
During a Biology class, four students – Jane, Jerome, Sana and Feng – are considering the following diagram, which shows the plasma membrane found in eukaryotic cells.



Jane says that no membranes are found in prokaryotic cells. Jerome disagrees with Jane.

a. Which student is correct? Explain your response. 1 mark

Sana continues the discussion by asking the teacher why it is beneficial for eukaryotic cells to have organelles that are surrounded by a membrane. The teacher asks whether any of the other students knows the answer. Feng provides an answer and the teacher says that he is correct.

b. **i.** What is Feng's answer? 1 mark

ii. One type of organelle in eukaryotic cells is surrounded by more than one membrane and contains stacks of membranes.

Identify the organelle and outline its function. In your answer, refer to the role of the membranes in the organelle's function. 2 marks

c. In the table below, identify structures R and S labelled in the diagram on page 10. 2 marks

Structure R	Structure S

d. The labels T, U and V shown in the diagram on page 10 indicate pathways through the plasma membrane.

i. Which pathway will a hydrophobic molecule pass through? Explain your response. 1 mark

ii. Which pathway will glucose pass through? Name the pathway. 1 mark

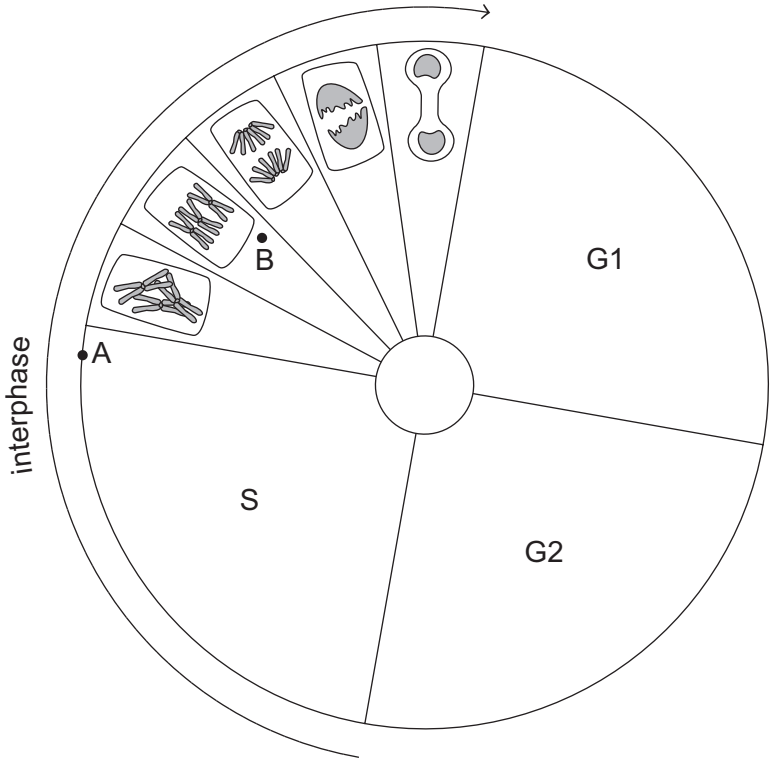
iii. In the diagram on page 10, the asterisk (*) represents an amino acid molecule that is passing through pathway U.

On the diagram, draw:

- more asterisks and an arrow (→) to show the movement of amino acid molecules into the cell via active transport
- an arrow with relevant labels to show **one** factor that is required for the movement of amino acids into the cell. 2 marks

Question 2 (5 marks)

During the plant cell cycle, new cells are produced from a parent cell. The following plant cell cycle diagram contains three errors.



a. In the table below, identify the three errors in the diagram above and state how each error should be corrected. 3 marks

	Identification	**Correction**
Error 1		
Error 2		
Error 3		

b. Various cell checks occur during the plant cell cycle. Two of these checks occur at points A and B in the diagram on page 12.

i. At point A, the cell cycle can pause for a period of time to allow for any structural damage checks and other checks.

