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education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

LIFE SCIENCES

JUNE 2024

MARKS: 150

TIME: $2^{1}/_{2}$ hours

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This question paper consists of 16 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your 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 for each question.
6. Do ALL drawings in pencil and label them 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 all drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and compass where necessary.
11. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g. 1.1.10 D.

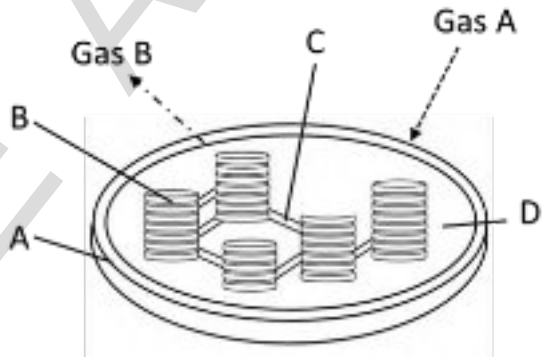
1.1.1 During which cellular process is carbon dioxide consumed and oxygen released?

A Cellular respiration
B Photosynthesis
C DNA replication
D Protein synthesis

1.1.2 What is the primary role of bacteria in the nitrogen cycle?

A Oxygen production
B Nitrate absorption
C Nitrogen fixation
D Photosynthesis

1.1.3 An adaptation of the chloroplast to improve the process of photosynthesis is:



A The protective single membrane that assists in active transport
B The stacks of thylakoids
C The liquid part of the stroma
D The membranes that contain chlorophyll

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1.1.4 What is the primary purpose of vaccination in disease management?

A Killing pathogens in the body
B Preventing the spread of diseases to vectors
C Providing immediate immunity
D Boosting the immune system

1.1.5 In which way do stomata contribute to the process of photosynthesis in plants?

A Stomata regulate water loss and gaseous exchange
B Stomata release nitrogen
C Stomata absorb sunlight
D Stomata synthesize glucose

1.1.6 In which way could knowledge of the differences between innate and adaptive immune responses inform the development of vaccines?

A Accelerating natural selection
B Enhancing genetic diversity
C Designing targeted immune responses
D Increasing environmental sustainability

1.1.7 In which way do environmental conditions, such as light intensity and temperature, impact crop management?

A Increasing atmospheric carbon dioxide levels
B Optimizing irrigation techniques
C Reducing chlorophyll production
D Enhancing crop yield through light manipulation

1.1.8 How do pathogenic bacteria typically cause harm to their host organisms?

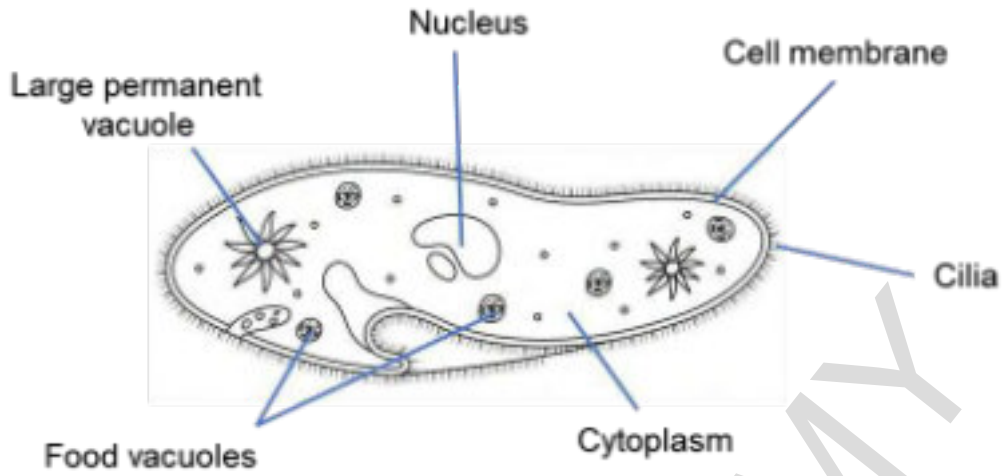
A By providing essential nutrients to the host organism
B By secreting toxins or enzymes that damage host tissues
C By forming symbiotic relationships with the host organism
D By competing with other bacteria in the environment

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1.1.9 The diagram below shows a single-celled organism called *Paramecium*



Which structures will also be found in all animal cells?

