

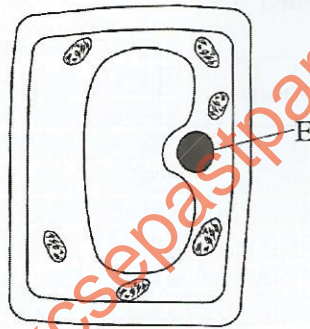
## 4.6 GENERAL SCIENCE (237)

## 4.6.1 General Science Paper 1 (237/1)

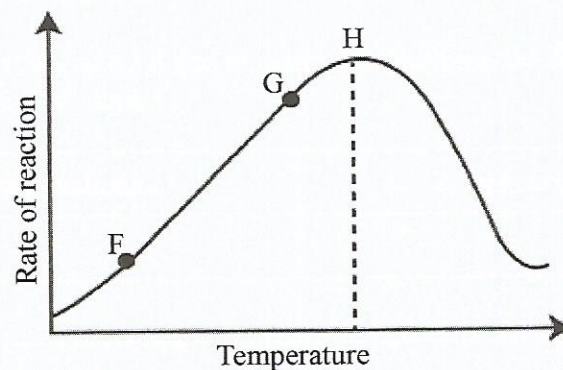
## SECTION A: BIOLOGY (34 marks)

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

1. Define the term entomology. (1 mark)
2. The scientific name of the common bean plant is *Phaseolus vulgaris*.
  - (a) State what *vulgaris* represents. (1 mark)
  - (b) Explain why the first name of the above plant starts with a capital letter. (1 mark)
3. The diagram below represents a cell.



- (a) Name the part labelled E. (1 mark)
  - (b) (i) State the organism from which the cell was obtained. (1 mark)
  - (ii) Give reasons for the answer in 3(b)(i). (2 marks)
4. State **three** factors that increase the rate of active transport. (3 marks)
  5. The graph below shows the effect of temperature on an enzyme catalysed reaction.

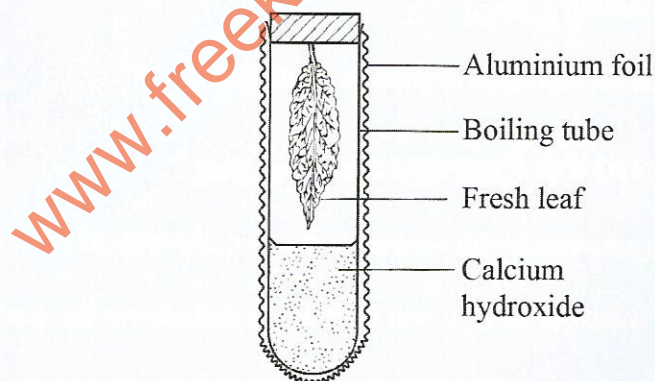


- (a) Account for the shape of the curve between points F and G. (2 marks)

- (b) State what point **H** represents. (1 mark)
- (c) Other than temperature, name **three** other factors that affect enzyme controlled reactions. (3 marks)
6. (a) State the meaning of each of the following:
- (i) Blood transfusion (1 mark)
- (ii) Agglutination (1 mark)
- (b) Complete the blanks to show blood donors and blood recipients in the table below. (4 marks)

Blood group	Can donate blood to	Can receive blood from
A	(i) _____	A, O
B	AB and B	(ii) _____
AB	(iii) _____	(iv) _____
O	A, B, AB, O	O

7. The diagram below was used to investigate the release of a certain gas by a plant.



- (a) State the reason for covering the boiling tube with aluminium foil. (1 mark)
- (b) Account for the observation made at the end of the experiment. (2 marks)



8. The following is an equation representing a certain physiological process.



- (a) Name the process represented by the equation. (1 mark)
- (b) If the respiratory quotient for the above equation is 0.7, state the food substrate used in the process. (1 mark)
9. The table below shows a description of the size of glomeruli and the length of renal tubules of animals in different habitats.

	Animal M	Animal N
Glomeruli	Small and numerous	Large and few
Renal tubule	Long	Short

- (a) Name a likely habitat for animal M. (1 mark)
- (b) (i) State the main nitrogenous waste produced by animal N. (1 mark)
- (ii) Give a reason for the answer in 9(b)(i). (1 mark)
10. (a) State **two** physiological changes that take place in a human skin to facilitate heat loss from the body. (2 marks)
- (b) State the function of sebum. (1 mark)
- (c) Give a reason why babies should be exposed to sunlight. (1 mark)

### SECTION B: CHEMISTRY (33 marks)

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

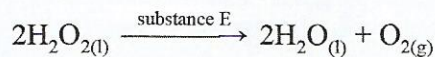
11. **Table 1** shows pH values of solutions A, B, C and D. Study it and answer the questions that follow.

