

### 3.6 GENERAL SCIENCE (237)

General science was tested for the first time in the year 2010. It is composed of two theory papers, Paper one and paper two. Each paper has three sections A, B and C. Section A is composed of Biology questions with 34 marks, section B Chemistry questions with 33 marks and section C Physics questions with 33 marks. Each of the papers is marked out of 100 marks.

#### CANDIDATES OVERALL PERFORMANCE

The overall performance of candidates in General Science in the years 2010, 2011 and 2012 is as shown in the table below.

**Table 13: Candidates overall Performance in the Years 2010, 2011 and 2012**

year	paper	candidature	Maximum score	Mean score	Standard deviation
2010	<b>Paper 1</b>	1211	100	13.77	25.44
	<b>Paper 2</b>	1211	100	11.97	08.87
	<b>overall</b>	<b>1211</b>	<b>200</b>	<b>25.44</b>	<b>16.94</b>
2011	Paper 1	1245	100	12.84	10.12
	Paper 2	1245	100	9.68	7.91
	<b>Overall</b>	<b>1245</b>	<b>200</b>	<b>22.42</b>	<b>17.29</b>
2012	Paper 1	1285	100	13.93	10.61
	Paper 2	1285	100	9.46	8.92
	<b>Overall</b>	<b>1285</b>	<b>200</b>	<b>23.34</b>	<b>18.71</b>

**From the table it can be observed that:**

- (i) The candidature of General Science increased slightly in 2012 compared to 2010 and 2011 though it was still very low.
- (ii) Paper one performance was fair compared to paper two which is also indicated by an improved standard deviation.
- (iii) There was a slight improvement on overall performance in 2012 when compared to 2011.
- (iv) Generally, the subject was poorly performed since the mean was very low.

The following is a discussion of some of the questions that candidates had difficulties in responding to.

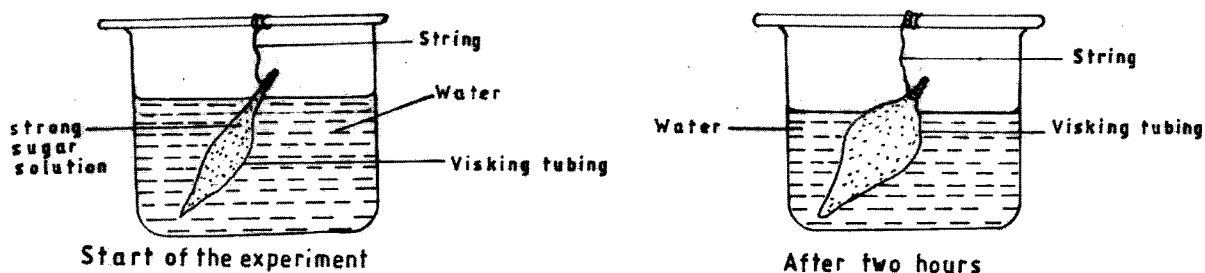
### 3.6.1 General Science Paper 1 (237/1)

#### SECTION A: BIOLOGY

In paper one biology section, candidates had difficulties responding to question numbers 3, 4, 6 and 8.

##### Question 3

The diagrams below illustrate a set-up that form one students used to demonstrate a certain physiological process and the result after two hours.



- (a) Name the physiological process that was being demonstrated. (1 mark)
- (b) Explain the observation made after two hours. (3 marks)

Using diagrams illustrating an experimental set-up, candidates were supposed to identify a physiological process and account for the observation.

##### Weaknesses

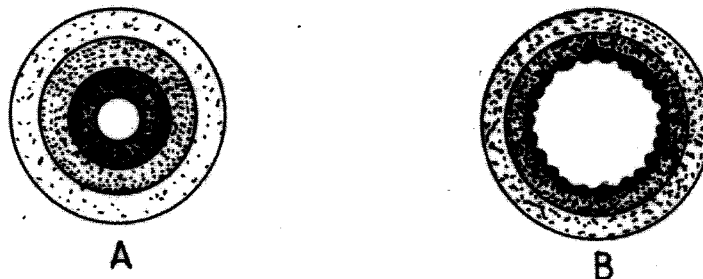
Candidates confused the various physiological processes. They also confused the terms hypertonic and hypotonic solutions.

##### Expected response

- (a) Osmosis; (1 mark)
- (b) Visking tube bulged because sugar solution is hypertonic; and distilled water is hypotonic; therefore water molecules moved into the visking tube by osmosis; (3 marks)

##### Question 4

The diagrams below represent cross sections of human blood vessels.



- (a) (i) Name the blood vessel labelled A. (1 mark)  
 (ii) Give a reason for your answer in (a) (i) above. (1 mark)
- (b) How is the blood vessel labelled B adapted to its function? (2 marks)

From given diagrams, candidates were supposed to identify blood vessels giving reasons. They were also to state the adaptations of a blood vessel to its function.

### Weaknesses

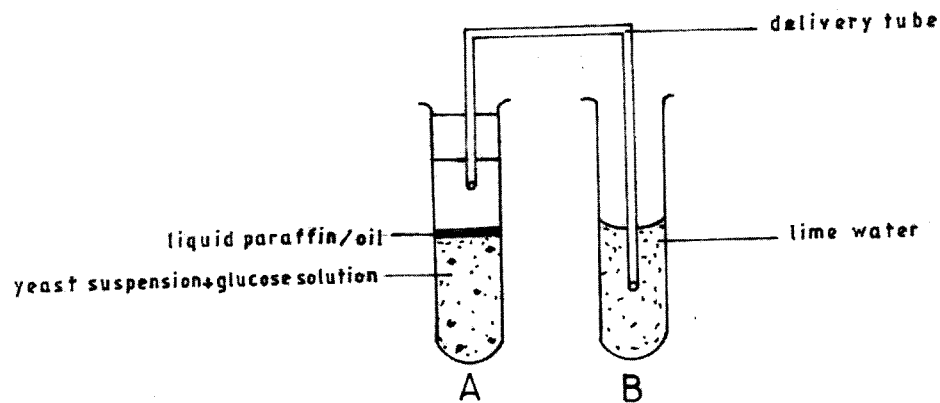
Candidates interchanged the blood vessels and seemed not to know their cross sections. They also didn't bring out the adaptations of vessel asked to its function.

### Expected response

- (a) (i) Artery;  
 (ii) Thick walled/ small lumen; (2 marks)
- (b) Have valves; to prevent backflow of blood;  
 Has large lumen/ is lined with smooth muscles; to facilitate smooth flow of blood; (2 marks)

### Question 6

The diagram below shows an experimental set-up to demonstrate a biological process.



- (a) Name the process being demonstrated. (1 mark)
- (b) State the observations made during the demonstration. (2 marks)

From the diagram, candidates were supposed to identify a certain biological process.

### Weaknesses

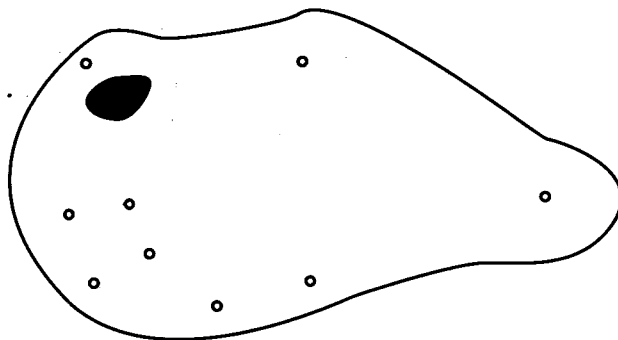
Candidates confused aerobic and anaerobic respiration.

### Expected response

- (a) Fermentation/ anaerobic respiration; (1 mark)  
(b) Lime water turns white/ white precipitate is formed; air bubbles produced; (2 marks)

### Question 8

Complete and label the drawing below to make it appear like that of a typical plant cell as seen under a light microscope. (3 marks)

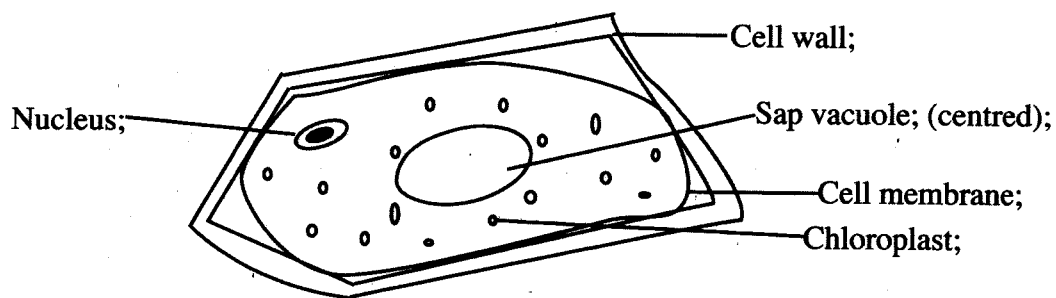


Candidates were supposed to complete and label a drawing to make it appear like a typical plant cell as seen under a light microscope.

### Weaknesses

Candidates showed organelles seen under an electron microscope.

### Expected response



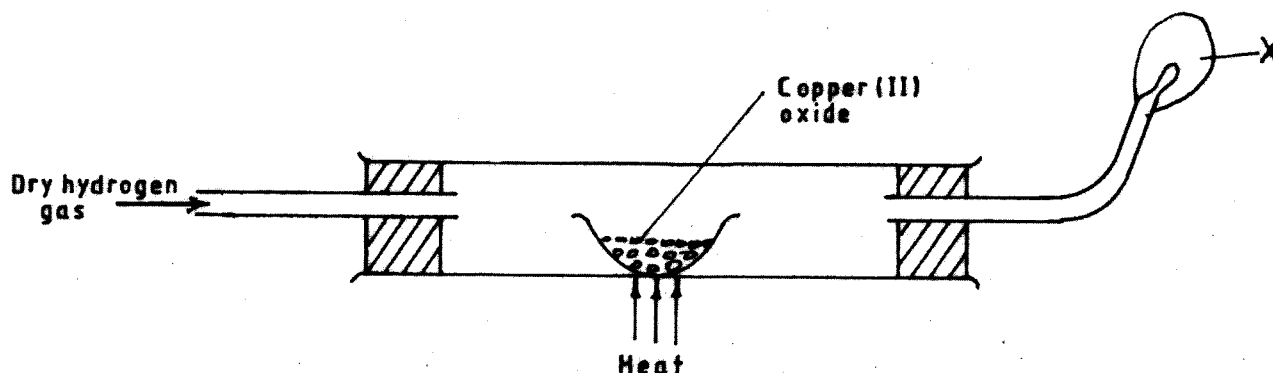
(3 marks)

## SECTION B: CHEMISTRY

In paper 1 Chemistry section, the questions that challenged most candidates were numbers 13 (a), 15 (b), 16, 18 and 19.

