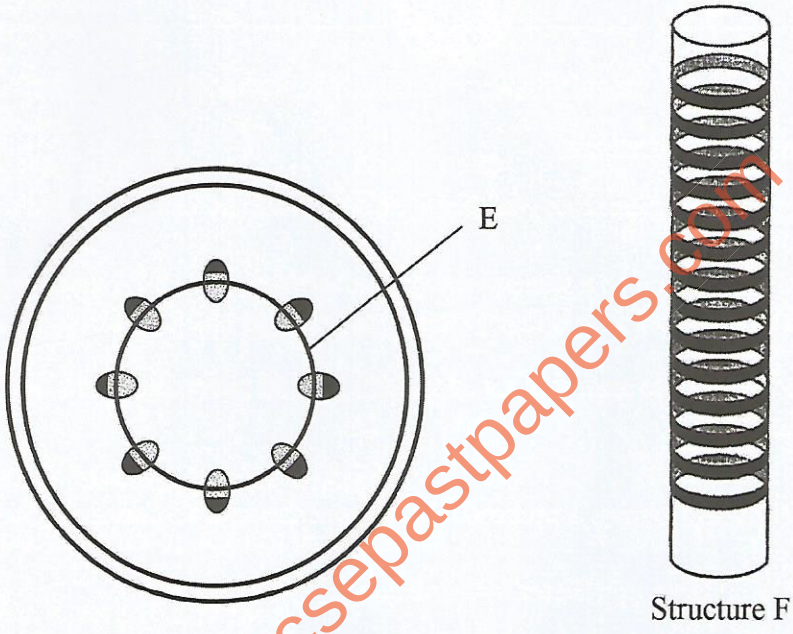
4.3 BIOLOGY (231)

4.3.1 Biology Paper 1 (231/1)

*Answer **all** the questions in the spaces provided.*

1. Explain why it is necessary for plants to have their leaves spread out. (2 marks)

2. The diagram below represents the transverse section through a young dicotyledonous stem and a structure, **F**, obtained from the same section.



Structure F

(a) (i) Identify the part labelled **E**. (1 mark)

(ii) State the function of the part labelled **E**. (1 mark)

(b) (i) Label the part **Z**, on the section from which structure **E** was obtained. (1 mark)

(ii) State **two** ways in which structure **E** is structurally adapted to its functions. (2 marks)

3. State **two** ways in which herbaceous plants obtain their mechanical support. (2 marks)

4. (a) Name the proteinous substance that makes up the exoskeleton of members of Phylum Arthropoda. (1 mark)

(b) State **two** functions of the exoskeleton. (2 marks)

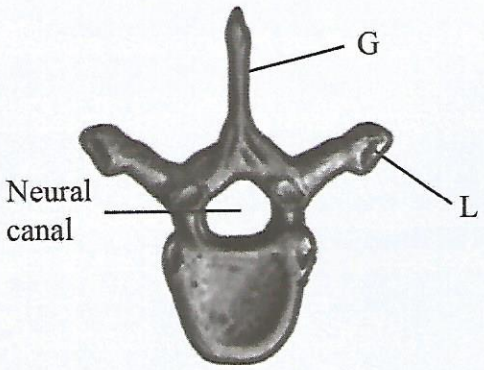
(c) State **one** disadvantage of the exoskeleton to members of Phylum Arthropoda. (1 mark)

5. Explain how each of the following structures adapt the fish to movement in water.

(a) Swim bladder (1 mark)

(b) head (1 mark)

6. The diagram below represents the anterior view of a mammalian vertebra.



(a) (i) Identify the vertebra. (1 mark)

(ii) Name the region of the vertebral column where the vertebra was obtained from. (1 mark)

(b) Name the part labelled **G**. (1 mark)

(c) Name the bone in the mammalian endoskeleton that articulates with the vertebra at the part labelled **L**. (1 mark)

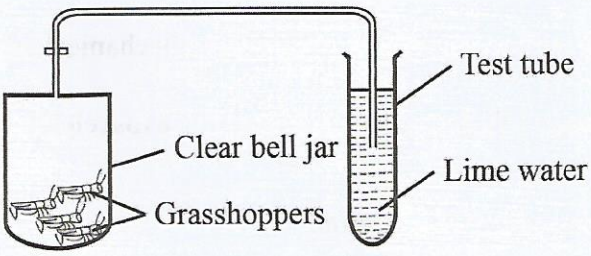
7. The word equation below shows a process that takes place in a certain living organism.

$$\text{Lactose} + \text{Water} \xrightarrow[K]{} \text{Substance J} + \text{Galactose}$$

(a) Name process **K**. (1 mark)

(b) State the importance of substance **J** in the living cells. (1 mark)

8. The setup below was used to demonstrate products of exhalation in grasshoppers. The setup was left undisturbed for 48 hours and observations made.