**Table 1**

Solution	A	B	C	D
pH values	12.0	7.0	3.0	5.5

- (a) Identify the solution that:
- (i) reacts vigorously with magnesium. (1 mark)
- (ii) is likely to be lemon juice. (1 mark)
- (b) Name the type of reaction that occurs between solution A and solution C. (1 mark)

12. The following equation represents a method of preparing oxygen gas in the laboratory. Use it to answer the questions that follow:



- (a) Identify substance E. (1 mark)
- (b) Name the method used to collect oxygen gas. (1 mark)
- (c) State **two** uses of oxygen gas. (1 mark)
13. Equal volumes of water were heated using different types of flames as shown in **Figure 1**. Use it to answer the questions that follow.

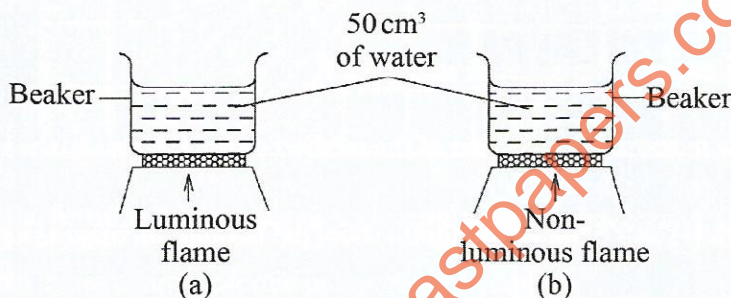
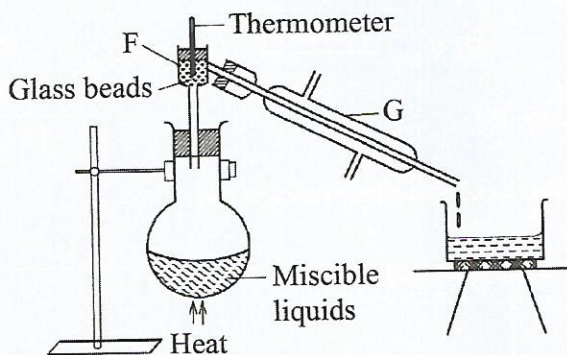


Figure 1

- (a) Identify the setup in which water boils first. (1 mark)
- (b) Explain the answer in 13(a). (2 marks)
14. (a) Define the term strong acid. (1 mark)
- (b) Two beakers, A and B, contain 10 cm³ of 1M hydrochloric and 10 cm³ of 1M ethanoic acid respectively. Equal masses of calcium carbonate were added to each of the beakers. Explain the observation made. (2 marks)

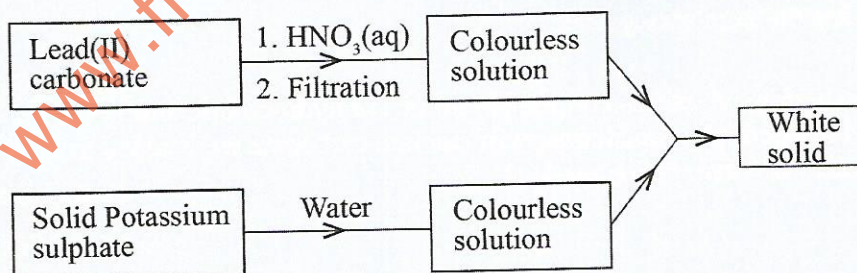


15. **Figure 2** shows a method used to separate miscible liquids. Use it to answer the questions that follow.



**Figure 2**

- (a) Name apparatus G. (1 mark)
- (b) State the use of glass beads in apparatus F. (1 mark)
- (c) Give **one** industrial application of the method of separation shown in **Figure 2**. (1 mark)
16. (a) Using dot (•) and cross (X) diagram show the bonding in magnesium oxide. (2 marks)
- (O = 8 , Mg = 12)
- (b) Diamond is a non-conductor of electricity. Give a reason. (1 mark)
17. **Figure 3** shows a method of preparing a salt. Study it and answer the questions that follow:



**Figure 3**

- (a) Write the formula of the white solid. (1 mark)
- (b) Give a reason for carrying out filtration in **Figure 3**. (1 mark)
- (c) Name the method of salt preparation shown in **Figure 3**. (1 mark)

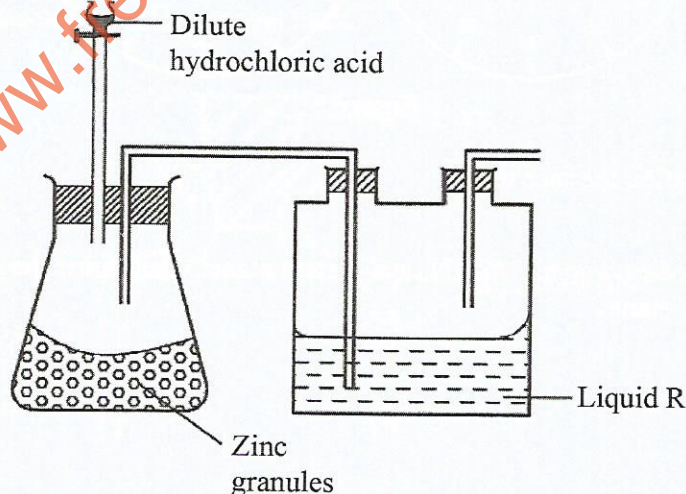


18. (a) Define the term non-electrolyte. (1 mark)
- (b) Name the product formed at the anode during electrolysis of molten lead (II) bromide. (1 mark)
- (c) State **one** major precaution that should be taken during the experiment in 18(b). (1 mark)
19. **Table 2** shows part of the periodic table. Use it to answer the questions that follow. (The letters do not represent the actual symbols of the element).