A Cell membrane, vacuole, nucleus

B Vacuole, cytoplasm, nucleus

C Cell membrane, cytoplasm, nucleus

D Cell membrane, cytoplasm, cilia

(9 x 2) **(18)**

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1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.9) in the ANSWER BOOK.

1.2.1 A protein coat surrounding the nucleic material of a virus

1.2.2 The tissue responsible for the transport of water and minerals in plants

1.2.3 A whip-like, protruding filament that help cells or microorganisms move

1.2.4 An organism that transmits pathogens from one host to another

1.2.5 The cells responsible for the production of antibodies in the immune system

1.2.6 The stage of cellular respiration that produces the majority of ATP (adenosine triphosphate)

1.2.7 Splitting of water molecules into oxygen atoms and hydrogen atoms.

1.2.8 Organising plants into hierarchical groups based on their shared characteristics.

1.2.9 The haploid phase in the life cycle of mosses

(9 x 1) **(9)**

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 number (1.3.1 to 1.3.3) in the ANSWER BOOK.

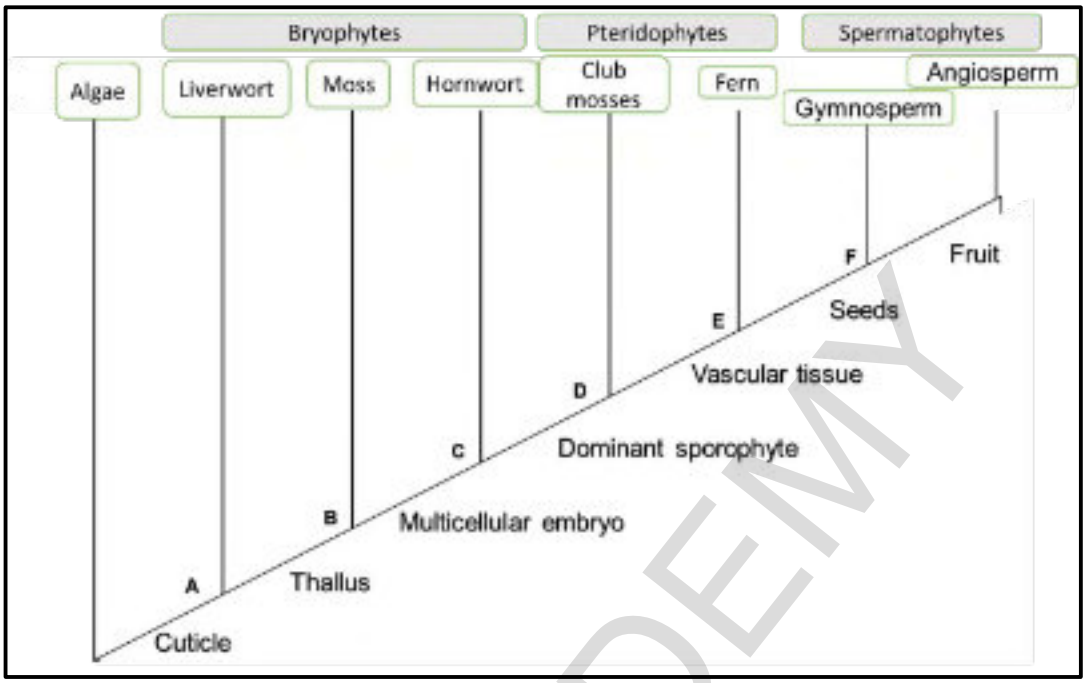
COLUMN I		COLUMN II	
1.3.1	The organelle involved in glycolysis	A: B:	Mitochondria Chloroplast
1.3.2	A vector-borne disease	A: B:	Malaria Bilharzia
1.3.3	Stored form of glucose in animal	A: B:	Starch Glycogen