(a) (i) State the observation made in the test tube. (1 mark)

(ii) Account for the observation made in 8(a) (i). (2 marks)

(b) Explain the observation made in the test tube if similar setup included young growing plants in the jar containing grasshoppers at the beginning of the experiment. (2 marks)

9. State the difference between glycolysis and Kreb's cycle based on the following:

(a) Where they occur (1 mark)

(b) Amount of energy produced (1 mark)

10. (a) Distinguish between gaseous exchange and respiration. (2 marks)

(b) Explain the importance of algae in a pond. (2 marks)

11. State **two** advantages of an insect undergoing a complete metamorphosis process. (2 marks)

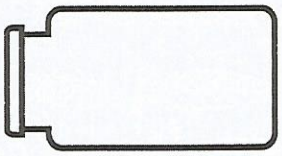
12. Complete the table below, outlining the differences between members of Class Diplopoda and Chilopoda based on the characteristics given. (3 marks)

Characteristic	Diplopoda	Chilopoda
(a) Body shape		
(b) Body segmentation		
(c) Number of legs per segment		

13. (a) State **two** reasons why the snake is classified as a reptile. (2 marks)

(b) Name the structure which enables Paramecium to move. (1 mark)

14. The diagram below represents an apparatus used to collect specimens for study.



(a) Identify the apparatus. (1 mark)

(b) State why it is advisable to have the apparatus illustrated above made of glass. (1 mark)

15. (a) State **two** activities that take place in the ovule of a flowering plant during fertilisation. (2 marks)

(b) State **two** functions of the seminal fluid in reproduction. (2 marks)

(c) Name the hormone that stimulates the contraction of muscles of the uterine wall during birth. (1 mark)

16. (a) Giving an example in each case, state the difference between internal and external fertilisation. (2 marks)

(b) State the agent of pollination in a maize plant. (1 mark)

17. Identify the response and receptor from the following list of sensory structures and processes:

- salivary gland
- smell of fried eggs
- olfactory cells
- salivation.

(a) Response (1 mark)

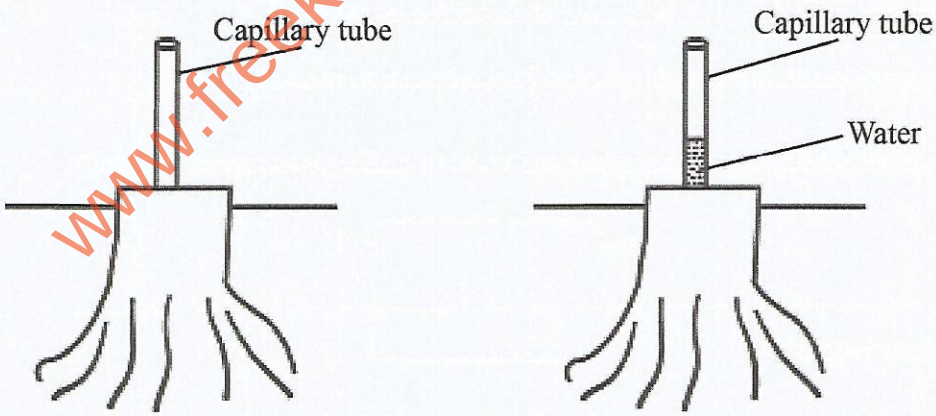
(b) Receptor (1 mark)

18. Explain how the knowledge of apical dominance is applied in agriculture. (2 marks)

19. (a) Explain why the population of people with sickle-cell anaemia is higher in malaria-prone areas. (2 marks)

(b) Explain why it is **not** advisable to put a patient on a drip of distilled water for rehydration. (3 marks)

20. (a) In an experiment, the stem of a plant was cut above the soil surface and a thin, transparent tube inserted immediately as shown below.

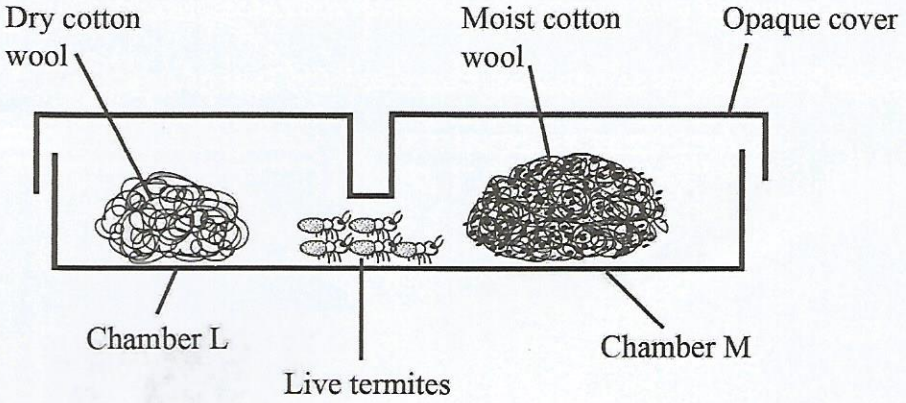


Start of experiment End of experiment

(a) Name the process by which mineral salts are absorbed from the soil. (1 mark)

(b) Account for the observation made at the end of the experiment. (3 marks)

21. In an experiment, live termites were placed at the junction between two interconnected chambers, **L** and **M** as shown below. Chamber **L** contained dry cotton wool and was covered by a transparent lid. Chamber **M** contained moist cotton wool and was covered with an opaque lid.



