education
Department of Education
FREE STATE PROVINCE

GRADE 11

LIFE SCIENCES

JUNE 2023

TOTAL: 150

TIME: 2½ HOURS

This question paper consists of 17 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answer to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. ALL drawings should be done in pencil and labelled in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.

SECTION A

QUESTION 1

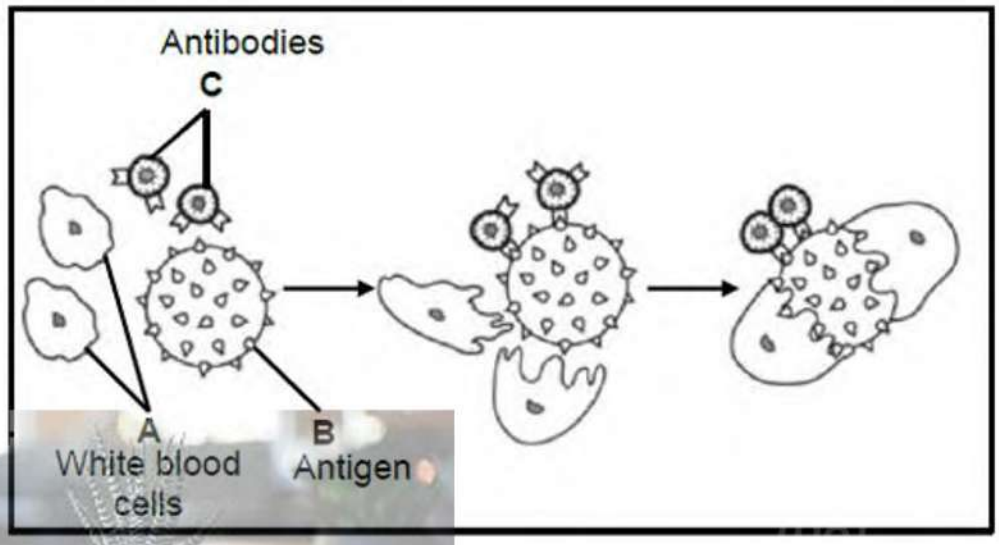
1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 In cells, aerobic respiration takes place in the ...

A mitochondria.
B cytoplasm.
C nucleus.
D nucleolus.

1.1.2 The diagram below illustrates activities taking place in a human body after vaccination.

Based on the diagram, vaccinations usually stimulate the body to produce more of …

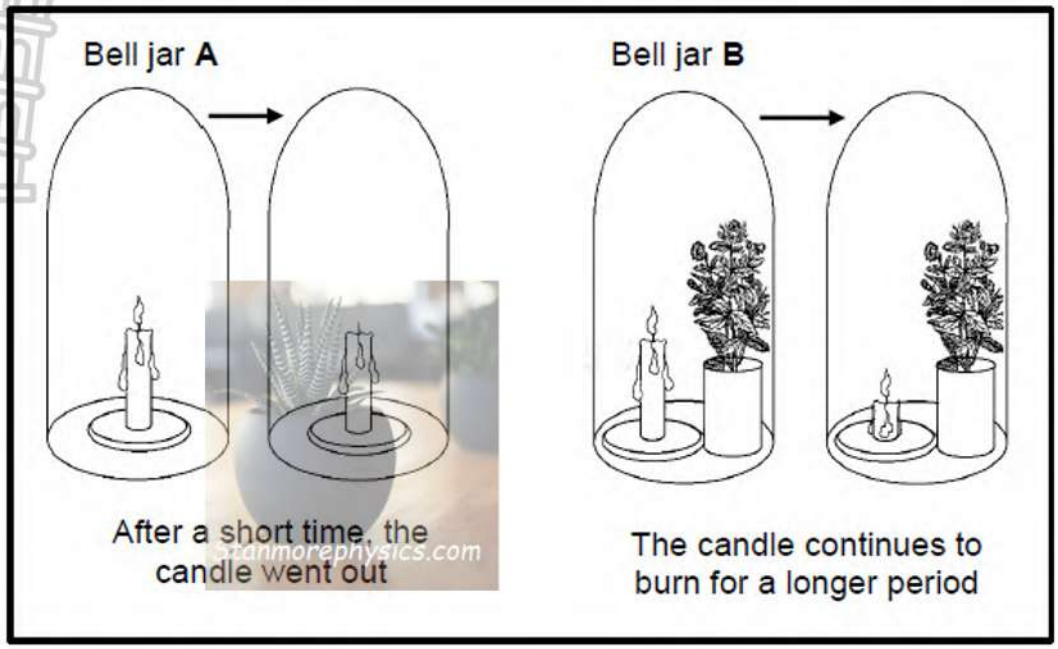


A **A** only.
B **B** only.
C **A** and **C** only.
D **A**, **B** and **C**.