**Table 2**

V						Q	X
	W						
Y							

- (a) Write the formula of the compound formed when W reacts with Q. (1 mark)
- (b) Element Y has a larger atomic radius than V. Explain. (1 mark)
- (c) Give **one** use of element X. (1 mark)
20. **Figure 4** is a setup for the preparation of hydrogen gas. Study it and answer the questions that follow.



**Figure 4**

- (a) (i) Complete the setup in **Figure 4** to show how a sample of hydrogen gas is collected. (1 mark)
- (ii) Identify liquid R. (1 mark)
- (b) Write a chemical equation for the reaction taking place in **Figure 4**. (1 mark)



21. The electron arrangement of elements represented by letters S, T, U and J are as follows:

$$S = 2.8, T = 2.8.8.2, U = 2.8.8.1 \text{ and } J = 2.7$$

- (a) Select a letter representing an element which forms:
- (i) an anion (1 mark)
- (ii) a soluble carbonate (1 mark)
- (b) Identify a letter representing an element with the smallest atomic radius. (1 mark)

### SECTION C: PHYSICS (33 marks)

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

22. State the area under which the flow of charges is studied in Physics. (1 mark)
23. Figure 5 shows a stop watch clock used during a race. Figure 5 (a) shows the reading on the clock at the beginning of the race while Figure 5 (b) shows the reading at the end of the race.

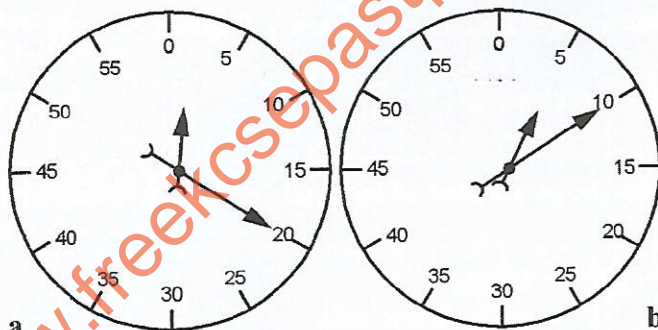


Figure 5

Determine the duration the race took. (2 marks)

24. An object of mass 6 kg weighs 148.8 N on a certain planet. Determine the gravitational field strength ( $g$ ) of the planet. (3 marks)

25. Figure 6 shows a measuring cylinder inverted in a beaker containing some water.

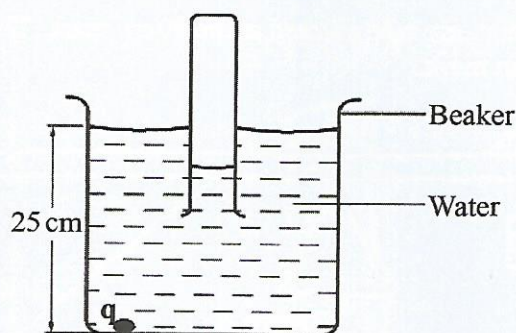


Figure 6

- (a) State the reason why the level of the water in the measuring cylinder is lower than that in the beaker. (1 mark)
- (b) Determine the pressure exerted by the water at point q. (density of water =  $1 \text{ g cm}^{-3}$  and  $g = 10 \text{ N kg}^{-1}$ ) (3 marks)
26. State why it is difficult to compress solids. (1 mark)
27. (a) State the purpose of the constriction in a clinical thermometer. (1 mark)
- (b) State **two** instances where alcohol would be preferred over mercury as a thermometer liquid. (2 marks)
28. Figure 7 shows a section of a thermos flask.

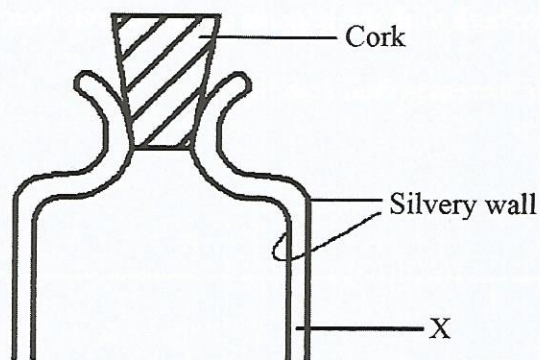


Figure 7

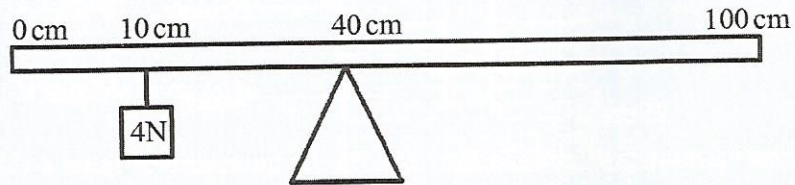
- (a) Identify the part labelled X. (1 mark)
- (b) State the function of each of the following:
- (i) Cork (1 mark)