### Question 13 (a)

The diagram below shows a reduction - oxidation process. Study it and answer the questions that follow.



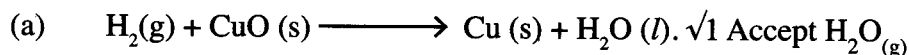
- (a) Write an equation for the reaction between dry hydrogen gas and hot copper (II) oxide. (1 mark)

Candidates were required to write an equation for the reaction of dry hydrogen and hot copper (II) oxide.

#### Weaknesses

Most candidates wrote a word equation instead of a chemical equation. They were unable to differentiate between **word equations** and **chemical equations**.

#### Expected response



### Question 15 (b)

- (b) Explain why element S is non-reactive. (1 mark)

The question required candidates to explain why element S was non - reactive.

#### Weaknesses

Most candidates could not identify the group to which element S belongs hence they could not know why it is non - reactive.

#### Expected responses

- (b) S because its outermost energy level has the maximum number of electrons (octet) hence stable/has the outermost energy level filled.  $\sqrt{1}$

### Question 16

- (a) Water hardness is classified as either temporary or permanent. What are the causes of permanent hardness in water? (2 marks)
- (b) How is temporary water hardness commonly removed? (1 mark)

Candidates were required to:

- State the causes of permanent water hardness;
- State how temporary water hardness is commonly removed.

### Weaknesses

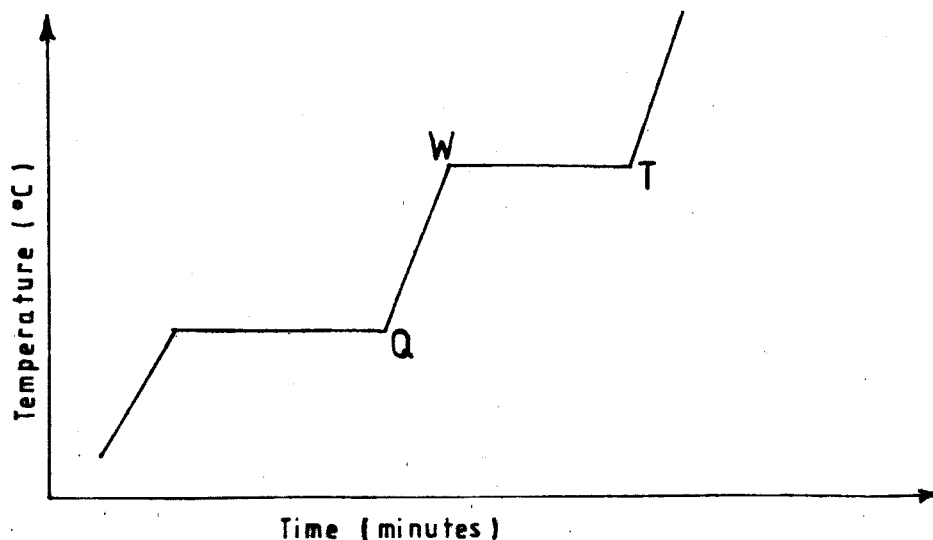
Candidates had no idea on the causes of permanent hardness in water and the common method used to remove temporary water hardness.

### Expected Responses

- (a) Mainly caused by sulphates ( $\text{SO}_4^{2-}$ ) of either  $\text{Mg}^{2+}$  or  $\text{Ca}^{2+}$  /dissolved  $\text{MgSO}_4$ ,  $\text{CaSO}_4$  or  $\text{MgCl}_2$  and  $\text{CaCl}_2$ . (2 marks)
- (b) Boiling. (1 mark)

### Question 18

The graph below shows variation of temperature when ice is heated over a period of time.



- (a) Using kinetic theory, explain the changes between points:
- (i) Q and W ..... (1½ marks)
- (ii) W and T ..... (1½ marks)
- (b) Name the apparatus that can be used to separate a mixture of water and oil. (1 mark)

Candidates were required to explain using **kinetic theory** the changes between points on a graph of variation of temperature when ice is heated over a period of time.

### Weaknesses

Candidates had limited knowledge kinetic theory of matter hence they could not explain the changes.

### Expected Responses

- (a) (i) The water molecules absorb heat energy  $\sqrt{\frac{1}{2}}$  increasing their kinetic energy  $\sqrt{\frac{1}{2}}$  resulting in increased collisions among molecules  $\sqrt{\frac{1}{2}}$ . (1½ marks)
- (ii) The energy absorbed  $\frac{1}{2}$  by the water molecules is used to break the intermolecular forces  $\sqrt{\frac{1}{2}}$  making water molecules to change to vapour  $\sqrt{\frac{1}{2}}$ . (1½ marks)
- (b) Separating funnel/ burette/dropping funnel. (1 mark)

### Question 19

- a) Using dot (•) and cross (X) diagram, illustrate the type of bonding in carbon (IV) oxide (Atomic numbers: C = 6; O = 8). (2 marks)
- (b) Give a reason why graphite conducts electricity. (1 mark)

Candidates were required to:

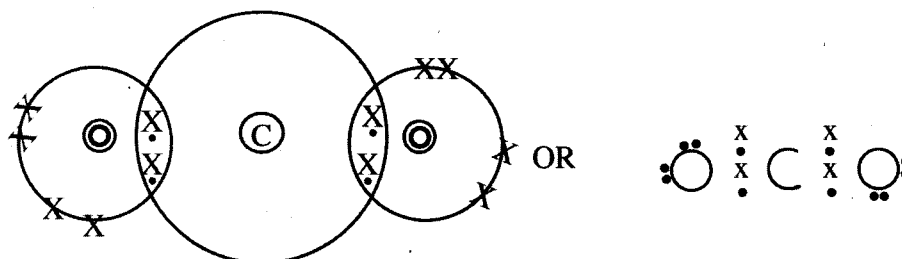
- use dot(.) and cross(x) diagram to illustrate the bonding in carbon (IV) oxide
- Give a reason why graphite conducts electricity.

### Weaknesses

Majority of the candidates did not know how to use valency electrons in carbon and oxygen to show the bonding.

### Expected Responses

19. (a)



(2 marks)

- (b) Graphite has delocalised electrons/mobile electrons.

(1 mark)

## SECTION C: PHYSICS

The physics section of general science was poorly performed. Most candidates left the entire section blank, a few who attempted scored very low. This showed a lack of preparedness on the candidates in physics. The questions and marking scheme provided in part II of this report will assist future candidates in preparing for the physics examination, below is a discussion of the questions which were poorly performed.

### Question 26

When one end of a metal is heated, the other end gets hot. Explain this observation. (2 marks)

Candidates were required to explain why when one end of a metal is heated the other end gets hot.

#### Weakness

Most candidates lacked knowledge on transfer of heat through metals.

#### Expected response

Heated molecules vibrate faster and make the neighbouring molecules to also vibrate faster. (2 marks)  
Vibration is relayed to other molecules in the solid hence conduction of heat.

### Question 29

Figure 6 shows a graph of force against extension for a spring.

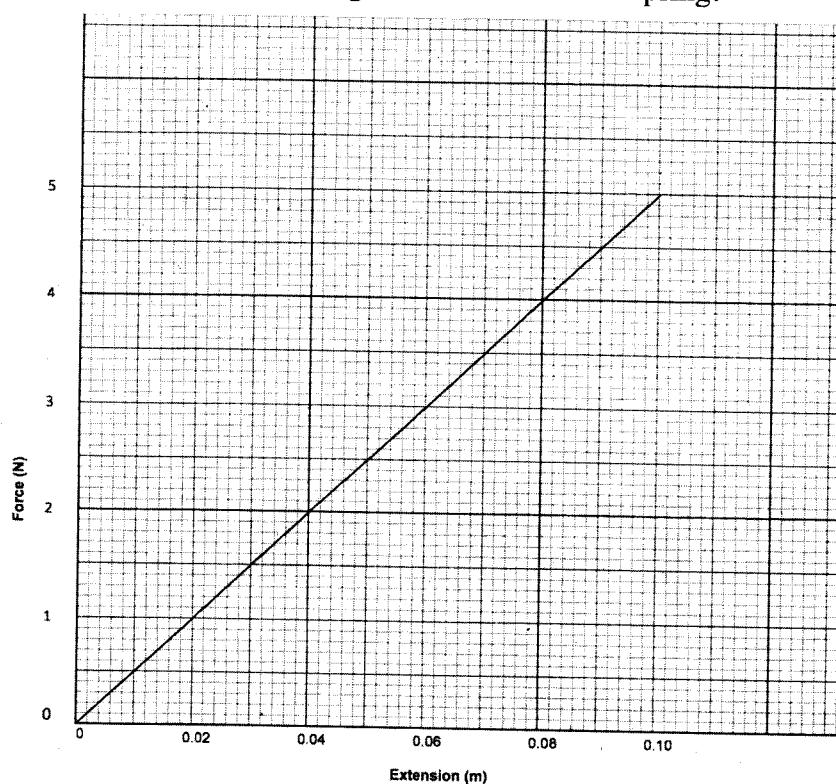


FIGURE 6

Use the graph to determine the spring constant.

(3 marks)



Candidates were required to use a graph to determine the spring constant for a given spring.

### Weakness

Most candidates were unable to use the graph to determine the spring constant.

### Expected response.

Spring constant = slope;

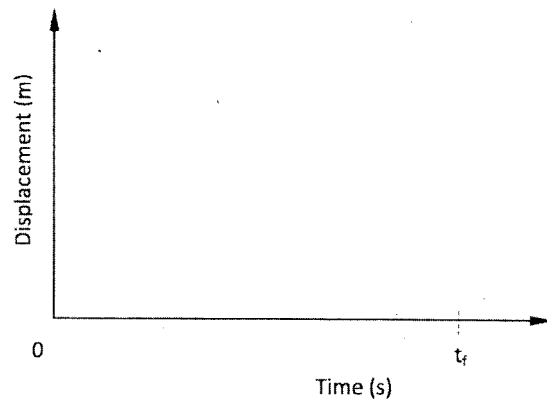
$$\begin{aligned} &= \frac{(5-0)\text{N}}{(0.10-0)\text{M}}; \text{substitution} \\ &= 50 \text{ N/m.} \end{aligned}$$

(3 marks)

### Question 30

A stone is thrown vertically upwards. On the axes provided sketch the displacement-time graph for the motion of the stone from the time it is thrown to the time,  $t_f$ , when it reaches the maximum height.

(2 marks)

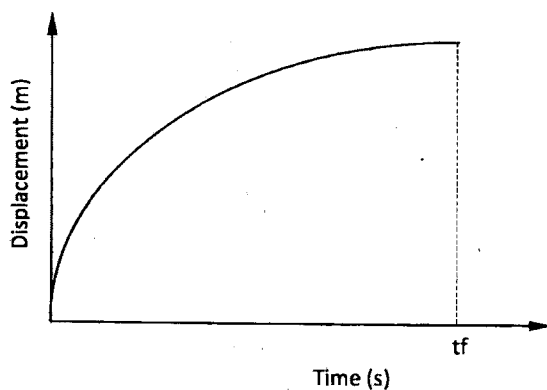


Candidates were required to sketch the displacement time graph for a stone thrown vertically upwards.