1.1.3 The phylum that includes jellyfish, sea anemones and blue bottles:

A Annelida
B Chordata
C Cnidaria
D Porifera

1.1.4 An experiment was set up to investigate whether oxygen is released during photosynthesis. The result of the experiment is represented in the following diagram.



Which of the following statements explain the phenomena in this experiment?

(i) Photosynthesis reduces the amount of CO_2 inside bell jar **B**
(ii) The oxygen in bell jar **A** was completely used up and the burning is not supported
(iii) The process of photosynthesis in the plant, increases the amount of oxygen inside bell jar **B**
(iv) The water vapour produced inside bell jar **A** due to combustion extinguished the burning candle

A (i) and (iv) only
B (i), (ii) and (iii) only
C (i), (iii) and (iv) only
D (iii) and (iv) only

1.1.5 Which organic molecule can be absorbed directly into the human blood capillaries?

A Glucose
B Protein
C Starch
D Lipids

1.1.6 The product of anaerobic respiration in plants:

A Alcohol
B Oxygen
C Glucose
D Water

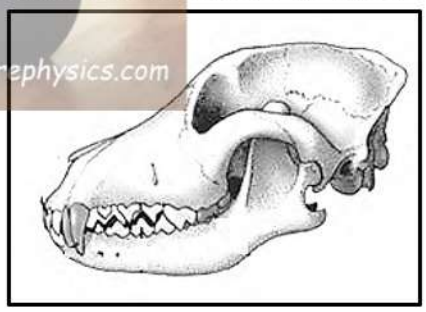
1.1.7 The following are involved in the process of aerobic respiration:

i. Energy
ii. Glucose
iii. Carbon dioxide
iv. Water
v. Oxygen

Which ONE of the following combinations correctly represent their involvement in aerobic respiration?

A ii + iii → i + iv + v
B ii + iv → i + iii + v
C i + ii → iii + iv + v
D ii + v → iii + iv + i

1.1.8 Which mode of nutrition is illustrated by the skull below?



A Herbivore
B Carnivore
C Omnivore
D Autotroph

1.1.9 ONE of the following is an advantage of asexual reproduction.

A All offspring share the same good characteristics
B There is genetic variation
C Energy expenditure is high
D A large number of offspring is produced rapidly

1.1.10 Which ONE of the following characteristics are present in Chordata?

A Bilateral symmetrical, triploblastic, closed blood system
B Bilateral symmetrical, diploblastic, open blood system
C Radial symmetrical, diploblastic, closed blood system
D Radial symmetrical, triploblastic, open blood system

(10 x 2) **(20)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 – 1.2.8) in the ANSWER BOOK.

1.2.1 The process by which food is chewed into a fine pulp in the mouth

1.2.2 The non-cellular jelly layer that separates the endo- and ectoderm

1.2.3 Type of symmetry in which an animal can be cut in any vertical plane through its central axis to give two mirror images

1.2.4 The cell organelle associated with cellular respiration

1.2.5 The rhythmical contraction of the muscles of the alimentary canal causing food to move along the gut

1.2.6 The structure that prevents food from entering the trachea during swallowing

1.2.7 The term used for animals that feed on plant material only

1.2.8 The form in which excess glucose is stored in a plant

(8 x 1) **(8)**

1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	The process in nutrition when absorbed nutrients become part of cells	A: Assimilation B: Absorption
1.3.2	Horizontal underground stem found mostly in ferns	A: Rhizoid B: Rhizome
1.3.3	Limiting factor(s) that influence the rate of photosynthesis as the light intensity increases	A: Oxygen B: Carbon dioxide

(3 x 2) **(6)**

1.4 Figures A, B and C below represent different phyla of animals.

A **B** **C**

1.4.1 Identify the phylum represented in:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

1.4.2 Name ONE characteristic that distinguishes these phyla form mammals. (1)

1.4.3 What type of symmetry does **B** have? (1)

1.4.4 Which organism(s) has/have the following characteristics? Write only the letter **A, B** or **C** for example 1.4.4 (f) **D.**