(ii) Silver wall

(1 mark)

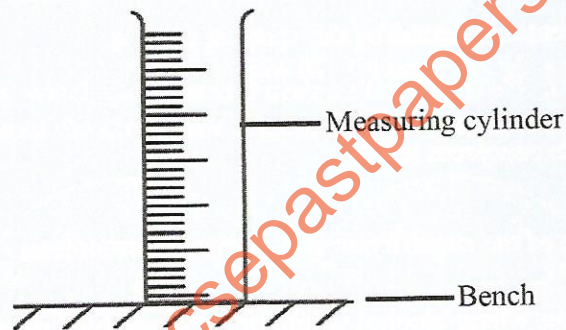
29. **Figure 8** shows a uniform metre rule pivoted at the 40 cm mark. The rule is balanced by a force of 4 N suspended at 10 cm mark.

**Figure 8**

Determine the weight of the rule.

(3 marks)

30. **Figure 9** shows an empty measuring cylinder placed on a horizontal bench.

**Figure 9**

- (a) Identify its state of equilibrium.

(1 mark)

- (b) Modern buses are built with the luggage compartments below the passenger seats.

Explain how this increases their stability.

(2 marks)

31. Figure 10 shows a graph of force against extension obtained when a helical spring was used to investigate Hooke's law.

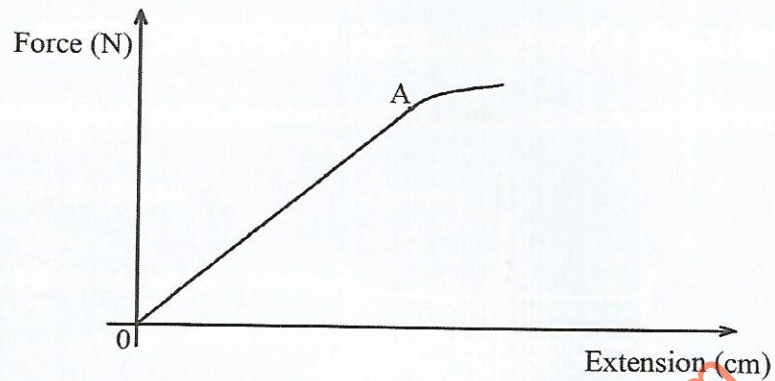


Figure 10

It was observed that after point A, the spring does not obey Hooke's law. Explain this observation.

(2 marks)

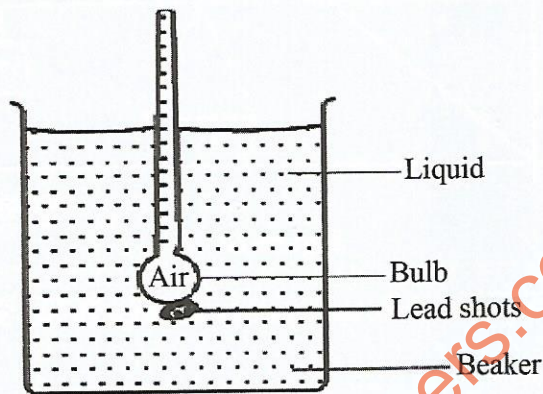
32. On the axis provided, sketch a *velocity-time* graph for a body moving with a uniform velocity of  $10 \text{ ms}^{-1}$ .

(2 marks)





33. State *Newton's third law* of motion. (1 mark)
34. A dry cell is used to light a bulb. State the energy transformation that occur. (2 marks)
35. **Figure 11** shows a hydrometer that can be used to measure densities of liquids.



**Figure 11**

Explain what would be observed when the size of the bulb is reduced without changing the mass. (3 marks)

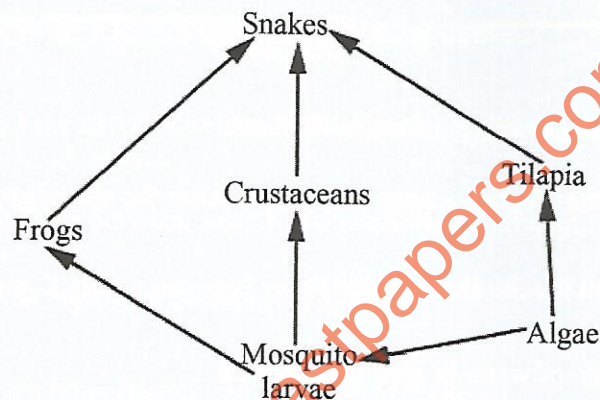
## 4.6.2 General Science Paper 2 (237/2)

## SECTION A: BIOLOGY (34 marks)

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

1. (a) Define the term symbiosis. (1 mark)
- (b) What are xerophytes? (1 mark)