### Weakness

Candidates left the question blank hence lacked knowledge on motion graphs.

### Expected response.



- curve of decreasing gradient;
- gradient of curve is zero at point  $t_f$ .

(2 marks)

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

#### SECTION A: BIOLOGY

In paper two Biology section, candidates had difficulties in answering question numbers 2, 5, 6, 7 and 8.

##### Question 2

- (a) State **one** function of each of the following structures in the human reproductive system:
- (i) ovary; (1 mark)
  - (ii) epididymis. (1 mark)
- (b) What is gestation period? (1 mark)

Candidates were required to state functions of parts of reproductive system.

##### Weaknesses

Students confused production of ova with storage, storage of sperms with production of sperms.

##### Expected response

- (a) (i) Produce ova; produce hormones; (1 mark)
- (ii) Temporary storage of sperms;  
place where sperms develop motility; (1 mark)
- (b) The time between fertilization and birth. (1 mark)

##### Question 5

- (a) (i) What is natural selection? (1 mark)
- (ii) Give **one** example of natural selection. (1 mark)
- (b) State **one** adaptation of *Ascaris lumbricoides* that enables them survive the digestive enzymes of their host. (1 mark)

Candidates were supposed to state the meaning and examples of natural selection and state adaptation of *Ascaris lumbricoides* that enable them survive the digestive enzymes of their host.

##### Weaknesses

Candidates were leaving out the aspect of transmission of characteristics in natural selection.

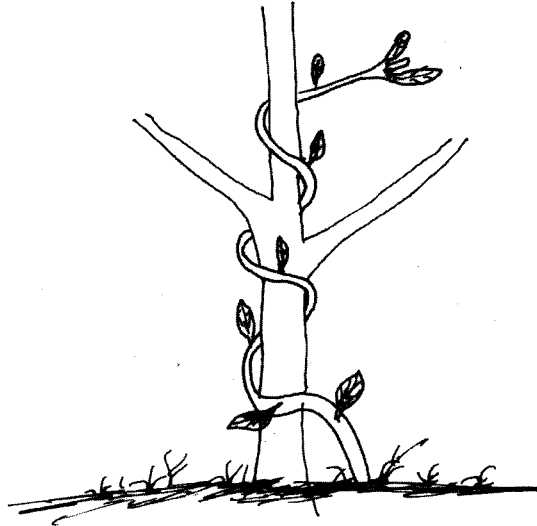
##### Expected response

- (a) (i) Organisms with favourable variations survive and reproduce while those with unfavourable variations reduce in numbers/become extinct; (1 mark)

- (ii) Industrial melanism/peppered moth;  
Resistance to drugs/pesticides/antibiotics; (1 mark)
- (b) Thick cuticle; secretion of anti-enzymes/mucus; (1 mark)

### QUESTION 6

The diagram below illustrates a certain tropic response.



- (a) Name the tropic response illustrated in the diagram. (1 mark)
- (b) Give **two** survival values of the tropic response shown above to the plant. (2 marks)

Candidates were supposed to identify the type of tropic response that was shown by a diagram and its survival values to the plant.

### Weaknesses

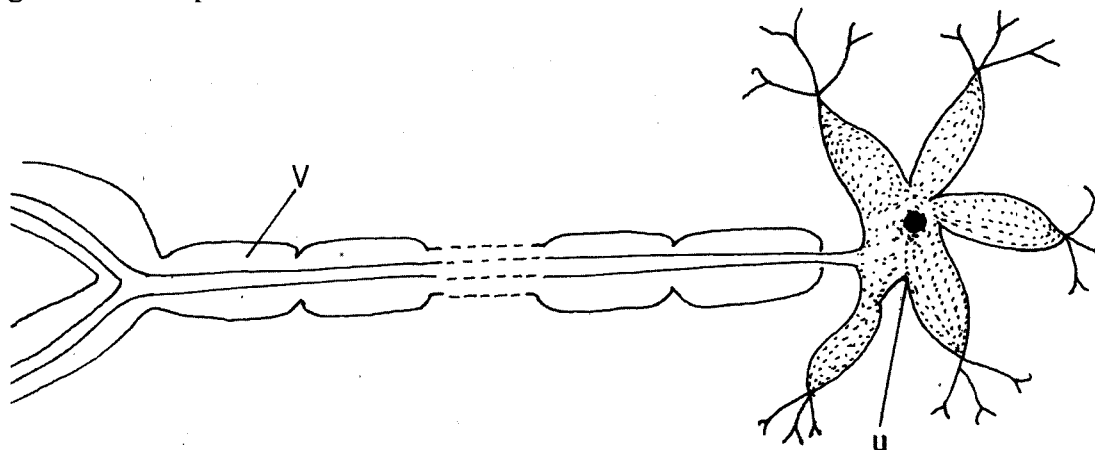
Candidates confused trophic for tropic.

### Expected response

- (a) Thigmotropism/Haptotropism; (1 mark)
- (b) Support; exposure to light; (2 marks)

### Question 7

The diagram below represents a neurone.



- (a) (i) Name the part labelled V. (1 mark)  
(ii) State **one** adaptation of the part labelled U to its function. (1 mark)
- (b) Name the part of the ear that is responsible for balancing. (1 mark)

Candidates were given a drawing of a neurone and were supposed to use it to name and state adaptations of parts of the neurone that were marked.

#### Weaknesses

Candidates could not identify parts of the neurone.

#### Expected response

- (a) (i) Myelin sheath; (1 mark)  
(ii) U-has dendrites which receive impulses from other neurones; (1 mark)
- (b) Semi-circular canals; (1 mark)

### Question 8

- (a) Name **two** types of movable joints in human beings. (2 marks)
- (b) State **one** function of the parenchyma tissue in young plants. (1 mark)

Candidates were supposed to name types of movable joints in human beings and state a function of parenchyma tissue in young plants.

#### Weaknesses

Candidates confused types and examples of joints.

### Expected response

- (a) hinge joints; ball and socket joints; gliding joints; pivot joint; (2 marks)
- (b) Packing; mechanical support; (1 mark)

### Advice to Biology teachers

Emphasis should be made on

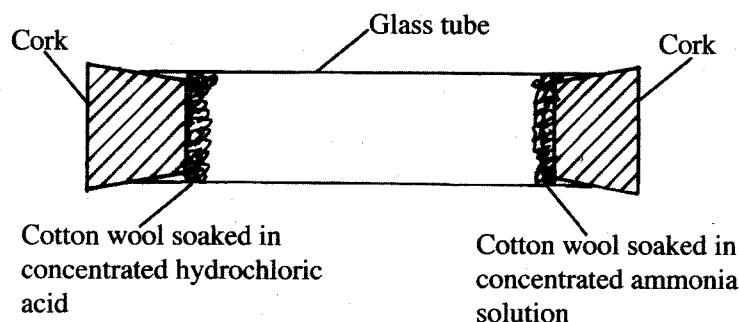
- ☐ Teaching all that is indicated by the syllabus and in good time.
- ☐ Doing more hands-on activities/practicals to facilitate retention.
- ☐ Correct spelling of technical biological terms.
- ☐ Drawing skills of biological diagrams.

### SECTION B: CHEMISTRY

In paper 2 Chemistry section, the questions that challenged most candidates were question numbers 11, 14, 18 and 19.

#### Question 11

The set-up shown below was used to investigate the rate of diffusion of ammonia and hydrogen chloride gases. Study it and answer the questions that follow.



- (a) State the observation made in the glass tube. (1 mark)
- (b) (i) On the diagram, indicate with a cross (X) the likely position where the above observation is made. (1 mark)
- (ii) Explain your answer in b(i) above. (1 mark)

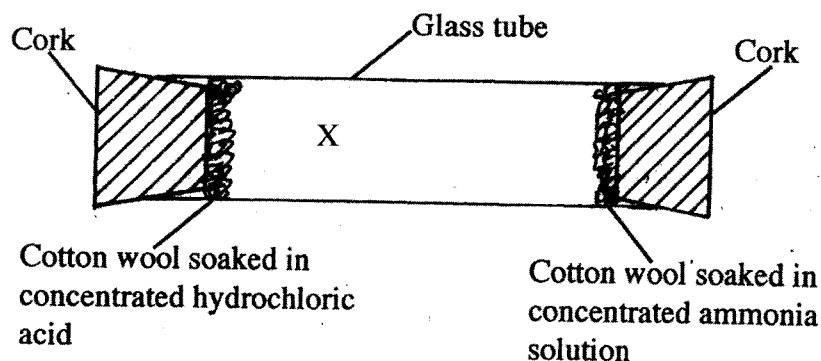
Candidates were required to state the observation made in the glass tube, indicate on the diagram where the observation is made and to explain why the observation is made there.

### Weaknesses

Most candidates seem to know the observation made, forgot to show on the diagram where the observation is made and had no idea on the name of the reactants and the product

### Expected responses

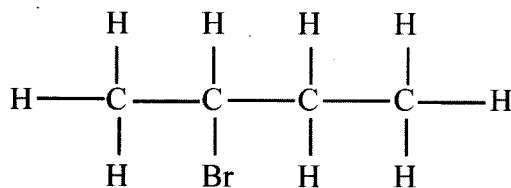
- (a) A white ring is formed in the glass tube. (1 mark)
- (b) (i) The cross (X) should be nearer to the source HCl (g). (1 mark)



- (ii) Since ammonia (RMM = 17) is less dense than HCl gas (RMM = 36.5), it will diffuse faster than HCl. (1 mark)

### Question 14

- (a) (i) Name the compound whose structure is given below: (1 mark)



- (ii) Draw the structure of pent-2-ene. (1 mark)
- (b) Describe a chemical test that can be used to distinguish between butane and but-1-ene. (2 marks)

The question required candidates to:

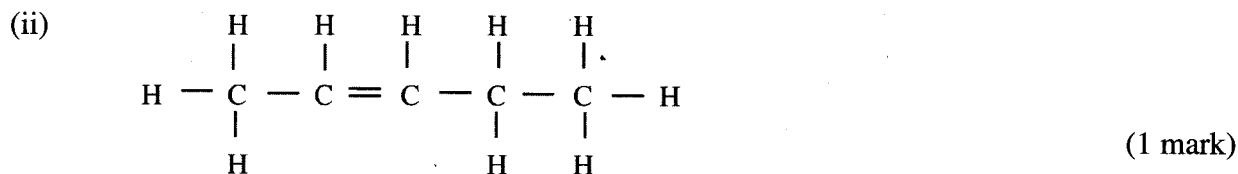
- Name an organic compound
- draw the structure of pent - 2- ene

### Weaknesses

Most candidates could not name nor draw the structure of the given organic compounds.