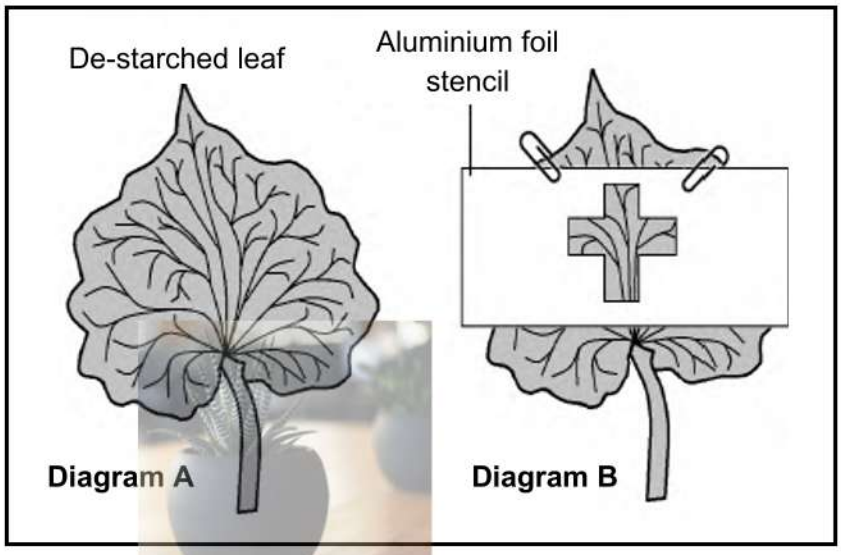
(a) Triploblastic (2)

(b) No nervous system (1)

(c) Bilateral symmetrical (2)

(d) True gut (1)
(11)

1.5 The diagrams below illustrate leaves used in an investigation during photosynthesis.



1.5.1 State the aim of this investigation. (2)

1.5.2 Give ONE reason for each of the following steps in this investigation:

(a) In the beginning of the investigation, the plant was kept in a dark cupboard for 48 hours (1)

(b) The leaf was boiled in water (1)

(c) The leaf was boiled in alcohol (1)
(5)

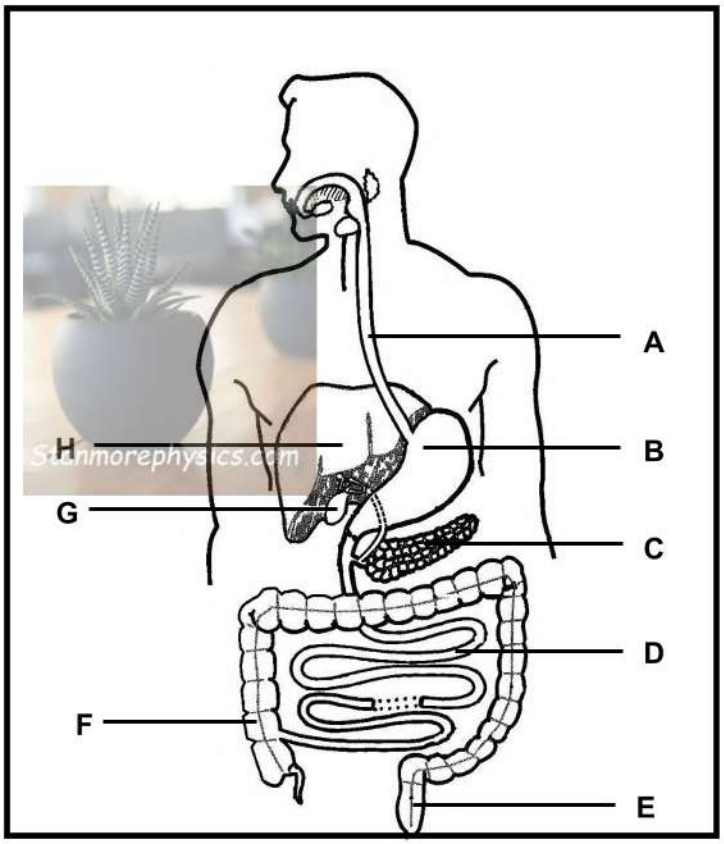
TOTAL QUESTION 1: 50

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the human digestive system.