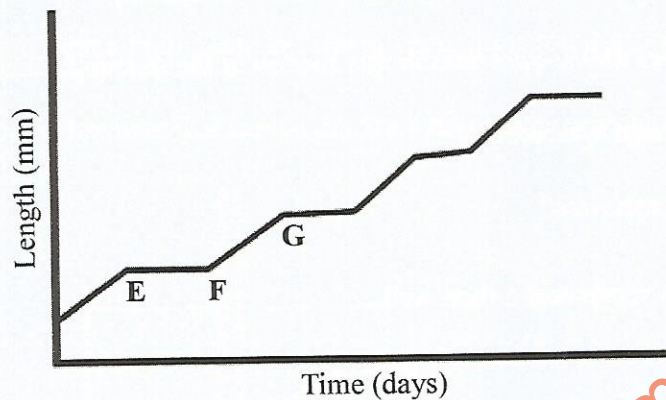
2. The diagram below represents a food web.



- (a) Name the ecosystem from which the food web was constructed. (1 mark)
  - (b) Identify the producer in the above food web. (1 mark)
  - (c) Write the food chain in which the snake is a secondary consumer. (1 mark)
  - (d) State the immediate effect of removing tilapia from the ecosystem. (1 mark)
3. (a) What are the functions of each of the following parts of the male reproductive system:
    - (i) Epididymis (1 mark)
    - (ii) Seminal vesicles (1 mark)
  - (b) Name the causative agent of syphilis. (1 mark)

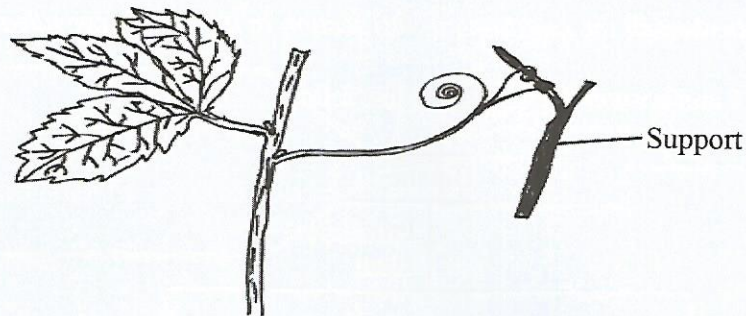


4. The curve below shows a growth pattern observed in a certain organism.

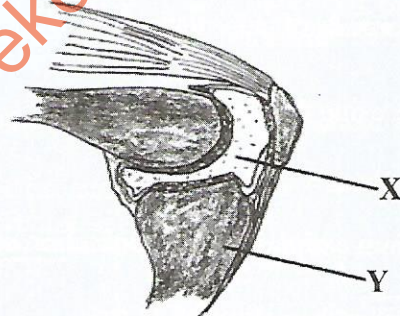


- (a) (i) State the growth pattern shown above. (1 mark)
- (ii) Name the phylum whose members exhibit the above growth pattern. (1 mark)
- (iii) Account for the shape of the curve between points E and F. (1 mark)
- (b) Explain the role of water in seed germination. (2 marks)
5. (a) Define each of the following terms:
- (i) Hybrid vigour (1 mark)
- (ii) Mutagen (1 mark)
- (b) The gene for chlorophyll formation in maize causes the plant to be colourless when in homozygous recessive condition. Such plants die after their seed food reserves are used up. In the heterozygous state the plant survives.
- (i) Why does the homozygous recessive plant die? (1 mark)
- (ii) Let the gene for normal chlorophyll be **R** and that of the mutant recessive gene be **r**. Two pale green heterozygous plants were crossed. What were the genotypes of the offsprings? Show your working. (3 marks)

6. (a) The figure below shows a tendril of a plant growing around a supportive structure.



- (i) What is the name of the response shown above? (1 mark)
- (ii) Explain the survival values of the above response to a plant. (2 marks)
- (b) State the difference between simple and conditioned reflexes. (2 marks)
- (c) State the role of thyroxine hormone in humans. (1 mark)
7. Differentiate between homologous and analogous structures. (2 marks)
8. The diagram below represents bones at a joint found in the hind limb of a mammal.



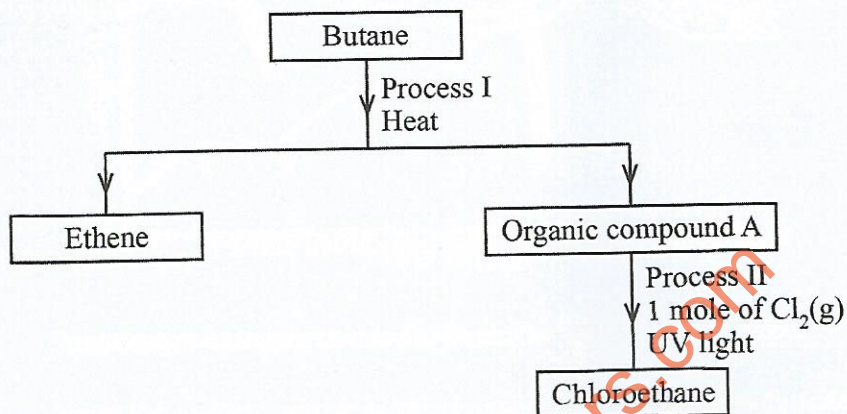
- (a) Name the bone labelled Y. (1 mark)
- (b) (i) Name the substance found in the part labelled X. (1 mark)
- (ii) State the function of the substance named in 8(b)(i). (1 mark)
9. State the importance of reproduction. (1 mark)
10. Explain what happens to the placenta after birth. (2 marks)