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

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1.4 The diagram below illustrates the cladistic relationship among the major groups of land plants. Using the cladogram below, answer the following questions:



1.4.1 Identify the common ancestor:

a) of gymnosperms and angiosperms (1)

b) of ferns and flowering plants (1)

1.4.2 Based on the cladogram above, what difference can you infer between moss and ferns? (1)

1.4.3 Identify a clade that could represent plants adapted to tropical rainforests. (1)

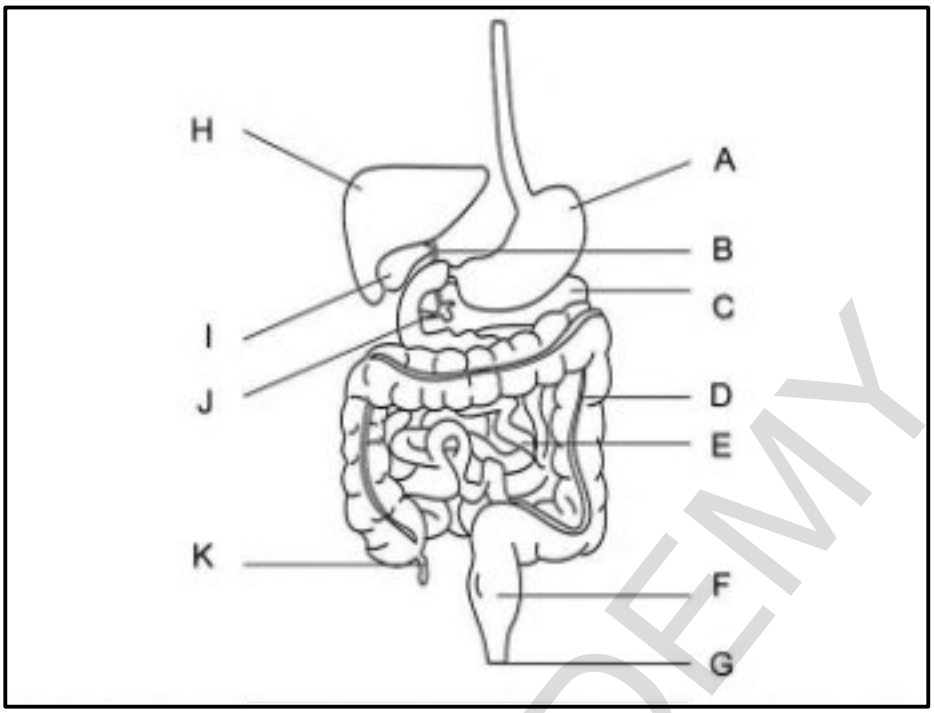
1.4.4 Name ONE characteristic that supports your answer to QUESTION 1.4.3. (1)

1.4.5 Explain why seedless vascular plants can grow taller than nonvascular plants. (2)
[7]

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1.5 The diagram below represents the digestive system of humans.



1.5.1 Identify the part labelled:

(a) **G** (1)

(b) **D** (1)

1.5.2 Give the LETTER of the part that:

(a) Stores glycogen (1)

(b) Contains the villi (1)

1.5.3 Give the LETTER and NAME of the part that:

(a) Starts protein digestion (2)

(b) Stores bile (2)

1.5.4 Give ONE function of:

(a) The pancreas (1)

(b) The colon (1)

(10)