2.1.1 Give the LETTER and the NAME of the organ:

(a) Which functions both as an endocrine and as an exocrine gland. (2)

(b) Where deamination of excess amino acids takes place. (2)

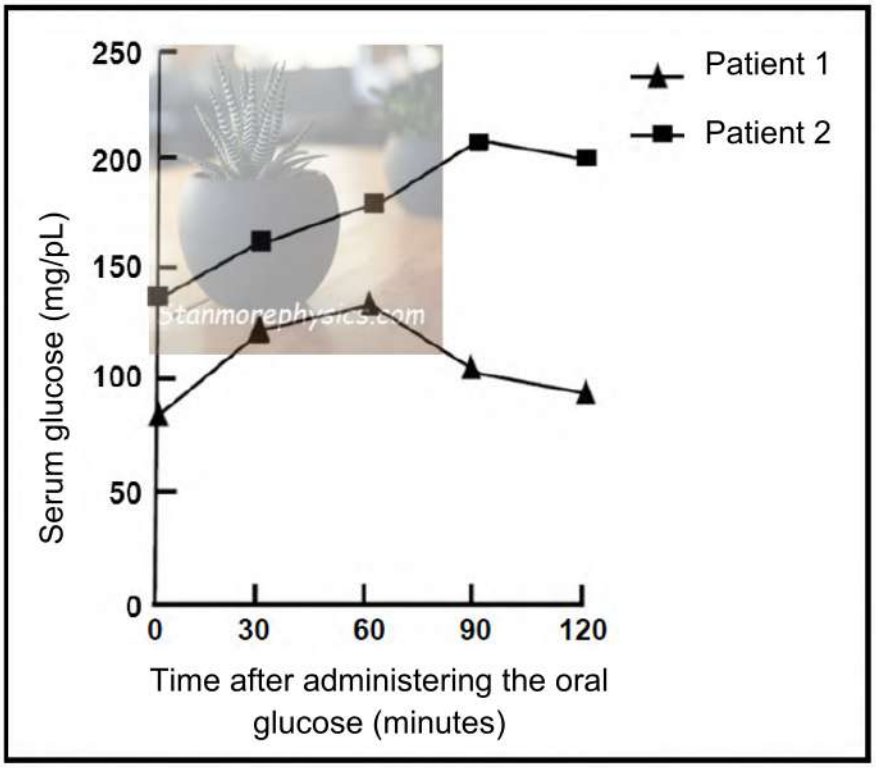
(c) Where most water and mineral salts are absorbed. (2)

2.1.2 Explain THREE ways in which part **D** is structurally adapted for its function of absorption. (6)

(12)

2.2 An oral glucose tolerance test is used to determine whether a person is diabetic. This test was performed on two people. After fasting for 12 hours, each person was given the same glucose solution to drink and then their blood glucose levels were measured every 30 minutes for two hours.

The results of the investigation are shown in the graph below.



2.2.1 Which patient suffers from diabetes? (1)

2.2.2 Give TWO reasons for your answer in QUESTION 2.2.1. (2)

2.2.3 How long does it take for patient **1**'s blood glucose level to return to the level it was before the glucose was ingested? (2)

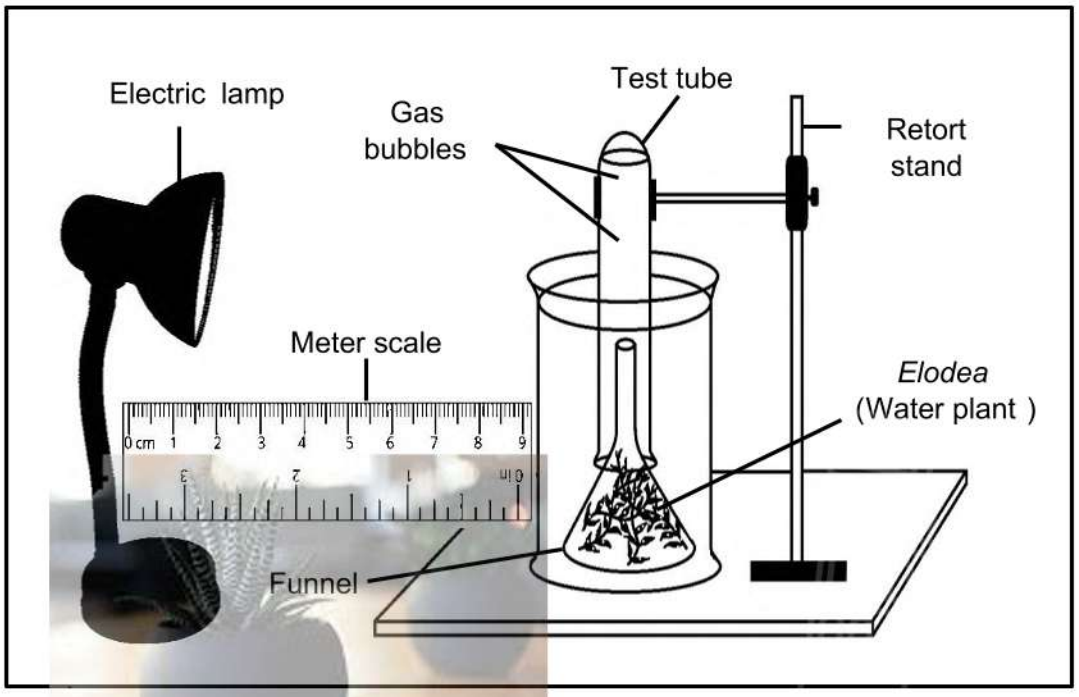
2.2.4 Discuss the homeostatic control of glucose as in patient **1** after ingesting the glucose solution. (6)
(11)