**SECTION B: CHEMISTRY (33 marks)**

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

11. Study **Figure 1** and answer the questions that follow.



**Figure 1**

- (a) Name:
- (i) Process I (1 mark)
- (ii) Organic compound A (1 mark)
- (b) Draw the structural formula of chloroethane. (1 mark)
12. Iron is extracted from its ore using the blast furnace.
- (a) Name the main ore of iron. (1 mark)
- (b) Give the role of calcium carbonate in the extraction of iron. (1 mark)
- (c) State a major pollutant in the extraction of iron. (1 mark)
- (d) State **one** use of steel. (1 mark)

13. Figure 2 represents part of the contact process. Use it to answer the questions that follow.

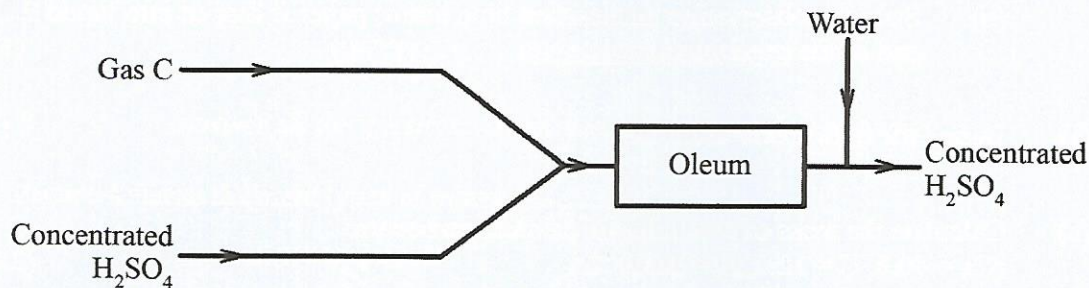


Figure 2

- (a) Identify gas C. (1 mark)
- (b) Name the catalyst used in the process in Figure 2. (1 mark)
- (c) Give two uses of sulphuric(VI) acid. (1 mark)
14. (a) State the method used in the extraction of aluminium metal. (1 mark)
- (b) Give two physical properties of aluminium metal. (2 marks)
15. A gas occupies a volume of  $60 \text{ cm}^3$  at  $20^\circ\text{C}$  and  $760 \text{ mmHg}$  pressure. Calculate its volume when the temperature is  $15^\circ\text{C}$  and at a pressure of  $720 \text{ mmHg}$ . (3 marks)
16. Figure 3 shows the preparation of chlorine gas. Study it and answer the questions that follow.

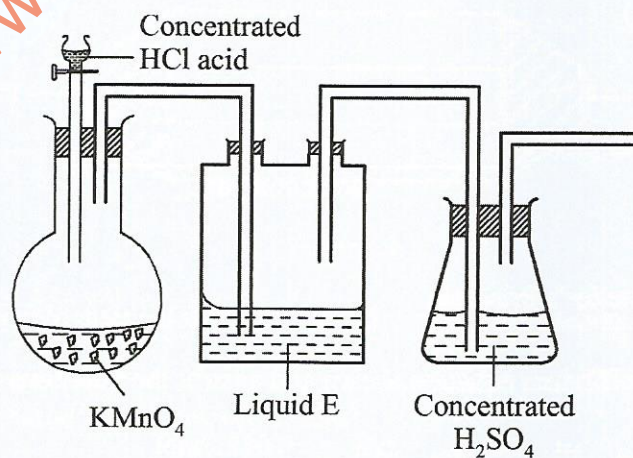
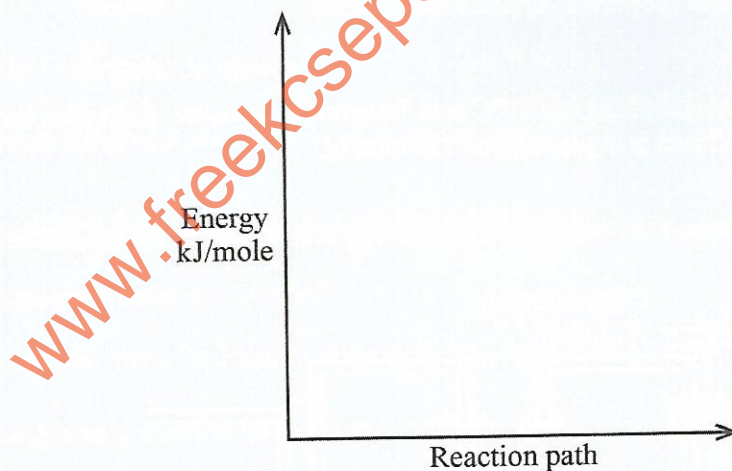
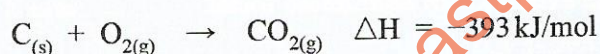