### Expected responses

- (a) (i) 2 - bromobutane (1 mark)



- (b) Place acidified potassium manganate (VII)/bromine water in separate test tubes. Bubble the gases separately through the solutions. With but-1-ene, the two solutions will be decolourised while butane will not decolourise both solutions. (2 marks)

### Question 18

142g of sodium sulphate were dissolved in 200 cm<sup>3</sup> of distilled water. More water was added to make up to 500 cm<sup>3</sup> of solution.

- (a) Calculate the molarity of the solution formed (Na = 23.0; S = 32.0; O = 16.0). (2 marks)
- (b) What volume of the solution is required to make a litre of solution of 0.5M. (2 marks)

Candidates were required to:

- Calculate **molarity** of a solution;
- Determine the volume of the given solution required to prepare a litre of **0.5 M** solution.

### Weaknesses

Candidates had no idea on how to do the calculations.

### Expected Responses

(a)  $\text{Na}_2\text{SO}_4$  RFM =  $(23 \times 2) + 32 + (16 \times 4)$   
 $= 46 + 32 + 64 = 142 \sqrt{1/2}$   
 $= \frac{142}{142} = 1 \text{ mole } \sqrt{1/2}$

500cm<sup>3</sup> contains 1 mole  
 1000cm<sup>3</sup> would contain ?

$$\frac{1000}{500} \times 1 \sqrt{1/2} \\
 = 2 \text{ M } \sqrt{1/2}$$

(2 marks)

(b)  $M_1 V_1 = M_2 V_2$   
 $2 \times V_1 = 0.5 \times 1000 \sqrt{1/2}$

$$V_1 = \frac{0.5 \times 1000}{2} \sqrt{1/2} = 250 \text{ cm}^3 \sqrt{1}$$

(2 marks)

### Question 19

- (a) The raw materials used in the extraction of iron are iron ore, calcium carbonate, coke and air.
- Write an equation for a reduction process in the blast furnace if the ore used was iron (III) oxide. (1 mark)
  - What is the purpose of the calcium carbonate? (1 mark)
  - Explain how the silica impurities are removed from the blast furnace. (2 marks)
- (b) Give **one** alloy that contains iron. (1 mark)

Candidates were required to:

- Write an equation for the reaction between iron (III) oxide and carbon (II) oxide;
- State the purpose of calcium carbonate;
- Explain how silica impurities are removed;
- Name an alloy that contains iron.

### Weaknesses

Candidates had limited knowledge on the process of extraction of iron metal by reduction method, the raw materials used and the alloys of iron.

### Expected Responses

- (a) (i)  $\text{Fe}_2\text{O}_{3(s)} + 3\text{CO}_{(g)} \longrightarrow 2\text{Fe}_{(l)} + 3\text{CO}_{2(g)}$  (1 mark)
- (ii) Decomposes to give carbon (IV) oxide and calcium oxide which are both used in the process. (1 mark)
- (iii) Calcium oxide react with silica to give calcium silicate (slug) which form a liquid layer on top of liquid iron as it flows away. (2 marks)
- (b) Steel (1 mark)

### Advice to Chemistry teachers

Emphasis should be made on:

- ☐ More practice on the topics that involve calculations e.g The Mole ;
- ☐ More practice in drawing and naming of organic compounds;
- ☐ Adopt practical approach to teaching;
- ☐ Where materials are scarce ,improvise and have hands on activities
- ☐ Syllabus should be covered in time to allow time for thorough revision

## SECTION C: PHYSICS

The performance in the physics section was very poor. Most candidates were not able to give correct responses to the questions. Many candidates were not able to attempt the questions in section C. Candidates are advised to look at the questions and marking scheme provided in part II of this report for future preparation. Below is a discussion of the questions which were poorly performed.

### Question 24

Figure 2 shows a block of wood floating in water.

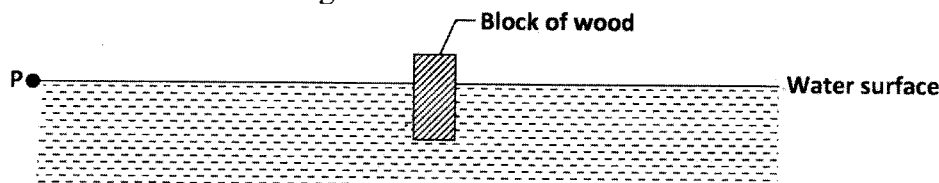


Figure 2

A wave is generated at point P. After some time the block of wood is seen to move up and down. State, with a reason the type of wave formed in the water. (2 marks)



Candidates were supposed to explain the type of wave formed when a block of wood floats on the surface of water after a wave is generated at appoint.

### Weakness

Candidates left the question blank. They lacked knowledge on water waves.

### Expected response

- Transverse wave;
- Movement of the block is perpendicular to the direction of the wave motion; (2 marks)

### Question 27

**Figure 6** shows a circuit in which a coil of wire is connected in series with a variable resistor, a battery and a switch.

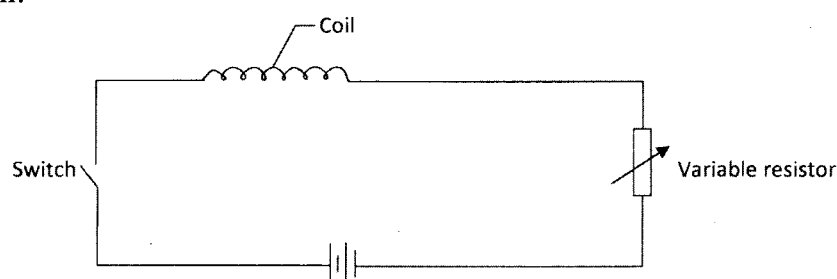


Figure 6

The coil gets heated when the switch is put on. The resistance in the circuit is then reduced using the variable resistor. State, with a reason the effect on the heat produced in the coil. (2 marks)

Candidates were expected to explain the effect of resistance on the heating.

### Weakness

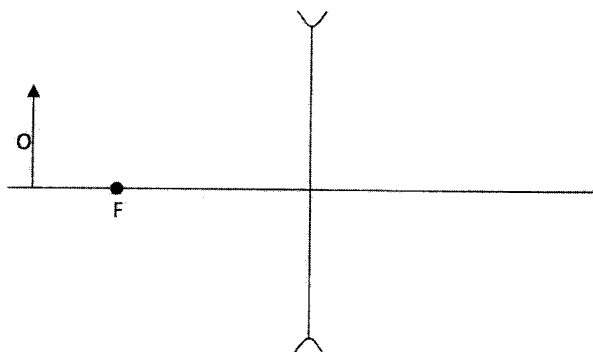
Most candidates confused the reducing resistance to reducing amount of current.

### Expected response

- Heat will increase;
- Reducing resistance increases the current; (2 marks)

### Question 29

**Figure 8** shows an object  $O$  in front of a diverging lens. The principal focus of the lens is marked  $F$ .



**Figure 8**

On the figure, draw a ray diagram to locate the image.

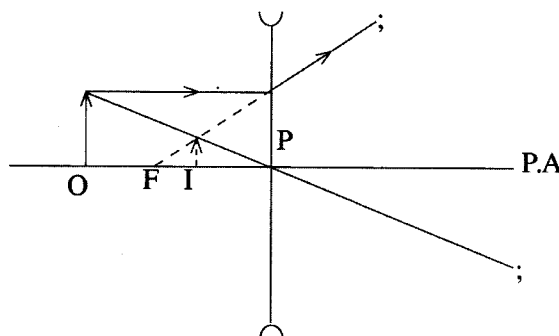
(3 marks)

Candidates were expected to draw ray diagram to locate the image in a diverging lens.

#### Weakness

Most candidates were drawing lines instead of rays, and confused the lens with a curved mirror.

#### Expected response



Ray from  $O$  parallel to  $PA$  then from lens;

Ray from  $O$  through pole  $P$ ;

Image erect virtual at intersection of they rays;

(3 marks)

#### Advice to teachers and candidates

Teachers and candidates of general science are advised to study the subject topics outlined in the syllabus to be adequately prepared for the examination.

Emphasis should be made on:

- ☐ Drawing ray diagrams with arrows to indicate the direction.
- ☐ Application of knowledge in different situations.
- ☐ Mastery of formulae in all topics.
- ☐ Proper mastery of content by giving practice.
- ☐ A practical approach to abstract concepts.

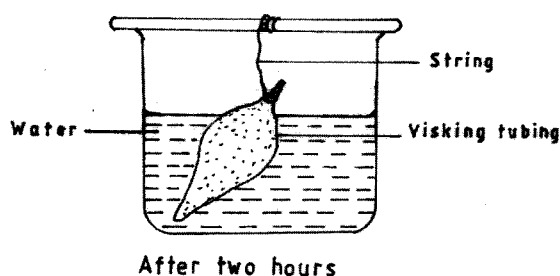
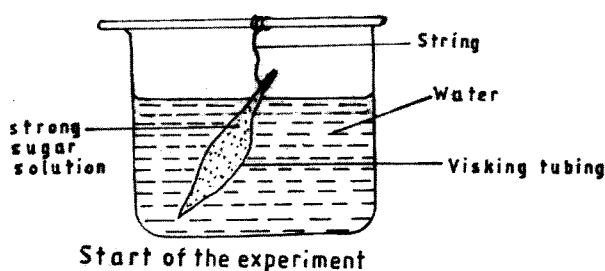
## 4.5 GENERAL SCIENCE (237)

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

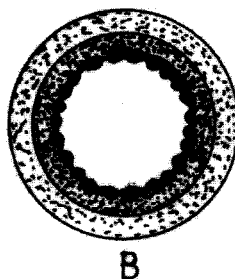
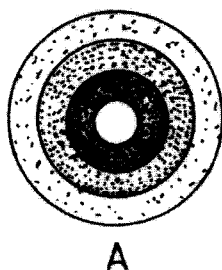
#### SECTION A: BIOLOGY (34 marks)

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

- 1 (a) Give **two** reasons why a child requires more energy than an adult. (2 marks)
- (b) How can the presence of lipids in a food substance be confirmed without using chemical reagents? (2 marks)
- 2 (a) State **one** example of an organism in the kingdom protocista. (1 mark)
- (b) Classify maize (*zea mays*) into its first two largest taxonomic units. (2 marks)
- 3 The diagrams below illustrate a set-up that form one students used to demonstrate a certain physiological process and the result after two hours.



- (a) Name the physiological process that was being demonstrated. (1 mark)
- (b) Explain the observation made after two hours. (3 marks)
- 4 The diagrams below represent cross sections of human blood vessels.