2.3 An investigation was conducted to determine the effect of light intensity on the rate of photosynthesis.

The procedure was as follows:

- Water plants of the *Elodea* species were placed under a glass funnel in a beaker containing water.
- A test tube containing water with no air bubbles, was fitted over the glass funnel as shown in the diagram.
- One pinche of bicarbonate of soda was added to the water before the start of the experiment.
- After switching off all the lights, a lighted table lamp was placed 1 metre away from the beaker.
- A meter scale was placed between the table lamp and the beaker.
- The number of air bubbles released by the plants in a 1-minute period was counted and recorded in a table.
- The above steps were repeated at different light intensities by moving the lamp to different distances.
- A test was conducted to identify the gas collected in the test tube.

The set-up of the investigation is shown in the diagram below.



2.3.1 Formulate a hypothesis for this experiment. (2)

2.3.2 Identify the independent variable in the experiment. (1)

2.3.3 How was the dependent variable measured in this experiment? (2)

2.3.4 Name the gas released as bubbles. (1)

2.3.5 State THREE variables that should have been kept constant during this experiment. (3)

2.3.6 Explain why only a PINCH (small amount) of bicarbonate of soda was added to the beaker at the start of the experiment? (3)
(12)

2.4 Tuberculosis (TB) is a disease caused by bacteria that are spread from person to person through the air. TB usually affects the lungs. A person with TB can die if they do not get treatment.

The table below shows the number of cases worldwide of tuberculosis (TB) and the number of TB related deaths around the world in 2009.

REGIONS	NUMBER OF TB CASES (in thousands)	NUMBER OF TB RELATED DEATHS (in thousands)
Africa	3900	430
The Americas	350	20
Eastern Mediterranean	350	99
Europe	560	62
South-East Asia	4900	480
Western Pacific	2900	240
Global Total	**14900**	**1300**

2.4.1 In what way can TB be spread through the air? (2)

2.4.2 Calculate the percentage of TB infected people that died in Africa. Show all working. (3)

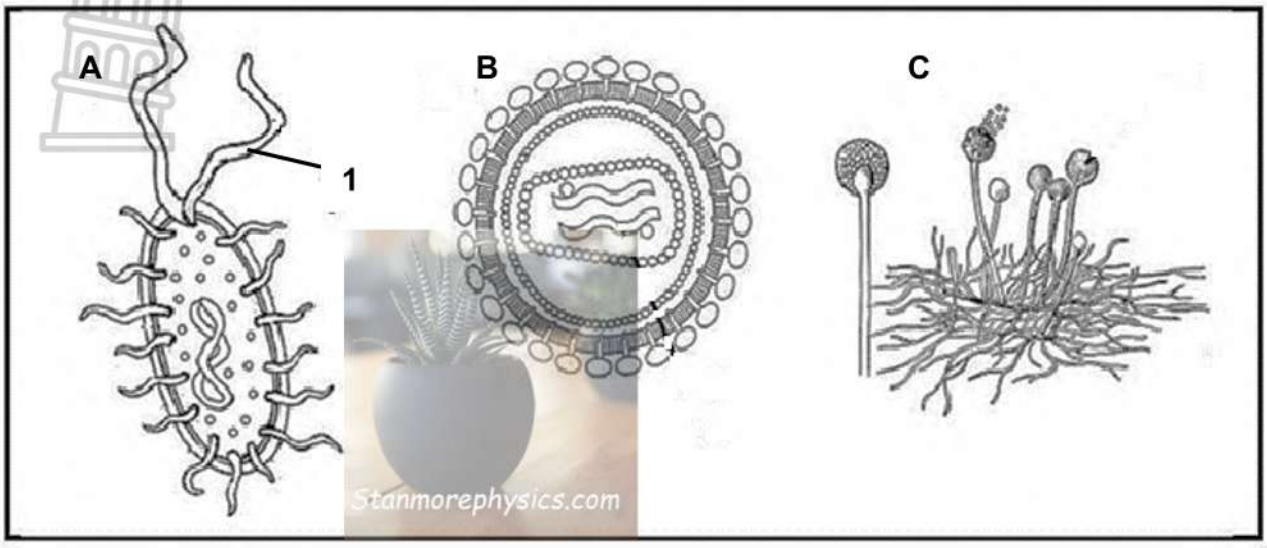
2.4.3 Draw a bar graph to show the number of TB related deaths in Africa, The Americas and Europe in 2009. (6)