Figure 3

- (a) Complete Figure 3 to show how dry chlorine gas is collected. (1 mark)



- (b) (i) Identify liquid E. (1 mark)
- (ii) State the observation made when blue litmus paper is dipped into liquid E at the end of the experiment. (1 mark)
17. (a) Define the term molar solution. (1 mark)
- (b) Calculate the mass of 0.4 moles of calcium carbonate. (2 marks)  
(Ca = 40.0, C = 12.0, O = 16.0)
18. (a) Dilute hydrochloric acid reacts faster with zinc powder than with zinc granules. Explain. (2 marks)
- (b) Write a chemical equation for the reaction between zinc metal and dilute hydrochloric acid. (1 mark)
19. (a) Define the term enthalpy of combustion. (1 mark)
- (b) On the grid provided draw an energy level diagram for the equation. (2 marks)



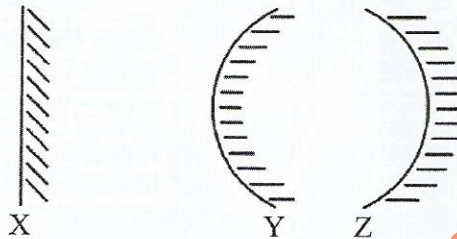
20. (a) State Le Chatelier's Principle. (1 mark)
- (b) Study the equilibrium equation shown and answer the questions that follow. (1 mark)
- $$2G_{2(g)} + X_{2(g)} \rightleftharpoons 2G_2X_{(g)} \quad \Delta H = -104 \text{ kJ/mol}$$
- State the effect on the position of equilibrium if:
- (i) pressure is decreased (1 mark)
- (ii) temperature is increased (1 mark)

21. State **two** factors to consider when choosing a fuel. (2 marks)

**SECTION C: PHYSICS (33 marks)**

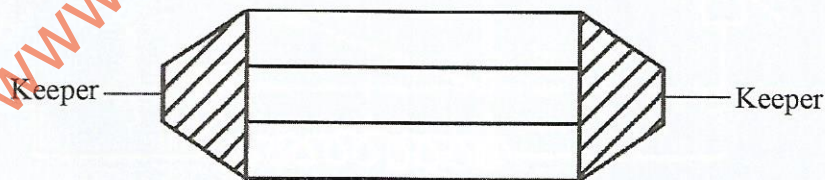
*Answer all the questions in this section in the spaces provided.*

22. Figure 4 shows different types of mirrors; X, Y and Z.



**Figure 4**

- (a) Identify Y and Z. (2 marks)
- (b) State **two** characteristics of the image formed by X. (2 marks)
23. State **two** maintenance practices that should be carried out on a lead acid accumulator. (2 marks)
24. It is observed that when a plastic ruler is rubbed with a dry piece of cloth, it becomes charged. Explain why charging may **not** be possible if the ruler is rubbed with a wet piece of cloth. (2 marks)
25. Figure 5 shows how two bar magnets can be stored.



**Figure 5**

- (a) State a suitable material that can be used to make the keepers. (1 mark)
- (b) State the reason for the answer in 25(a). (1 mark)



26. (a) State the meaning of the term *amplitude* as used in waves. (1 mark)
- (b) Figure 6 shows a *displacement – time* graph of a wave particle.

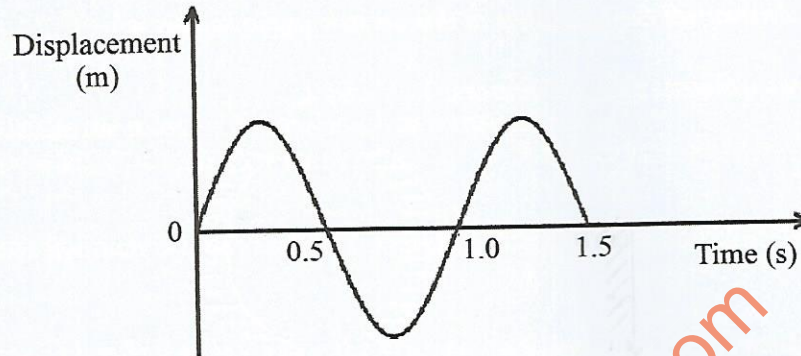


Figure 6

- State the period of the wave. (1 mark)
27. State two factors that affect the speed of sound in air. (2 marks)
28. Figure 7 shows an incomplete circuit diagram which is to be used to investigate the relationship between the current through a wire and the potential difference across it.