- (a) (i) Name the blood vessel labelled A. (1 mark)
- (ii) Give a reason for your answer in (a) (i) above. (1 mark)

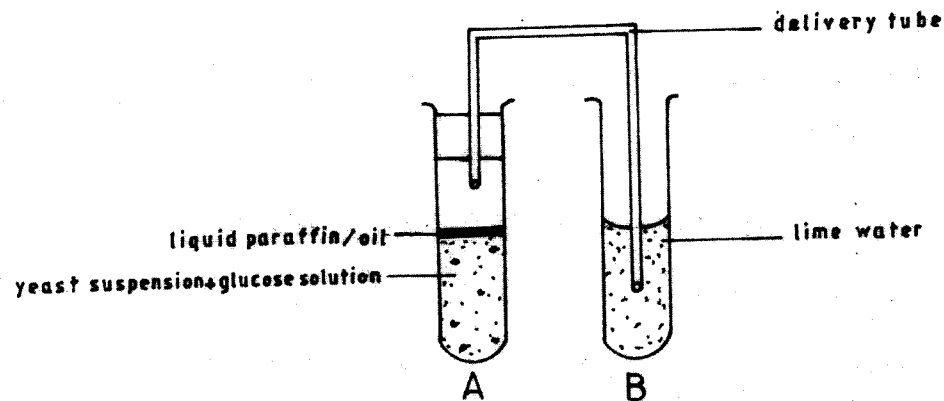
(b) How is the blood vessel labelled B adapted to its function? (2 marks)

5 (a) Differentiate between excretion and egestion. (2 marks)

(b) How does the liver help to maintain a constant body temperature in human beings? (2 marks)

(c) State two causes of kidney stones. (2 marks)

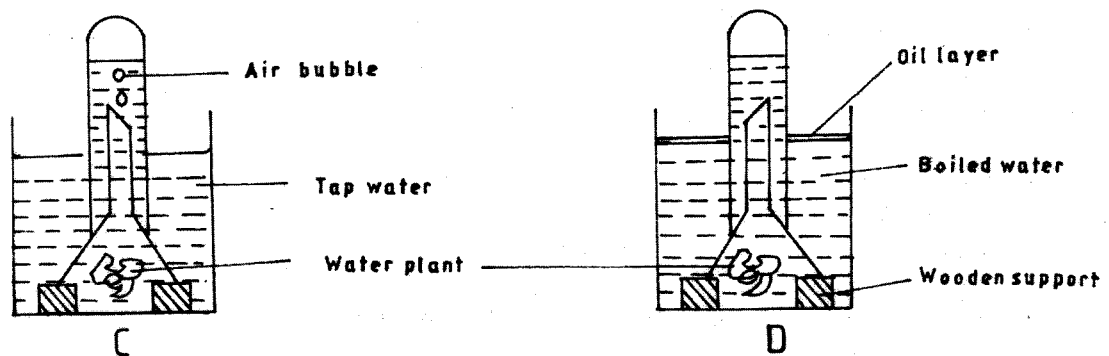
6 The diagram below shows an experimental set-up to demonstrate a biological process.



(a) Name the process being demonstrated. (1 mark)

(b) State the observations made during the demonstration. (2 marks).

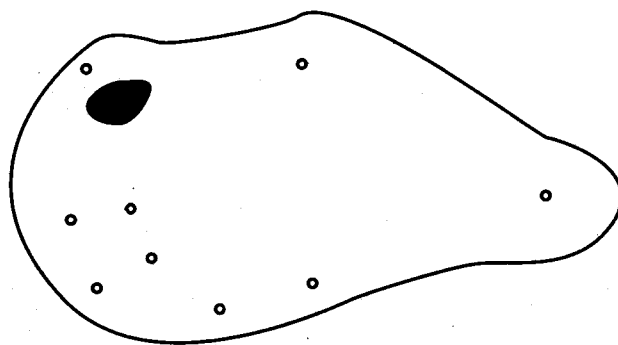
7 Form one students set up an experiment to demonstrate a physiological process as shown in the diagrams below.



(a) Why were bubbles not produced in the set-up labelled D? (2 marks)

(b) Name the gas collected in the set-up labelled C. (1 mark)

- 8 Complete and label the drawing below to make it appear like that of a typical plant cell as seen under a light microscope. (3 marks)

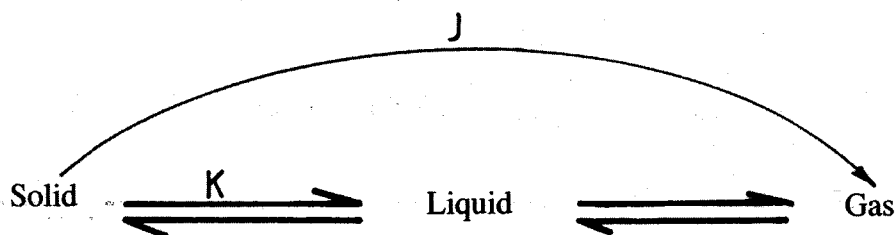


- 9 State **four** factors that affect the rate of breathing in human beings. (4 marks)

### SECTION B: CHEMISTRY (33 marks)

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

- 10 The diagram below shows changes in states of matter under different conditions. Study it and answer the question that follows.



Give the names of the changes represented by the letters **J** and **K**. (1 mark)

**J** .....

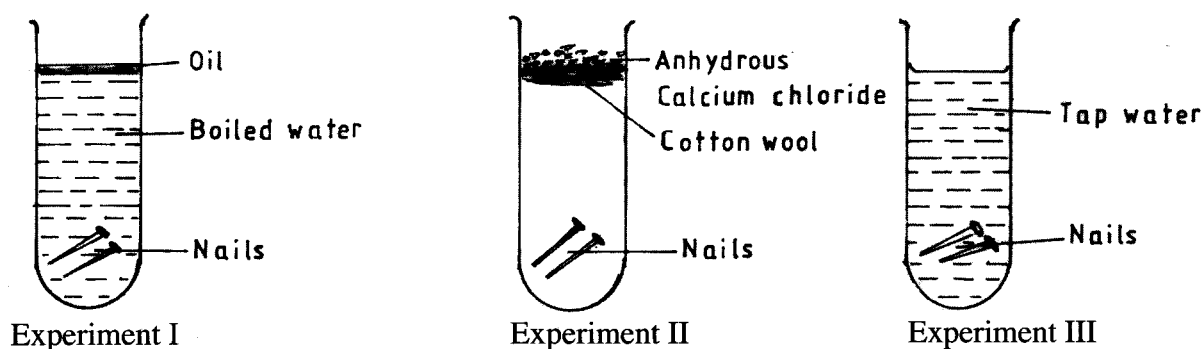
**K** .....

- 11 (a) Complete the following word equation. (1 mark)

Dilute sulphuric (VI) acid + Solid sodium carbonate

- (b) Give **one** commercial use of sulphuric (VI) acid. (1 mark)

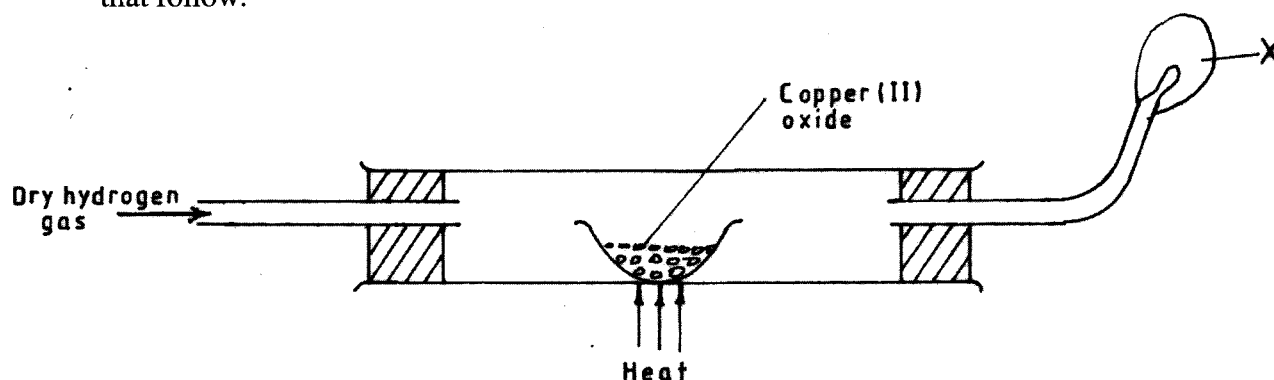
- 12 Three experiments were set up as shown below to investigate the conditions necessary for rusting to occur.



- (a) After three days, only the nails in experiment III had rusted. Why didn't rusting occur in experiments I and II ?
- I .....(1 mark)
- II .....(1 mark)
- (b) What would be the effect of using salty water instead of tap water in experiment III? (1 mark)
- (c) Complete the table below by stating the type of oxides formed when the following substances are burnt in air. (1 mark)

Substance	Type of oxide
Hydrogen	Neutral
Phosphorus	
Magnesium	

- 13 The diagram below shows a reduction - oxidation process. Study it and answer the questions that follow.



- (a) Write an equation for the reaction between dry hydrogen gas and hot copper (II) oxide. (1 mark)
- (b) In the process above, which substance undergoes oxidation? Explain. (1 mark)
- (c) Name the substance that burns at X? (1 mark)

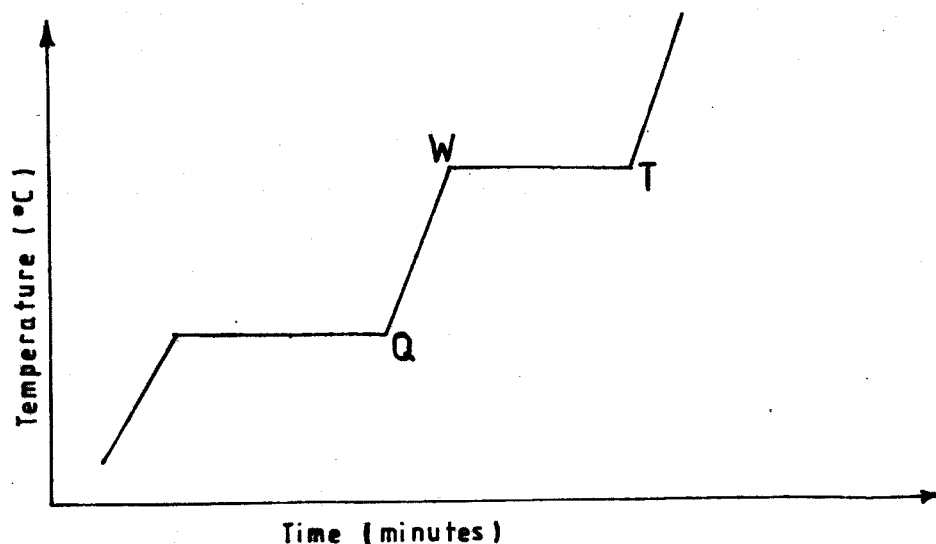
- 14 (a) The two main isotopes of carbon are  $^{12}_6\text{C}$  and  $^{13}_6\text{C}$  with relative abundances of 98.8% and 1.2% respectively. Calculate the relative atomic mass (RAM) of carbon. (2 marks)
- (b) The elements X and Y have atomic numbers 13 and 17 respectively. Write the electronic configuration of:
- (i) ion of X; ..... (½ mark)
- (ii) Y..... (½ mark)
- (c) Write the formula of the compound formed when X reacts with Y. (1 mark)

- 15 The table below represents part of the periodic table. The letters do not represent the actual symbols of the elements. Use it to answer the questions that follow.