2.4.4 Which region had the highest number of TB cases in 2009? (1)

2.4.5 Explain why the TB related deaths in Africa is more than those in The Americas and in Europe. (3)
(15)
[50]

QUESTION 3

3.1 The diagrams below illustrate different micro-organisms.



3.1.1 To which plant group does the organism illustrated in diagram **C** belong? (1)

3.1.2 Give the function of part **1**. (1)

3.1.3 Explain why organisms **A** and **B** are regarded as prokaryotic organisms. (2)

3.1.4 Name TWO environmental conditions in which organism **C** will thrive (prosper). (2)

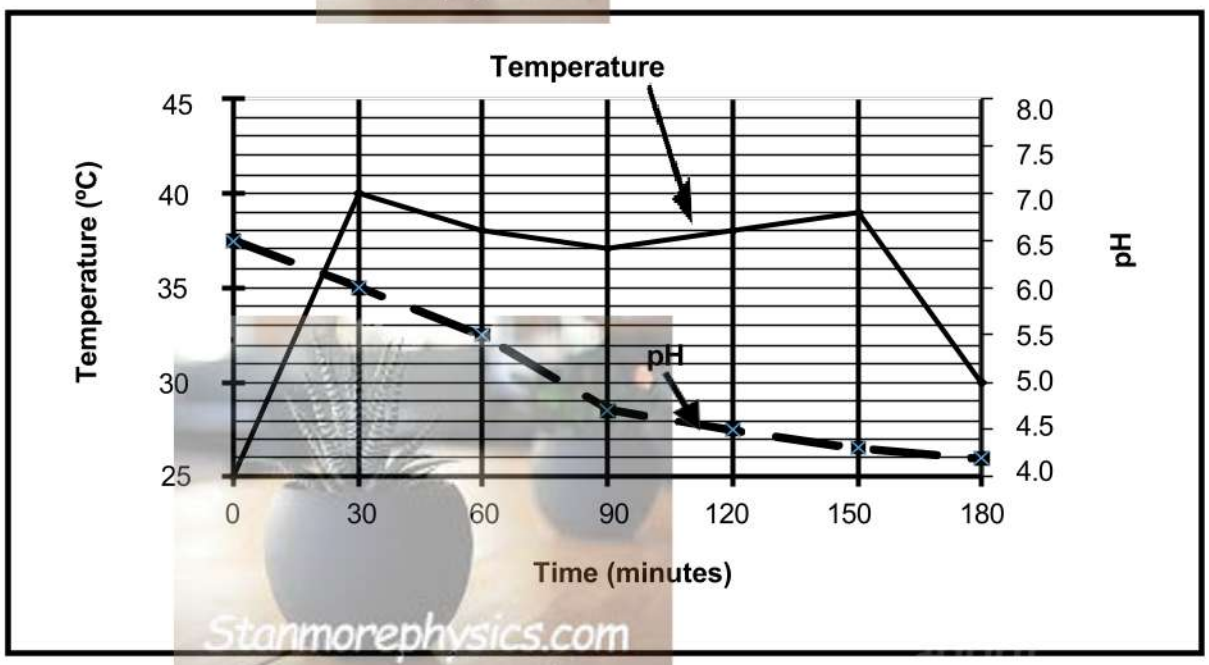
3.1.5 Describe how organism **A** can be used in biotechnology to produce insulin. (3)
(9)

3.2 Different types of bacteria are used to produce yogurt from milk. The ideal temperature to produce yogurt is 40 °C. Two types of bacteria work together to cause milk to thicken and turn sour. The acid is due to the conversion of sugar (lactose) in the milk to lactic acid. When the suitable acidity, taste and thickness are reached, the yogurt is cooled. It slows the bacterial action, but does not kill the bacteria. The lactic acid and low pH prevent other bacterial species from growing.