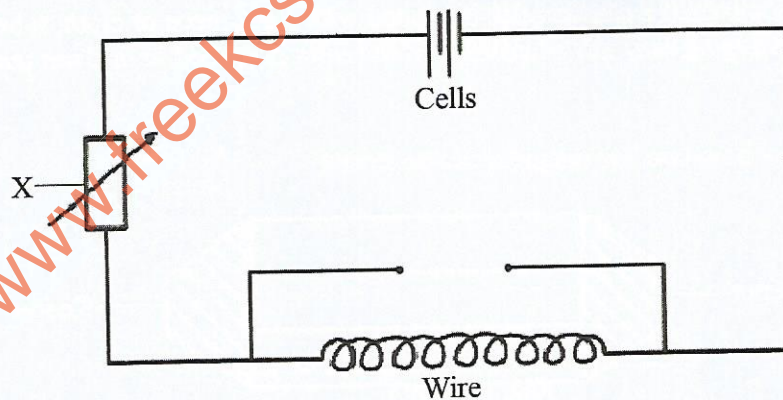
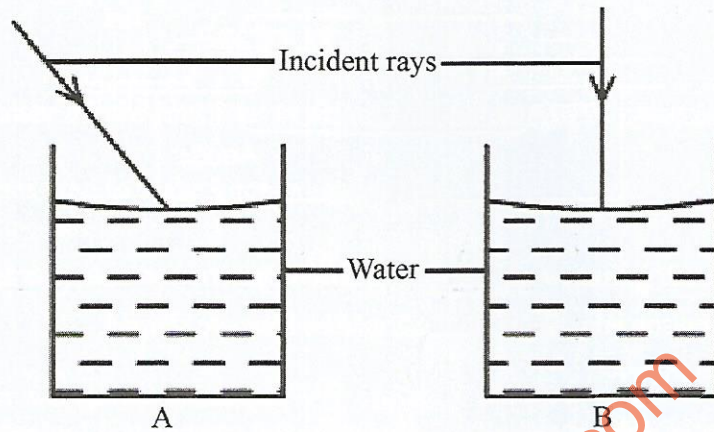


Figure 7

- (a) Complete the diagram by inserting the missing components. (2 marks)
- (b) State the name of the circuit component X. (1 mark)
29. State two factors that determine the quantity of heat produced by the heating element in an electric kettle. (2 marks)
30. A trader uses 2 kW water heater for 4 hours per day. Determine the number of units of energy consumed per day by the trader. (3 marks)

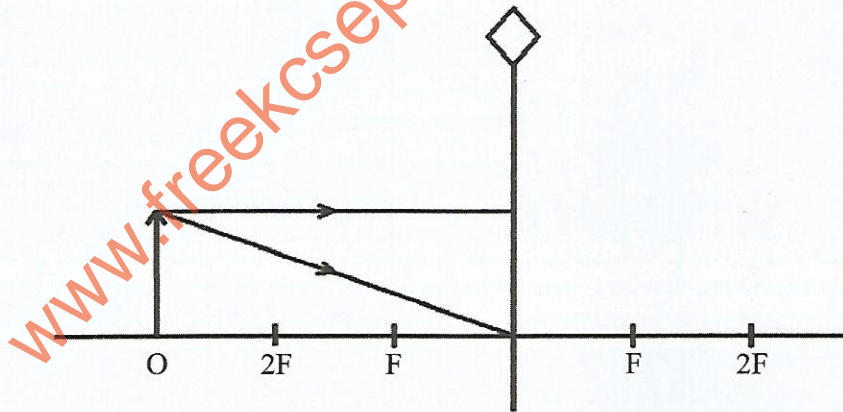
31. **Figure 8** shows two beakers A and B containing some water. A ray of light is incident on the surfaces of water in the beakers.



**Figure 8**

Complete the diagrams by drawing the paths of the rays in the water. (2 marks)

32. **Figure 9** shows two rays from an object O and incident on a converging lens whose principle focus is at F.



**Figure 9**

Complete the ray diagram to show the position of the image I. (2 marks)

33. State what is meant by the term *Cathode rays*. (1 mark)



34. Figure 10 shows an x-ray tube.

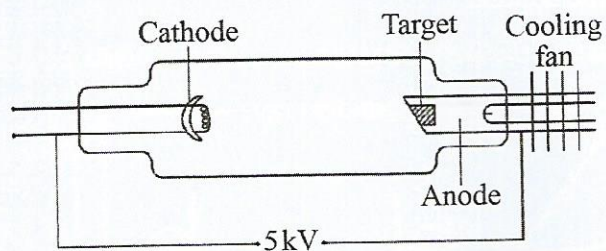


Figure 10

- (a) State the reason why the cathode should be concave shaped. (1 mark)
- (b) The potential difference between the anode and cathode was increased from 5 kV to 32 kV during operation. State the effect on the nature of the x-rays produced. (1 mark)
35. State two properties of alpha particles. (2 marks)
36. Figure 11 shows a cell, a bulb and a semiconductor in series.

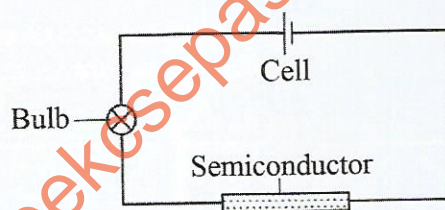


Figure 11

It was observed that when the temperature of the semiconductor was increased, the bulb started to light. State the reason for this observation. (2 marks)