TOTAL SECTION A: 50

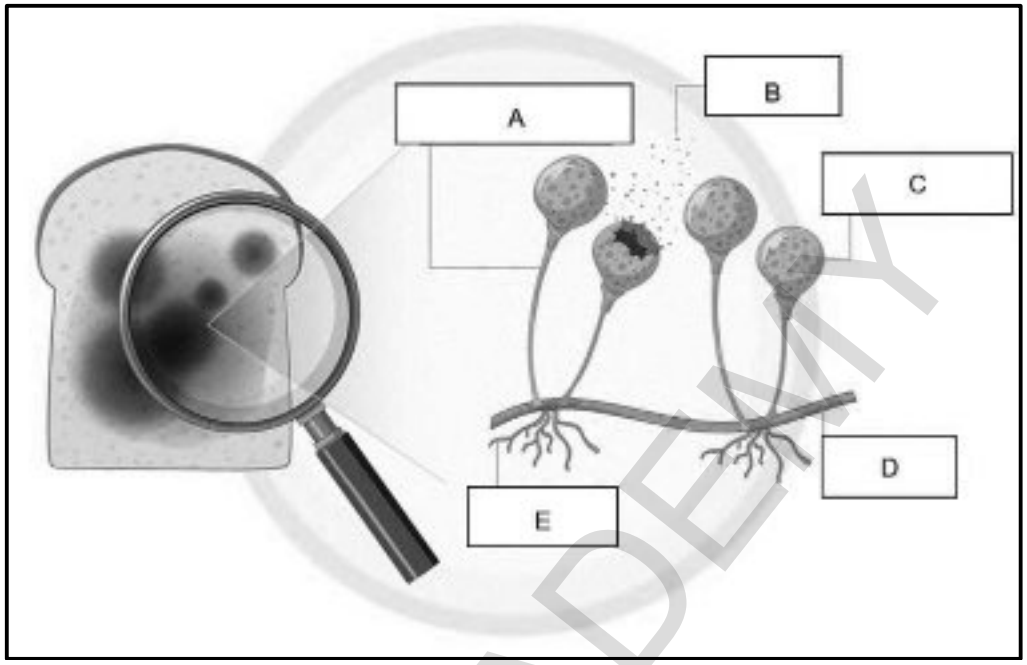
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SECTION B

QUESTION 2

2.1 The diagram below shows mould growing on bread.



2.1.1 Name the Kingdom of organisms to which **bread mould** belongs. (1)

2.1.2 Label the structures:

(a) **A** (1)

(b) **D** (1)

2.1.3 Briefly describe the ecological role of mycorrhiza in ecosystems. (4)

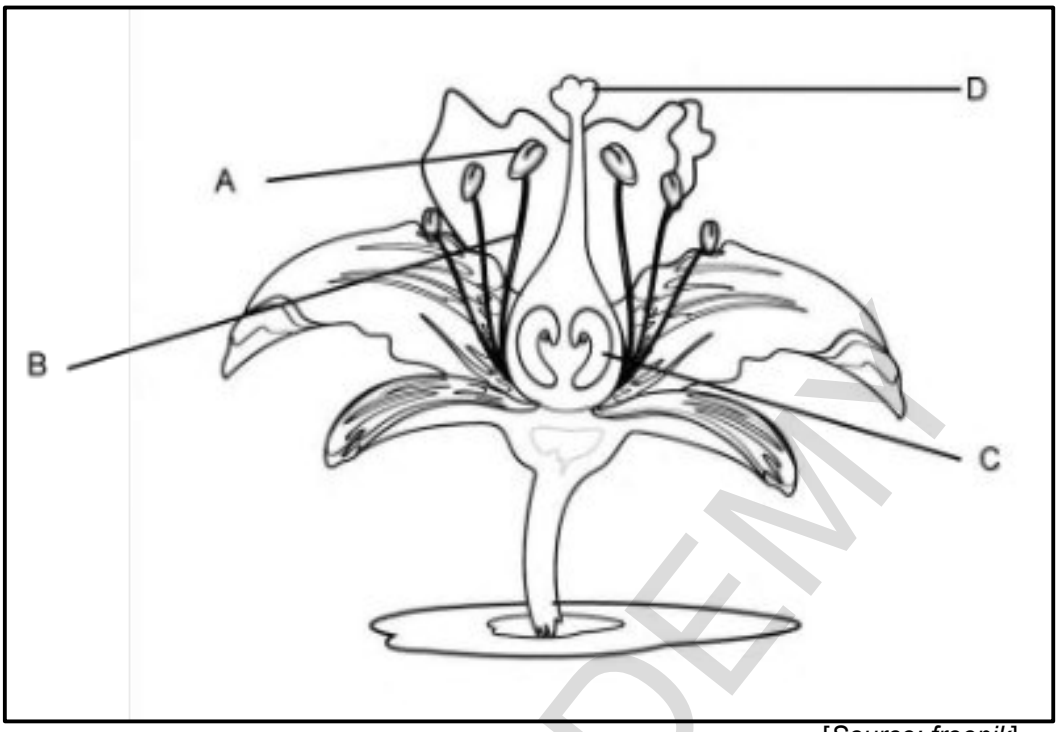
2.1.4 Explain the role of the mycelium in bread mould's nutrition. (2)

2.1.5 Describe the process of asexual reproduction using sporangia in bread mould. (3)
(12)

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2.2 The diagram below shows the structure of a flower.