In an investigation to produce yogurt, a student used the following method:

- A water bath was set up at 40 ºC.
- 200 cm^3 of sterilized milk was placed in a sterile beaker and 5 cm^3 of active yogurt was added to the milk.
- The mixture was stirred and placed in the water bath.
- The temperature and pH were monitored by two sensors over a 3 hour period.

The results are shown in the graph below.



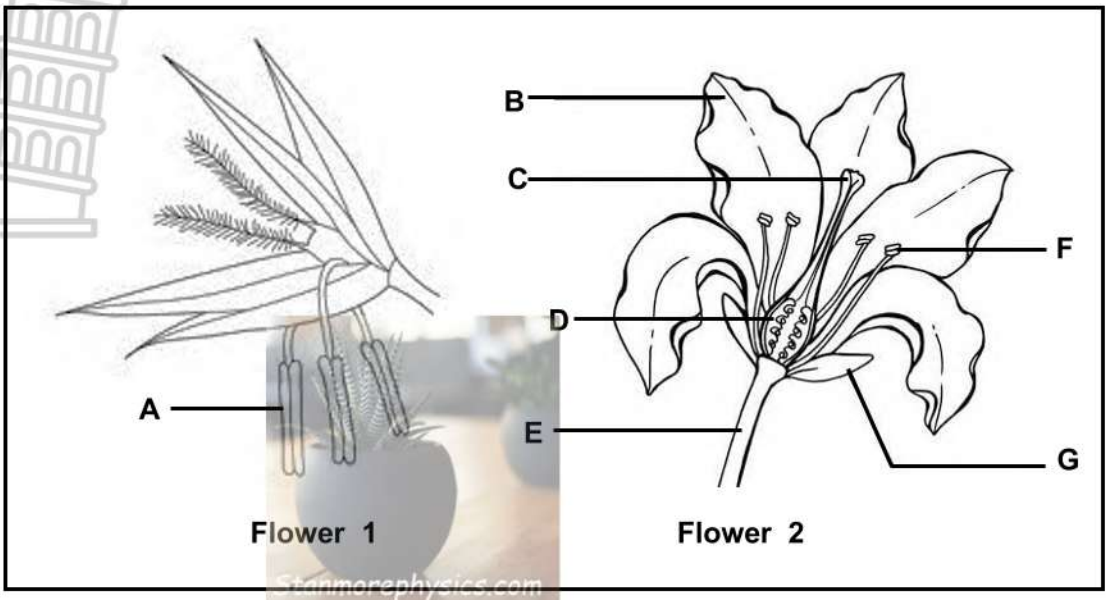
3.2.1 What is the pH of the milk at the beginning of the investigation? (1)

3.2.2 Explain why the pH changed as indicated in the graph. (3)

3.2.3 Why is it important to use sterilised milk in the investigation? (1)

3.2.4 How can the reliability of the experiment be improved? (2)
(7)

3.3 The diagrams below represent flowers of angiosperms.



3.3.1 Identify part:

(a) **A** (1)

(b) **B** (1)

3.3.2 Describe the role of part **B** in pollination. (2)

3.3.3 Give the LETTER and the NAME of the parts in diagram **2** that represent the gynoecium. (4)

3.3.4 Gymnosperms and Angiosperms, are both seed-forming plant groups and are collectively known as the Spermatophytes.

Tabulate TWO differences that separate them into these TWO groups of Spermatophytes. (5)

3.3.5 Which flower in the above diagrams is pollinated by wind? (1)

3.3.6 Give THREE visible reasons for your answer in QUESTION 3.3.5. (3)

3.3.7 What will part **D** develop into after fertilisation? (1)

(18)