P	Q						R	S	
T									

- (a) Which element would be most reactive with water? Explain. (2 marks)
- (b) Explain why element S is non-reactive. (1 mark)
- (c) Identify the element which is in the group of alkaline earth metals. (½ mark)
- (d) Element P and R would react to form a compound PR. What type of bond exists in compound PR? (½ mark)
- 16 (a) Water hardness is classified as either temporary or permanent. What are the causes of permanent hardness in water? (2 marks)
- (b) How is temporary water hardness commonly removed? (1 mark)
- 17 Given 50 cm<sup>3</sup> of dilute hydrochloric acid in a beaker, describe how solid calcium chloride could be prepared using calcium carbonate. (3 marks)

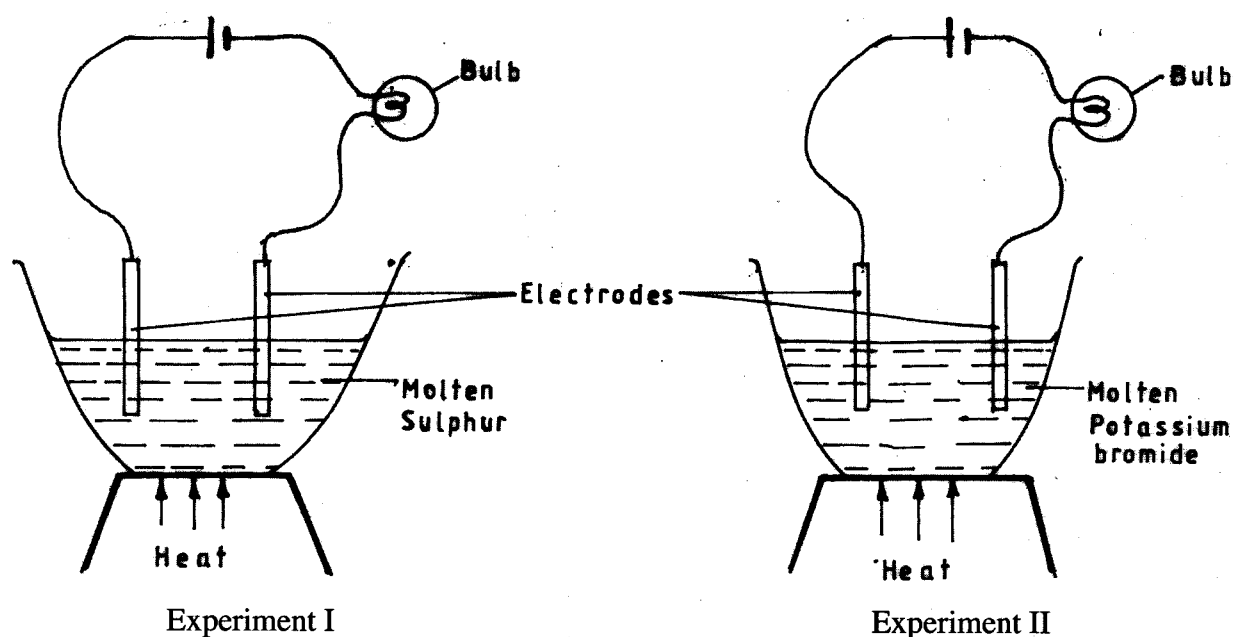
- 18 The graph below shows variation of temperature when ice is heated over a period of time.



- (a) Using kinetic theory, explain the changes between points:
- (i) Q and W .....(1½ marks)
  - (ii) W and T .....(1½ marks)
- (b) Name the apparatus that can be used to separate a mixture of water and oil. (1 mark)
- 19 (a) Using dot (•) and cross (X) diagram, illustrate the type of bonding in carbon (IV) oxide (Atomic numbers: C = 6; O = 8). (2 marks)
- (b) Give a reason why graphite conducts electricity. (1 mark)



- 20 The diagrams below show set-up of experiments done to investigate conduction of electric current by some substances. Study the diagrams and answer the question that follows.



In which experiment does the bulb light? Explain.

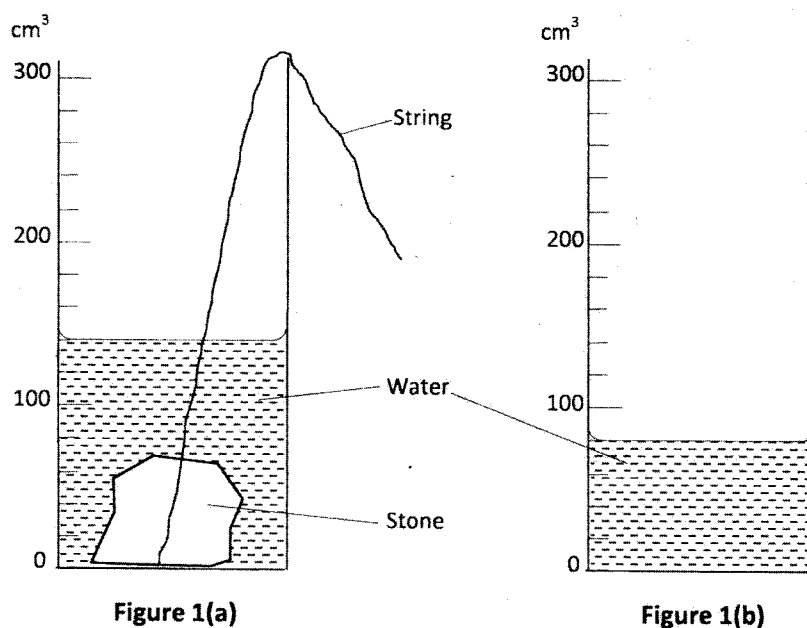
(2 marks)

### SECTION C: PHYSICS (33 marks)

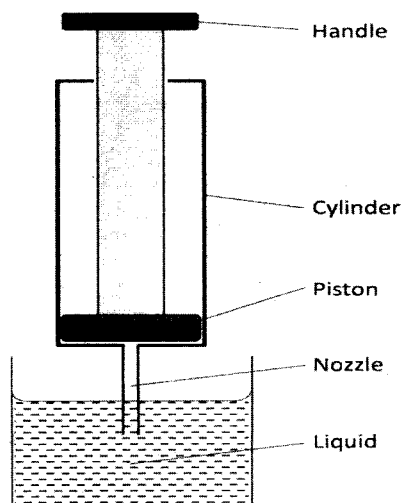
Answer *all* the questions in this section in the spaces provided.

- 21 **Figure 1(a)** shows a stone of mass 144 g immersed in water. Before the stone was immersed, the level of water was as shown in **figure 1(b)**. Determine the density of the stone.

(3 marks)



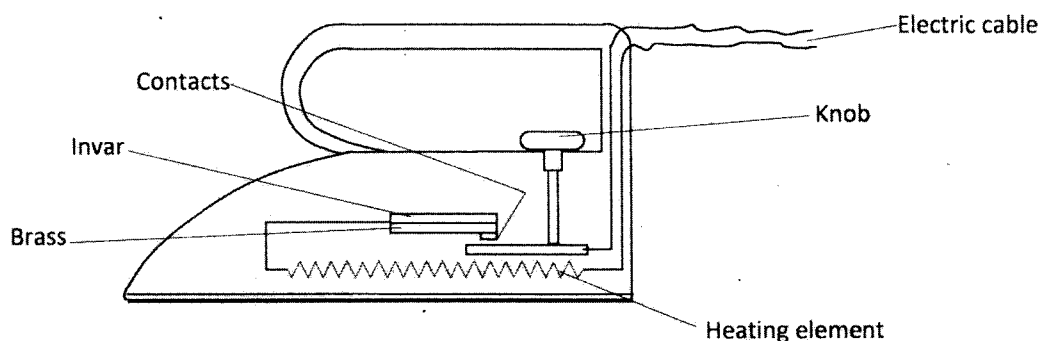
- 22 The weight of an object is 23.5 N. Determine the mass of the object given that the acceleration due to gravity is  $10 \text{ ms}^{-2}$ . (3 marks)
- 23 (a) State the reason why atmospheric pressure at sea level is greater than at a higher altitude. (1 mark)
- (b) **Figure 2** shows a syringe with its nozzle dipped in a liquid.



**Figure 2**

It is observed that when the piston is pulled upwards the liquid enters the cylinder. Explain this observation. (2 marks)

- 24 State the reason why the volume of a gas is always equal to the volume of the vessel containing it. (1 mark)
- 25 (a) Define the term temperature. (1 mark)
- (b) **Figure 3** shows an electric iron box in which a brass-invar bimetallic strip is used to control the temperature.

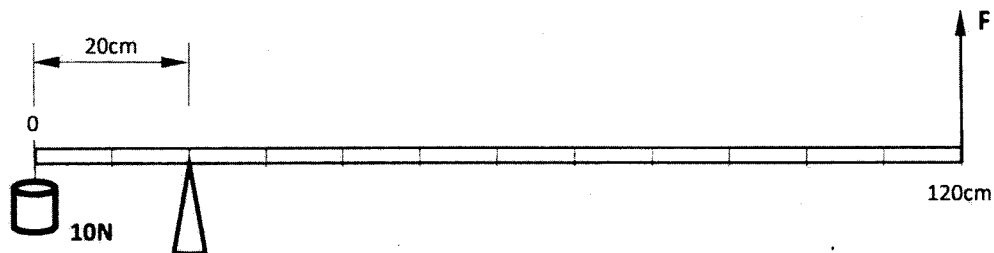


**Figure 3**

Given that brass expands more than invar, describe how the bimetallic strip controls the temperature of the iron box. (2 marks)

26 When one end of a metal is heated, the other end gets hot. Explain this observation. (2 marks)

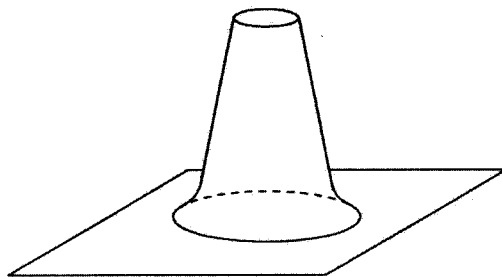
27 **Figure 4** shows a uniform rod 120 cm long and weighing 15 N. The rod is pivoted at 20 cm from one end and is balanced by two forces, 10 N and F.