[*Source: freepik*]

2.2.1 Identify:

(a) Structure **A** (1)

(b) The process taking place in structure **C** (1)

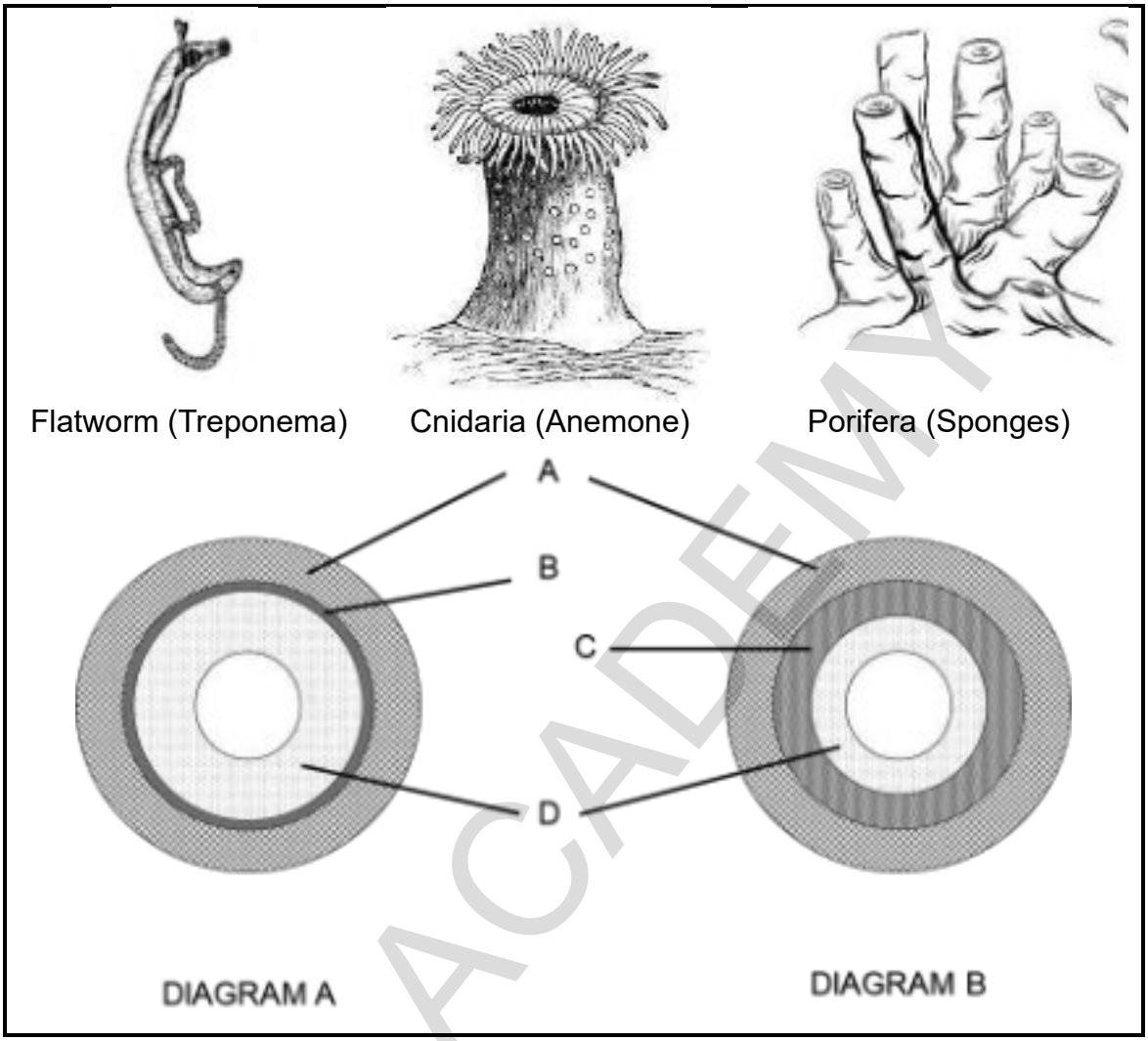
2.2.2 Describe the process of cross-pollination. (4)