3.4 The plants below represent different plant groups.

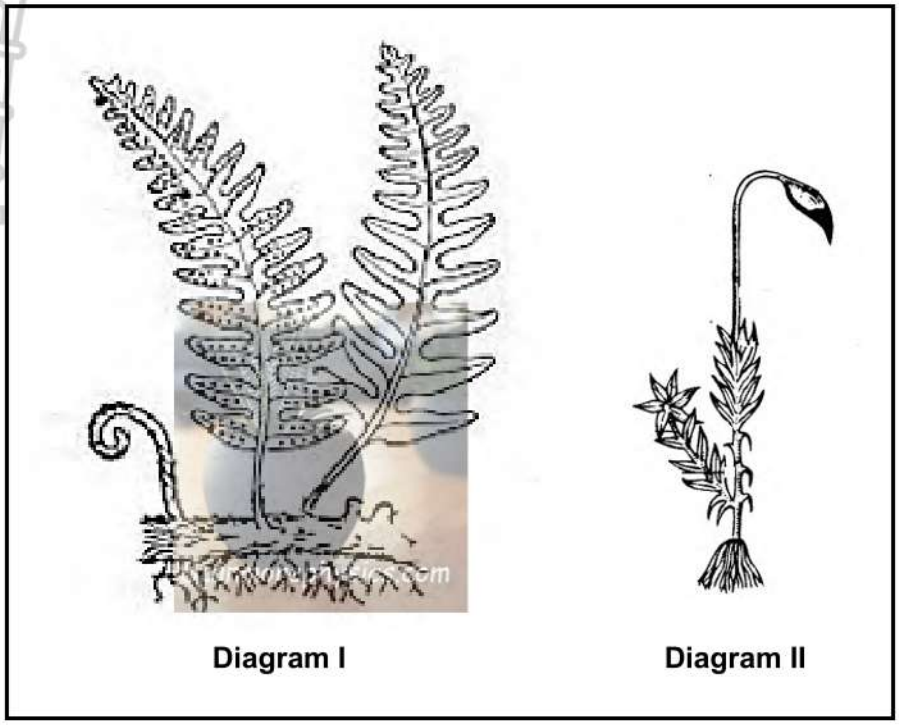


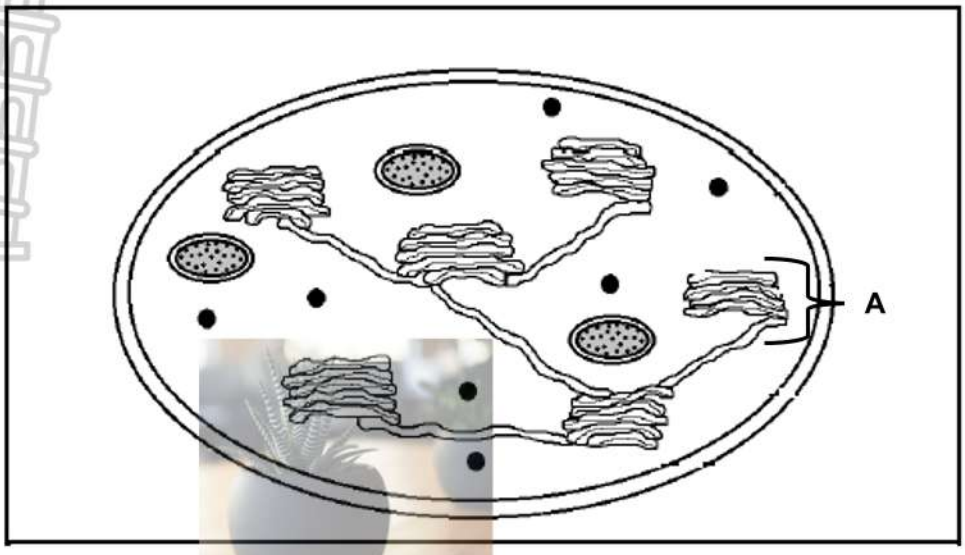
Diagram I **Diagram II**

3.4.1 Which plant group is represented by **Diagram II**? (1)

3.4.2 Explain why the plant in **Diagram II** is considered a thallus plant. (2)

3.4.3 What do these TWO plants have in common regarding reproduction? (2)
(5)

3.5 The diagram below represents an organelle found in a plant cell.



3.5.1 Identify:

(a) The organelle illustrated above (1)

(b) Structure **A** (1)

3.5.2 Name the TWO phases of photosynthesis that take place within this organelle. (2)

3.5.3 Name the TWO products formed during photosynthesis. (2)

3.5.4 Explain the effect of temperature on the rate of photosynthesis. (5)

(11)

[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150