(a) (i) State the likely observation at the end of the experiment. (1 mark)

(ii) Explain **two** factors responsible for the observation in 21(a) (i). (2 marks)

22. State **one** function of each of the following parts of the mammalian movable joints:

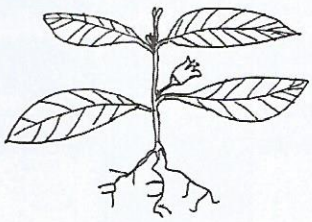
(i) Synovial membrane (2 marks)

(ii) Ligaments (1 mark)

23. A form of dwarfism called Achondroplasia is caused by a dominant gene (D) located on body chromosomes. Individuals who are homozygous (DD) for the condition do not survive. Those who are homozygous (dd) are of normal height, while heterozygous (Dd) are dwarfs. If two dwarfs married, work out the likely survival chances of their offspring. (4 marks)

24. Explain the difference in Basal Metabolic Rate (BMR) between a 55-year-old man and his 8-year-old grandson. (3 marks)

25. The illustration below represents a plant learners collected and drew during a field study.



With a reason, state the Division and Class to which the plant belongs:

(i) Division: ..... (1 mark)

Reason: ..... (1 mark)

(ii) Class: ..... (1 mark)

Reason: ..... (1 mark)

SECTION A (40 marks)

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

1. The photograph below shows an organism from a certain Class of organisms.

(a) (i) Name the Class to which the organism belongs. (1 mark)

(ii) Using observable features from the photograph, state **two** reasons for your answer in 1(a)(i). (2 marks)

(iii) State **two** ways in which the organism is important to the environment. (2 marks)

(b) (i) Name the Kingdom to which bacteria belong. (1 mark)

(ii) Name **two** bacterial diseases in human beings. (2 marks)

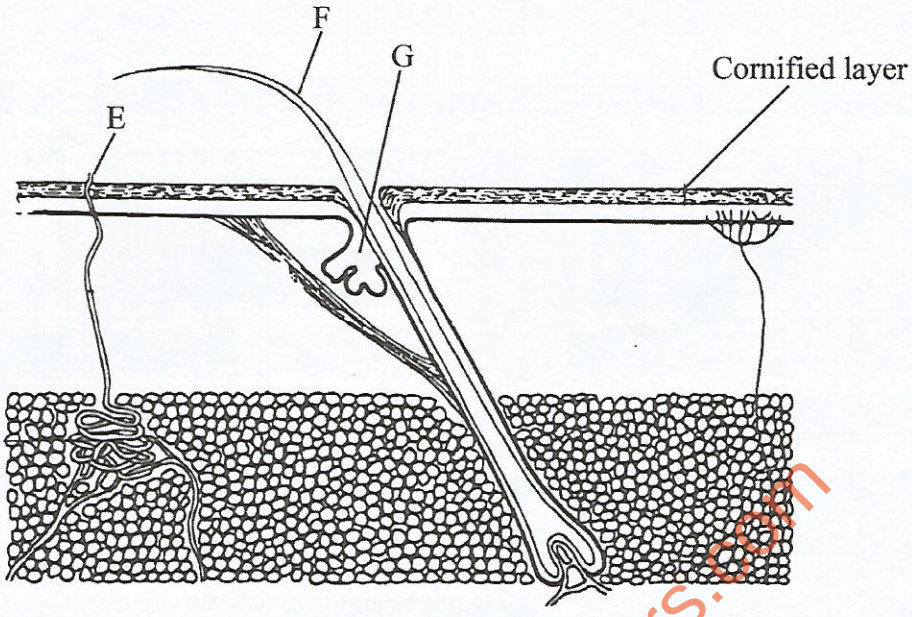
2. (a) State **two** adaptations of the frog's skin to gaseous exchange. (2 marks)

(b) Explain how the human nasal cavity is adapted to gaseous exchange. (3 marks)

(c) Explain why the amoeba does **not** require an elaborate gaseous exchange system. (2 marks)

(d) Name the respiratory disease caused by *Bordetella partusis*. (1 mark)

3. The diagram below shows a section through the mammalian skin.



(a) (i) Name the substance produced by the part labelled **G**. (1 mark)