2.2.3 Explain TWO adaptations of a flower for insect pollination. (4)
(10)

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2.3 The diagrams below represent various animals and a cross-section of the body plans.



2.3.1 Name **A** and **D**. (2)

2.3.2 Which diagram, **A** or **B**, represents a triploblastic organism? (1)

2.3.3 Which organism, Flatworms, Cnidaria or Porifera, shows bilateral symmetry? (1)

2.3.4 Describe THREE roles of arthropods in the environment. (3)

2.3.5 Explain TWO advantages of a through-gut system in animals. (4)
(11)

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2.4 Exploring the intricate relationship between dentition and nutrition unveils the fascinating adaptations in the structure of teeth, shedding light on how different animals have evolved to meet their dietary needs.

2.4.1 What is a *herbivore*? (1)

2.4.2 Compare and contrast the dental adaptations of herbivores and carnivores. (4)

2.4.3 Predict the potential changes in the dental structure of an omnivore if its diet changes from raw uncooked food to soft cooked food. (4)

2.4.4 Explain how the changes named in QUESTION 2.4.3 would be advantageous. (2)

2.4.5 Identify the organelle and describe the structures involved in cellular respiration. (3)

2.4.6 Explain how these structures named in QUESTION 2.4.5 contribute to the production of ATP and the release of energy during cellular respiration. (3)
(17)
[50]

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QUESTION 3

3.1 A fusiform body plan is a streamlined, spindle-shaped body tapered at both ends. An example of a fish with a fusiform body plan is the tuna. This type of body plan is well-suited for fast and efficient movement through water

On the other hand, a non-fusiform flatfish body plan is characterised by a flattened and laterally compressed shape. Flatfish, such as the Flounder, are a notable example. These fish are adapted to life on the seafloor, and their bodies are flattened from side to side. Flatfish exhibit a unique adaptation, where one eye migrates to the other side of the head during development, allowing them to lie flat on the substrate.

A group of ichthyologists (fish specialists) wanted to investigate the effect of body shape in aquatic organisms on hydrodynamic efficiency.

The following protocols were followed:

- They chose two species, one with a fusiform body plan (tuna) and another with a non-fusiform body plan (flatfish). They selected healthy organisms, representative of their species, and accustomed to captivity.
- They used the same water tunnel to simulate hydrodynamic conditions
- They used the same water flow rates for the tuna and flatfish
- They conducted five trials for each type of fish, varying parameters such as water flow rate and direction.
- They recorded swimming performances using high-speed cameras placed strategically around the tank.
- Results of speed, acceleration, and manoeuvrability were recorded in a table.