Identify **one** error that may occur during the S phase that could be checked for at point A. 1 mark

_____

_____

ii. At point B, the location and attachment of the chromosomes is checked.

If the cell cycle is progressing correctly, what would this check show? 1 mark

_____

_____

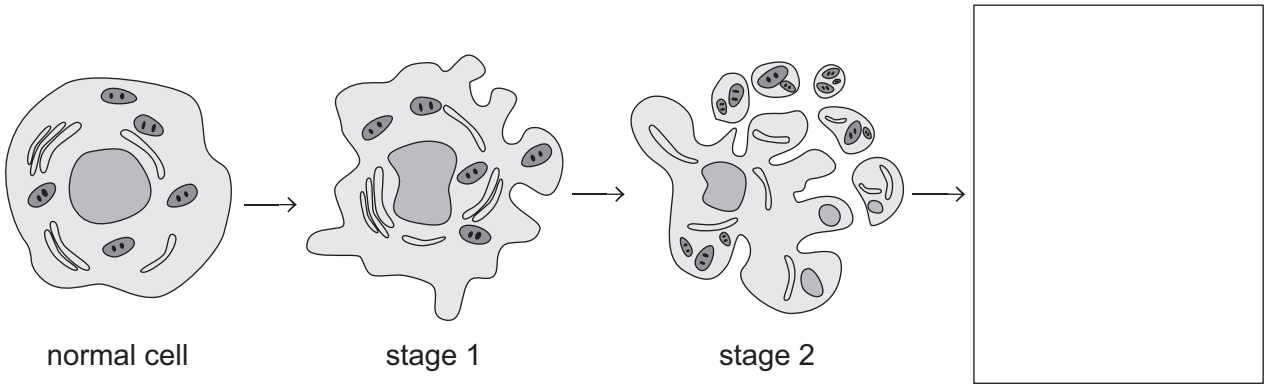
Question 3 (6 marks)

Necrosis is a type of cell death where cells die due to environmental factors, such as poisons, lack of oxygen or high temperatures that destroy cell enzymes. Apoptosis is a different type of cell death.

a. **i.** How is apoptosis different to necrosis? 1 mark

ii. State **one** situation in which apoptosis may occur in humans between conception and death. 1 mark

b. The diagram below shows the stages of a cell undergoing apoptosis.



normal cell stage 1 stage 2

i. What happens to the volume of a cell once apoptosis is activated? 1 mark

ii. State the term used to describe the bulging on the outside of the cell that occurs in stage 1 of the diagram above. 1 mark

iii. Identify the chemical substances that cause the cell's nucleus and other organelles to fragment in stage 2 of the diagram above. 1 mark

iv. In the box in the diagram above, draw what happens to **one** of the apoptotic bodies formed in stage 2. In your response, include a label that describes what is happening. 1 mark

Question 4 (8 marks)

Surgical procedures are often performed to remove damaged or malfunctioning tissues or organs in the human body. The removal of a tissue or organ may address a particular condition but may also create other issues that need to be addressed to ensure an individual's quality of life and maintain body functions.

a. In the table below, state how the removal of each listed tissue or organ would affect an individual's body functions. 4 marks

Tissue or organ removed	Effect on body functions
gall bladder	
20 cm of the colon	
thyroid gland	
half of the stomach	

To ensure quality of life and maintain body functions, individuals who have had tissues or organs removed may need to make modifications to the way that they live; for example, changing their diet.

b. Suggest **one** modification that would be necessary for each of the following individuals.