(ii) State **two** functions of the substance named in 3(a)(i). (2 marks)

(b) Name the part labelled **E**. (1 mark)

(c) Explain the function of the part labelled **F** to the mammal. (2 marks)

(c) (i) Name **one** part of the human body where the cornified layer is thickest. (1 mark)

(ii) Give a reason for your answer in 3(c)(i). (1 mark)

4. (a) Two dogs with black fur mated and produced an offspring with both black and brown fur. Given letter **N** represents the gene for black fur, determine the phenotypic ratio of the offspring. (5 marks)

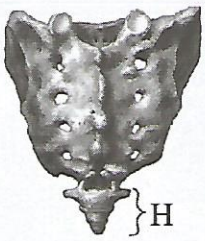
(b) The photographs below show a hairy pinna in a human ear.

(i) Explain why this trait is only found in males. (2 marks)

(ii) Name **one** other trait that only appears in males. (1 mark)

5. (a) State the role of sunlight in the formation of strong bones. (1 mark)

(b) The photograph below shows the dorsal view of a part of the mammalian vertebral column.



(i) Name the part of the vertebral column shown. (1 mark)

(ii) Name the part labelled **H**. (1 mark)

(iii) State **three** ways in which the vertebra shown is adapted to its functions. (3 marks)

(c) Explain the significance of movement in plants. (2 marks)

SECTION B (40 marks)

Answer question ***6 (compulsory)*** *and either question* ***7*** *or* ***8*** *in the spaces provided after question* ***8****.*

6. The table below shows the varying concentration of two hormones, progesterone and luteinizing hormone, determined at seven-day intervals during the human menstrual cycle.

Time in days	**1**	**7**	**14**	**21**	**28**
Concentration of progesterone (mg/cm^3 of blood)	2	2	24	100	20
Concentration of luteinizing hormone (mg/cm^3 of blood)	46	40	100	84	40

(a) On the same axis, draw graphs of concentration of hormones against time. (8 marks)

(b) (i) Name the physiological process taking place when the concentration of luteinizing hormone is highest. (1 mark)

(ii) State the significance of the process named in 6 (b) (i). (1 mark)

(c) (i) Determine the concentration of progesterone hormone at which the endometrium is thickest. (1 mark)

(ii) Explain your answer in 6(c)(i). (1 mark)

(d) State **two** roles of progesterone hormone in humans. (2 marks)

(e) Name **two** sites where progesterone hormone is produced in the human body. (2 marks)

(f) Name another hormone, apart from the luteinizing hormone, that inhibits the secretion of progesterone hormone. (1 mark)

(g) (i) Predict the concentration of progesterone hormone seen days after the study period if fertilisation did **not** take place. (1 mark)

(ii) Give a reason for your answer in 6(g)(i). (1 mark)

(h) Name the part of the human body where the luteinizing hormone is produced. (1 mark)

7. (a) Explain the role of the placenta during pregnancy. (10 marks)

(b) Explain features and mechanisms that hinder self pollination and self fertilisation. (10 marks)

8. (a) Describe how the xylem tissue is structurally adapted to its functions. (5 marks)

(b) Describe the functions of blood in the human body. (15 marks)

1. (a) You are provided with plant specimens labelled **E**, **F**, **G**, **H**, and **J**. Use the specimens to develop a dichotomous key that can be used to identify the plants from which they were obtained based on the following characteristics in the order they are given: (6 marks)

   (i) Leaf form

   (ii) Leaf venation

   (iii) Leaf colour

   (b) Account for the likely observation if fresh specimen **E** was exposed to light and tested for starch. (3 marks)

   (c) Explain **one** observable feature that adapts plants from which specimen **G** and **H** were obtained to a dry environment.

   G (2 marks)

   H (2 marks)

   (d) Besides leaf characteristics, state **one** other observable characteristic on the plant from which specimen **F** was obtained that enables it to be placed in its Class. (1 mark)

2. You are provided with solution **M** which is a food substance.

   Procedure

   (a) Using the reagents provided, test for the food substance present in substance **M** and complete the table below. (12 marks)

Food Test	Procedure	Observation	Conclusion

   (b) State **two** precautions one should observe while conducting the experiment in 2(a). (2 marks)

3. You are provided with specimen **N** and **P** which are plants of the same species grown under different conditions.

   (a) State **two** observable differences between the two specimens. (2 marks)

(b) (i) Name the phenomenon observed in specimen **N**. (1 mark)

(ii) Explain how the knowledge on the phenomenon named in b(i) is applied in agriculture. (2 marks)

(c) Account for the appearance of specimen **N**. (3 marks)

(d) State **two** other environmental factors necessary for seed germination apart from light. (2 marks)

(e) State **two** observable features on the specimens that make them be placed in the same Class. (2 mark)