3.1.1 Identify the dependent variable for this investigation. (1)

3.1.2 Explain why the flatfish was included in the investigation. (2)

3.1.3 List TWO conditions that made this investigation valid. (2)

3.1.4 Identify ONE way in which the investigation was made reliable. (2)

3.1.5 List THREE planning steps for this investigation. (3)

3.1.6 Explain why the fish needed to be accustomed to captivity. (2)

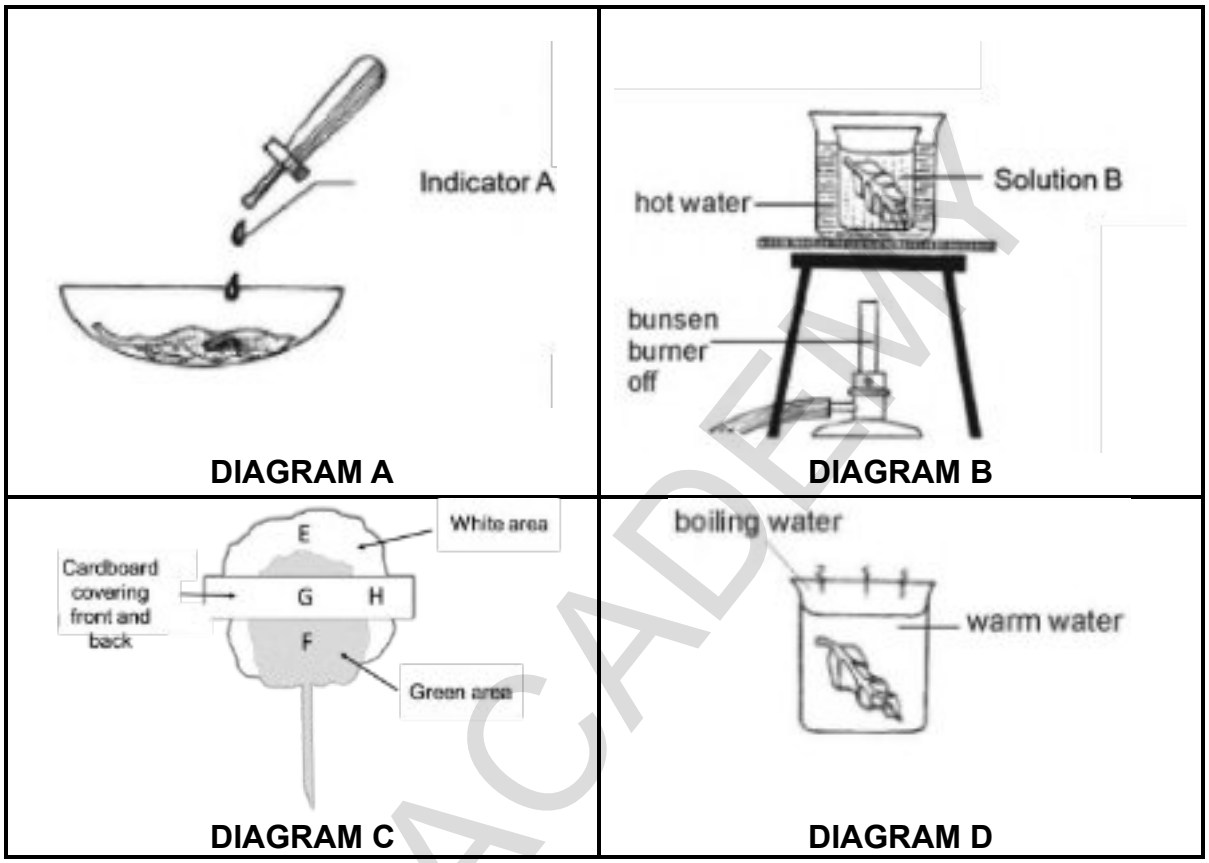
3.1.7 Explain how the migration of the eye of the flatfish is a beneficial adaptation. (2)
(14)

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3.2 A variegated leaf is characterised by irregular patterns of colouration, ranging from shades of green to white. This variation results in areas of the leaf having reduced or no chlorophyll content, leading to lighter-coloured patches on the leaf surface.

A variegated geranium plant was destarched for 24 hours. Then a strip of cardboard was placed over a leaf section on the plant and exposed to light for 24 hours.



3.2.1 Identify:

(a) Indicator **A** (1)

(b) The chemical in solution **B** (1)

3.2.2 Give the LETTER/s of the part/s n DIAGRAM **C**:

(a) that will test positive for starch (1)

(b) that will test negative for starch (3)

3.2.3 Arrange the diagrams in the correct sequence for a Starch test. (2)

3.2.4 Explain why solution **B** was used in the procedure. (2)

3.2.5 Explain why a variegated leaf was used in this investigation. (2)

3.2.6 Describe the effect of increasing light intensity on photosynthesis. (2)

(14)