i. a 40-year-old who has had their gall bladder removed 1 mark

ii. a 33-year-old who has had their thyroid gland removed 1 mark

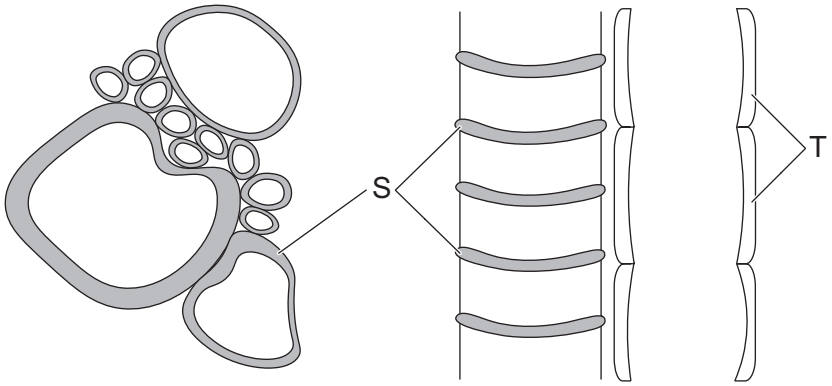
c. In rare cases, people may lose their tongue due to disease or injury. When an individual does not have a tongue, they usually live on a high-calorie liquid diet.

Outline **two** functions of the tongue that enable an individual to consume and digest solid foods. 2 marks

Question 5 (6 marks)

The following diagrams illustrate xylem vessels in a plant. Diagram 1 shows a transverse section through some xylem vessels. Diagram 2 shows a longitudinal section through two xylem vessels.

Diagram 1 **Diagram 2**



a. The walls of the xylem vessels are labelled S in diagrams 1 and 2.

Describe the walls of xylem vessels. 1 mark

b. The xylem vessel cells are labelled T in diagram 2. The cells join end-to-end in long columns to form the vessels.

i. Do xylem vessels contain cellular content? Explain your response. 1 mark

ii. What is transported in the xylem vessels? 1 mark

iii. On diagram 2 above, draw an arrow to show the direction of movement of the solution that is transported in xylem vessels. 1 mark

iv. Outline the **most important** force that enables the movement of the solution through xylem vessels and **one other** force that also enables this movement. 2 marks

Question 6 (6 marks)

In a Biology class experiment, the teacher gave each student a clean, transparent, resealable plastic bag, which she said represented part of the human digestive system. She also gave each student two plain, savoury biscuits and a cup of water. The teacher then instructed the students to add the biscuits and water to their bags and then seal the bags tightly using the bags' seals as well as rubber bands to prevent leakage.

Once all the students had completed the steps, the teacher told them to squeeze and squash the bags vigorously in all directions for 10 minutes, then leave the bags on a bench at the back of the laboratory until 10 minutes of class time remained.

During the final 10 minutes of the class, each student made observations of the biscuits in their bag and removed a small sample into a beaker. They then added some iodine solution to the beaker.

a. **i.** Outline the type of digestion that the students were simulating when they were squeezing and squashing the bags. 1 mark

_____

_____

ii. Identify the structures that carry out the type of digestion outlined in **part a.i.** In your answer, refer to the location of the structures. 1 mark

_____

_____

b. When the students added the iodine solution to their samples, the iodine retained its orange–brown colour.

i. Outline the type of digestion that the students did **not** simulate in the experiment. 1 mark

_____

_____

ii. For a human to digest a plain, savoury biscuit, what would need to be present in their body to enable the type of digestion outlined in **part b.i.**? 1 mark