**Figure 4**

Determine the magnitude of F. (3 marks)

28 **Figure 5** shows a drinking glass placed upside down on a table.



**Figure 5**

(a) Name its state of equilibrium. (1 mark)

(b) State a reason for your answer in (a). (1 mark)

- 29 Figure 6 shows a graph of force against extension for a spring.

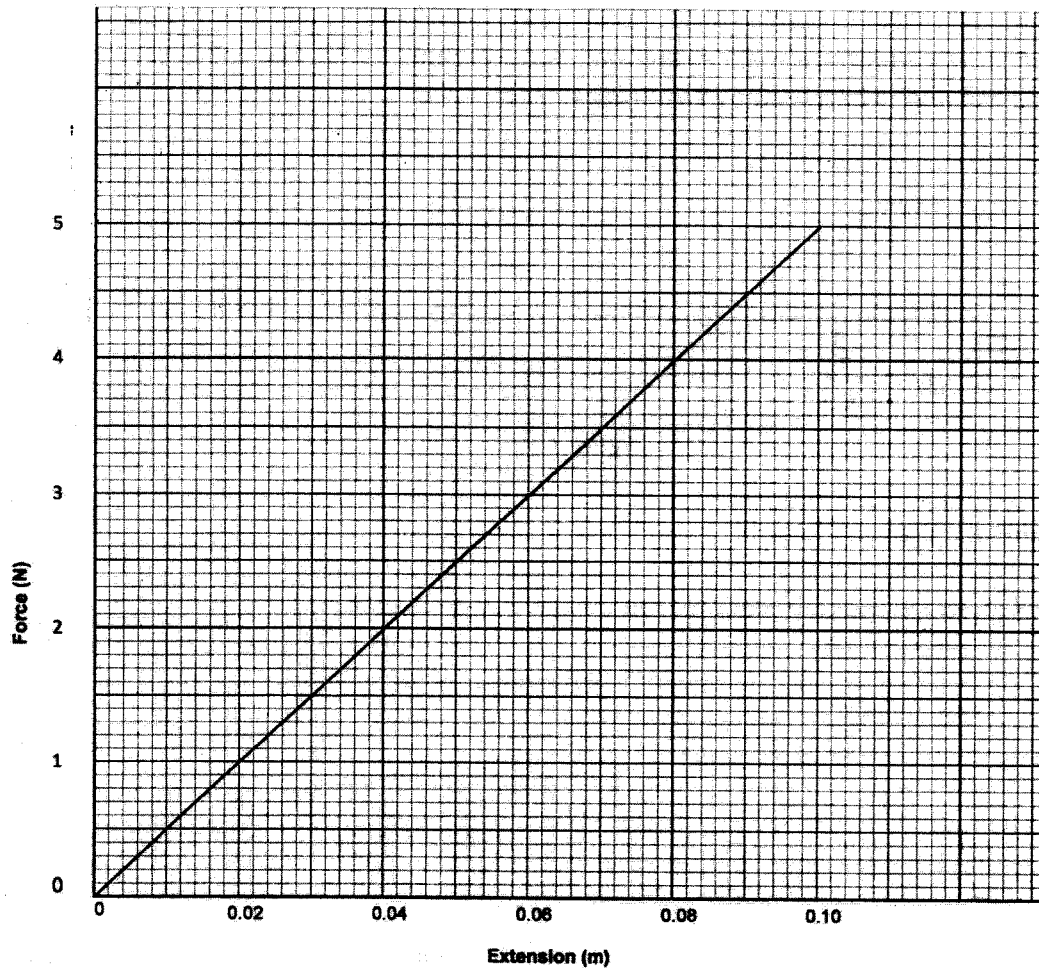


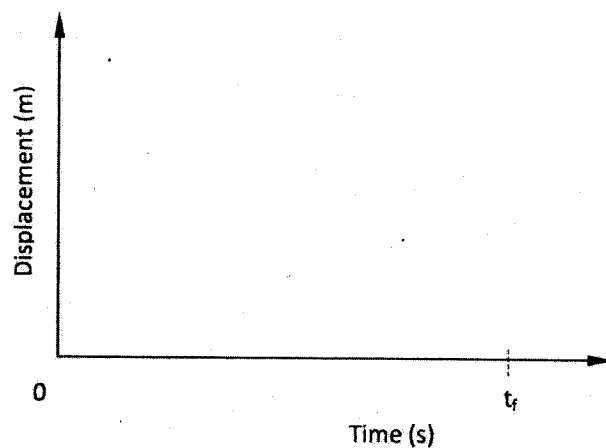
FIGURE 6

Use the graph to determine the spring constant.

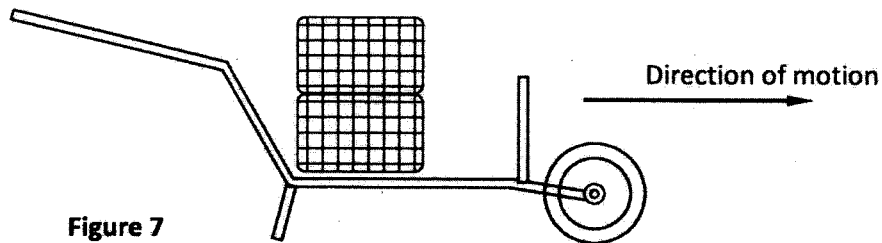
(3 marks)

- 30 A stone is thrown vertically upwards. On the axes provided sketch the displacement-time graph for the motion of the stone from the time it is thrown to the time,  $t_f$ , when it reaches the maximum height.

(2 marks)



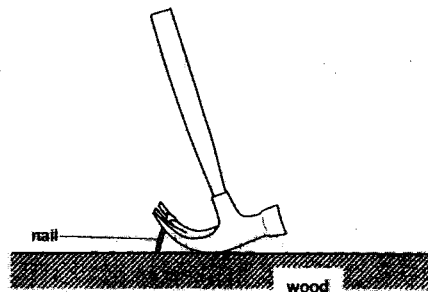
- 31 **Figure 7** shows a wheelbarrow being used to carry a box in the direction shown.



**Figure 7**

When the wheelbarrow is suddenly stopped the box slides forward. Explain why the box slides forward. (2 marks)

- 32 (a) **Figure 8** shows a hammer being used as a machine to remove a nail from a piece of wood.

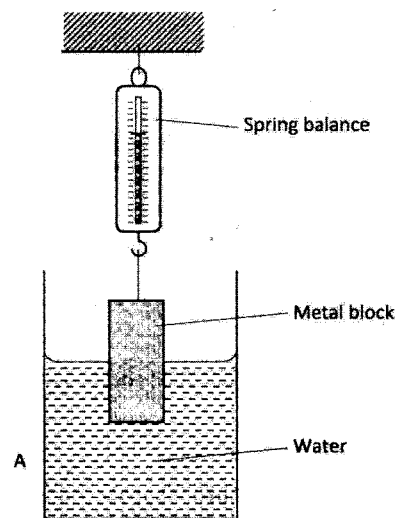


**Figure 8**

Indicate with an arrow on the hammer, the position where the least effort should be applied to remove the nail. (1 mark)

- (b) Light from the sun is used by a solar panel to charge a car battery. State the energy changes that take place from the sun to the solar panel and finally to the battery. (2 marks)

- 33 **Figure 9** shows a metal block suspended from a spring balance and partially immersed in water.



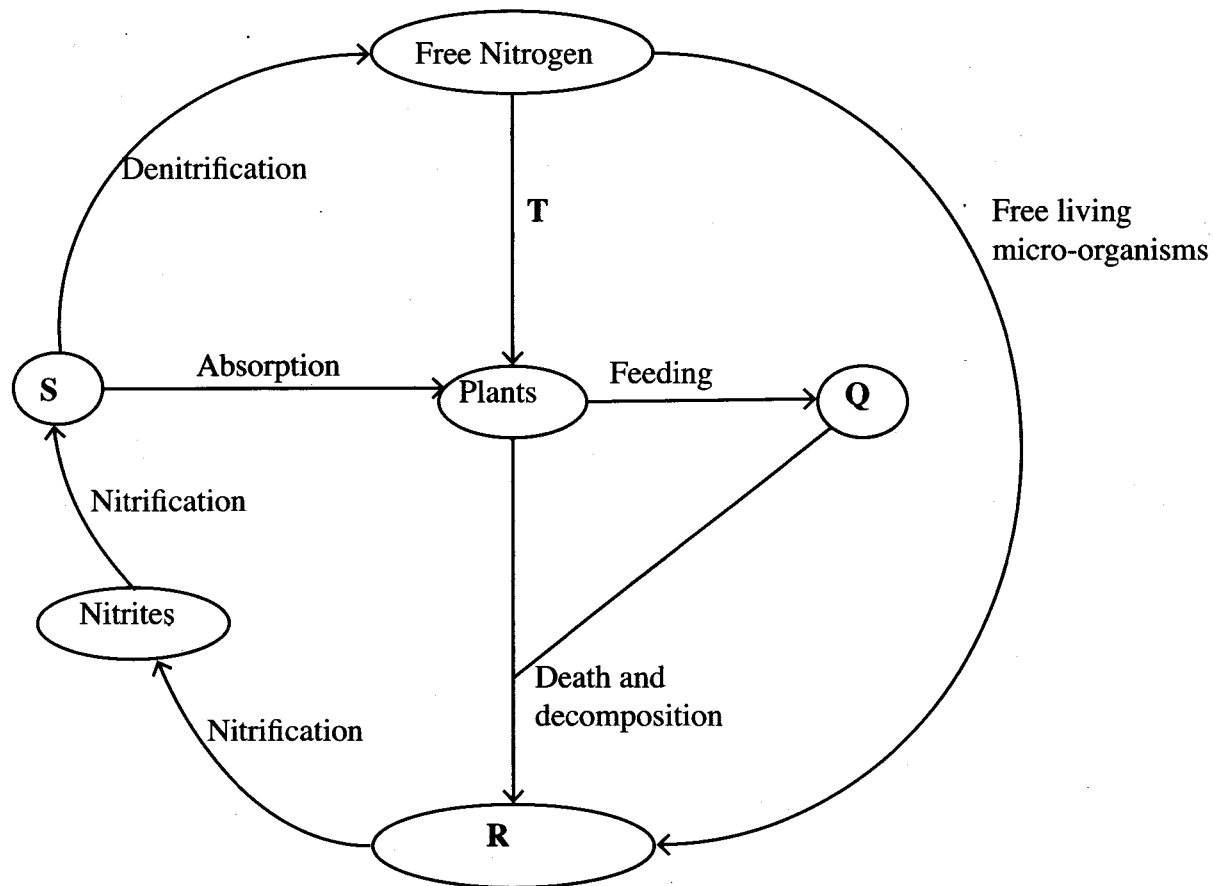
**Figure 9**

- (a) State what will be observed in the reading of the balance if the block is lowered further into the water. (1 mark)
- (b) Explain your answer in (a). (2 marks)

SECTION A: BIOLOGY (34 marks)

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

- 1 The diagram below represents the nitrogen cycle:



- (a) Name the components labelled **Q**, **R** and **S**

**Q** .....

**R** .....

**S** .....

(3 marks)

- (b) Name the process labelled **T**.