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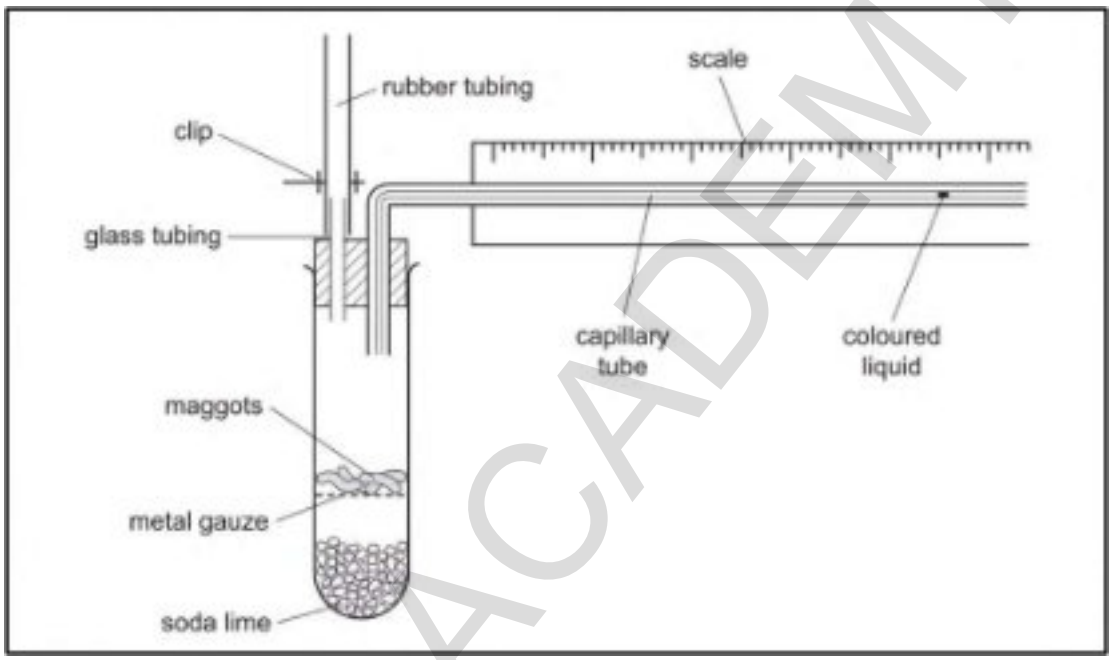
3.3 Flies lay eggs which hatch into larvae.

An investigation was carried out on the respiration rate of larvae.

The setup shows some living larvae in a large test tube.

- The apparatus was left to settle with the clip open.
- The clip was then closed, and a drop of coloured liquid was introduced into the open end of the capillary tube.

During the investigation, the drop of coloured liquid moved along the capillary tube towards the test tube.



[Source: Cambridge 2012, Practical]

3.3.1 What is meant by *respiration rate*? (2)

3.3.2 Describe a suitable control for this investigation. (1)

3.3.3 What is the function of the soda lime in this investigation? (1)

3.3.4 Explain how the movement of the coloured liquid in the capillary tube relates to the metabolic activity of the larvae. (2)

3.3.5 Tabulate TWO differences between photosynthesis and aerobic respiration. (5)

3.3.6 Describe the importance of lactic acid fermentation in muscle cells during strenuous physical activity. (3)
(14)

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3.4 Read the following extract on fermentation.

> Fermentation is a metabolic process in which microorganisms convert nutrients, typically carbohydrates, into alcohol and acids such as lactic acid and acetic acid. Humans have been using fermentation to change the nature of food products for centuries. Many foods you eat every day are formed through the process of fermentation. Some you may know and eat regularly include cheese, yoghurt, beer, and bread. Other products that are less common to many people include Kombucha, Miso, Kefir, Kimchi, Tofu, and Salami.

3.4.1 What is *fermentation*? (2)

3.4.2 Name the primary end products of fermentation mentioned in the text. (2)

3.4.3 Explain how humans use fermentation in the food industry. (2)

3.4.4 Give TWO examples of human-useable nonfood products that are produced by fermentation. (2)
(8)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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