_____

_____

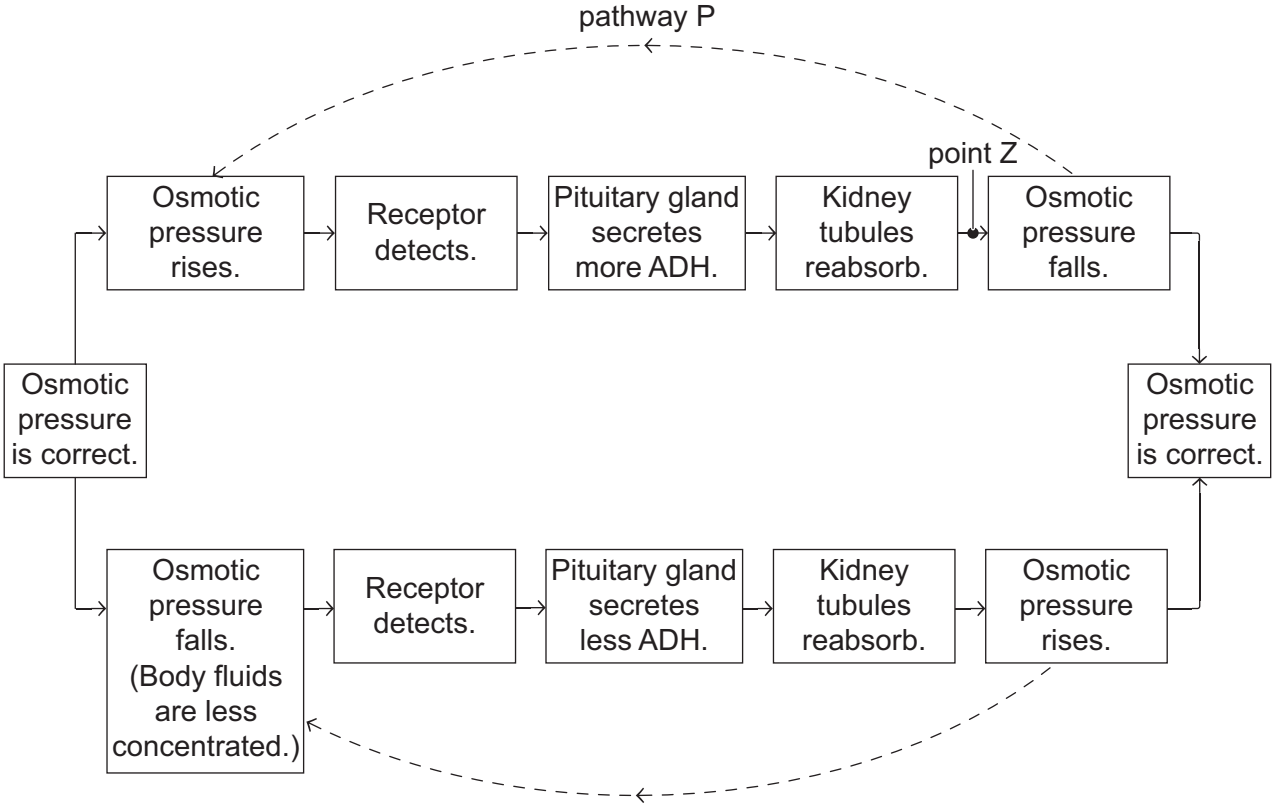
iii. What are the pH and temperature conditions that would ensure that the type of digestion outlined in **part b.i.** is efficient? 2 marks

pH _____

Temperature _____

Question 7 (9 marks)

Osmoregulation is the process by which the osmotic pressure of blood and other body fluids is controlled. The kidneys play a major role in maintaining water balance and, therefore, osmotic pressure; when body fluids are more concentrated, osmotic pressure is higher because the fluids contain a lower concentration of water. The following flow chart summarises osmoregulation in humans.



a. In osmoregulation, the receptor detects changes in the osmotic pressure of blood and other body fluids.

Identify the organ that acts as the receptor and its location in the body. 2 marks

b. What type of substance is ADH? 1 mark

c. At point Z in the flow chart on page 18, urine is produced.

Describe the urine that is produced at point Z in terms of volume and colour. Justify your response. 3 marks

d. Pathway P in the flow chart on page 18 is an important pathway in osmoregulation.

Name pathway P. Explain its function in osmoregulation, and its importance in cell functioning. 3 marks

End of Question and Answer Booklet

Extra space for responses

Clearly number all responses in this space.