(1 mark)

- (c) Give **one** example of organisms that cause decomposition.

(1 mark)

- 2 (a) State **one** function of each of the following structures in the human reproductive system:

(i) ovary;

(1 mark)

(ii) epididymis.

(1 mark)

(b) What is gestation period? (1 mark)

3 (a) State the meaning of the following terms:

(i) growth;

(1 mark)

(ii) development.

(1 mark)

(b) What is the importance of dormancy in seeds?

(3 marks)

4 State **two** differences between continuous and discontinuous variations.

(2 marks)

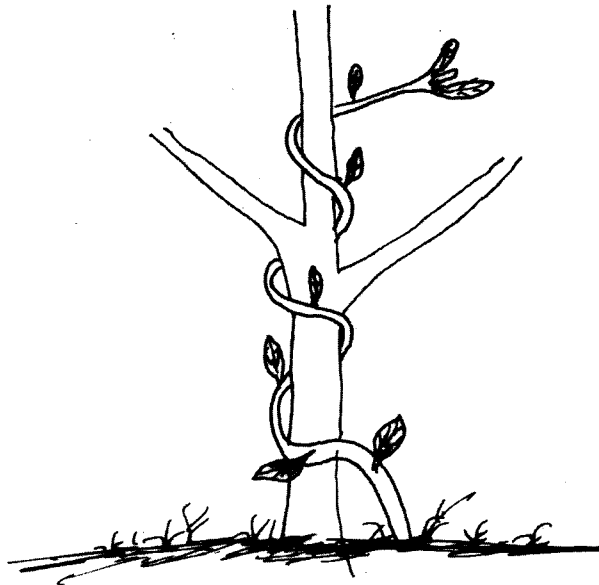
5 (a) (i) What is natural selection? (1 mark)

(ii) Give **one** example of natural selection. (1 mark)

(b) State **one** adaptation of *Ascaris lumbricoides* that enables them survive the digestive enzymes of their host.

(1 mark)

6 The diagram below illustrates a certain tropic response.



(a) Name the tropic response illustrated in the diagram.

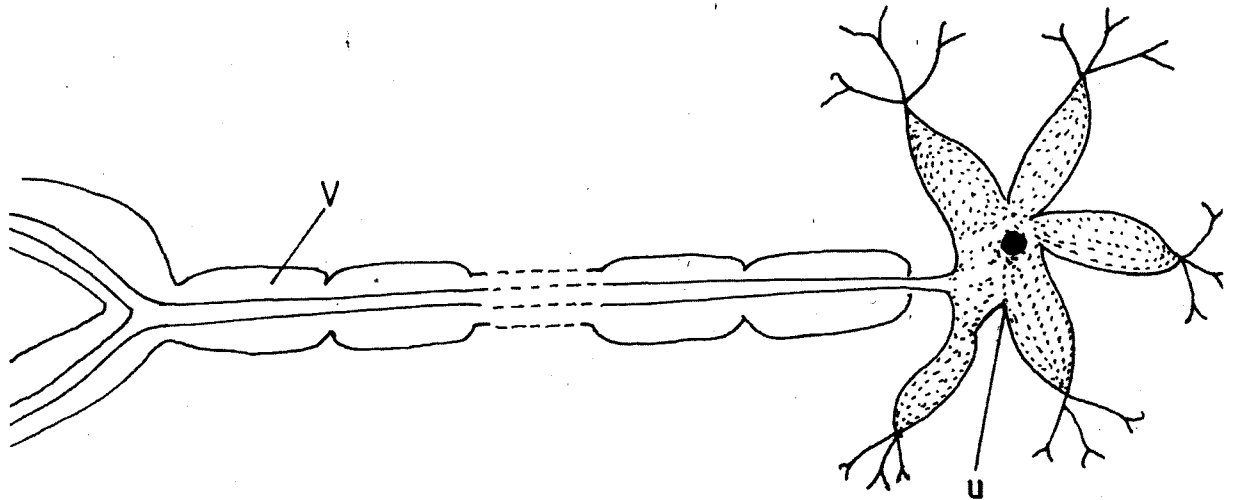
(1 mark)

(b) Give **two** survival values of the tropic response shown above to the plant.

(2 marks)



- 7 The diagram below represents a neurone.

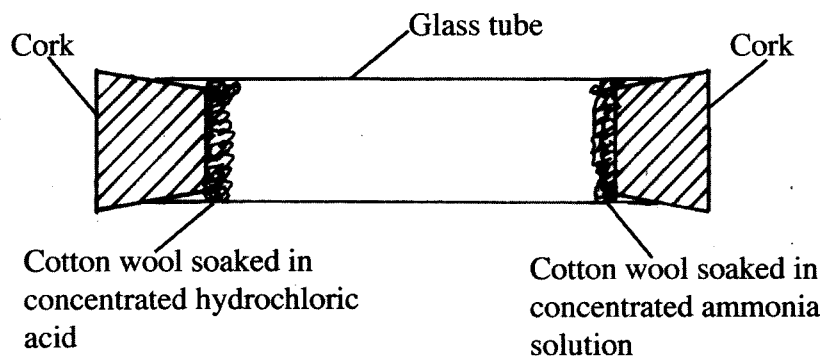


- (a) (i) Name the part labelled V. (1 mark)
- (ii) State **one** adaptation of the part labelled U to its function. (1 mark)
- (b) Name the part of the ear that is responsible for balancing. (1 mark)
- 8 (a) Name **two** types of movable joints in human beings. (2 marks)
- (b) State **one** function of the parenchyma tissue in young plants. (1 mark)
- 9 (a) What does the term implantation mean in human reproduction? (1 mark)
- (b) State **two** ways of reducing the spread of herpes simplex. (2 marks)
- 10 Why is the sex of a child determined by the father and not the mother? (4 marks)

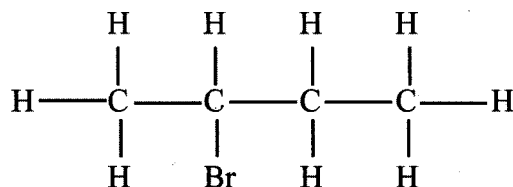
## SECTION B: CHEMISTRY (33 marks)

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

- 11 The set-up shown below was used to investigate the rate of diffusion of ammonia and hydrogen chloride gases. Study it and answer the questions that follow.



- (a) State the observation made in the glass tube. (1 mark)
- (b) (i) On the diagram, indicate with a cross (X) the likely position where the above observation is made. (1 mark)
- (ii) Explain your answer in b(i) above. (1 mark)
- 12 Calculate the mass that is contained in 0.1 moles of calcium carbonate. (Ca = 40.0; C = 12.0; O = 16.0). (2 marks)
- 13 In trying to investigate some properties of chlorine gas, a student introduced wet blue litmus paper into a gas jar containing the gas.
- (a) State the observations made in the gas jar. (1 mark)
- (b) Explain the observations in (a) above. (1 mark)
- 14 (a) (i) Name the compound whose structure is given below: (1 mark)

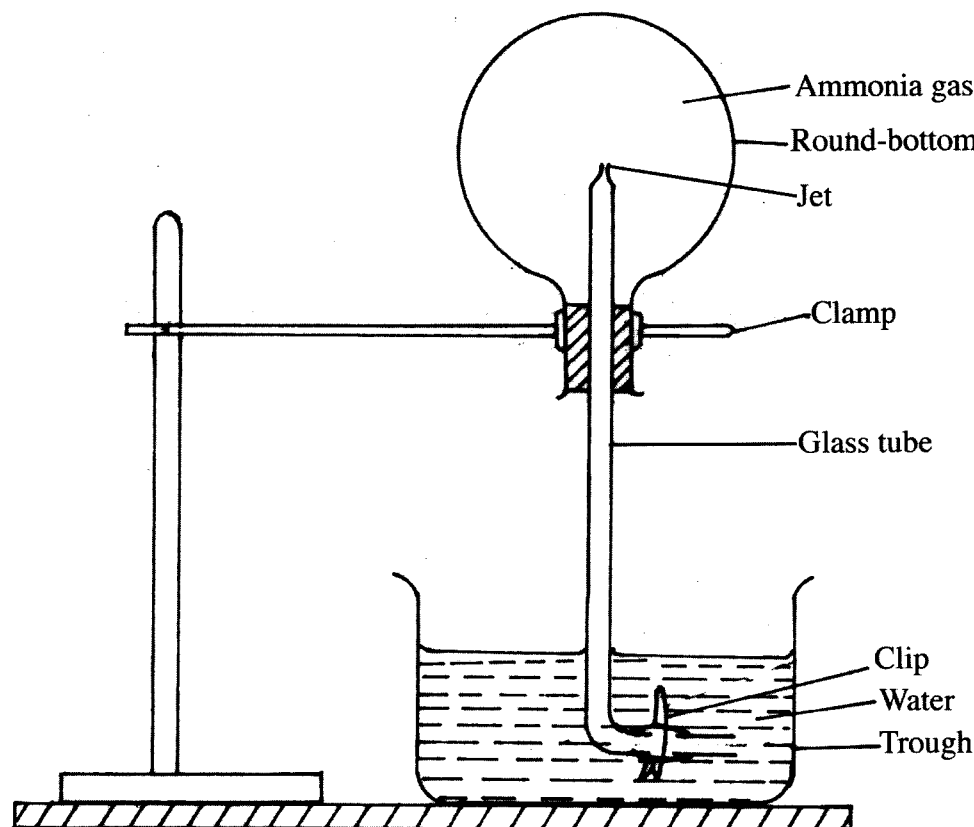


- (ii) Draw the structure of pent-2-ene. (1 mark)

- (b) Describe a chemical test that can be used to distinguish between butane and but-1-ene. (2 marks)

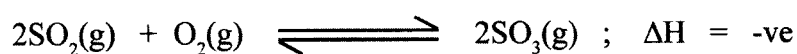
15 The set-up below was used to investigate some properties of ammonia gas. Study it and answer the questions that follow.

- (a) The clip was slightly opened to allow a drop of water to move up to the tip of the glass tube. After a few minutes, the clip was opened to allow more water to pass.



- (i) State the observation made in the round-bottomed flask. ( $\frac{1}{2}$  mark)
- (ii) Explain the answer in a(i) above. ( $1\frac{1}{2}$  marks)
- (b) Name **two** chemicals that can be used to prepare ammonia gas in a school laboratory. (1 mark)
- (c) Give **two** commercial uses of ammonia. (1 mark)

16 Sulphur (IV) oxide and oxygen react as shown in the equation below.



- (a) What is meant by  $\Delta H = -\text{ve}$ ? (1 mark)

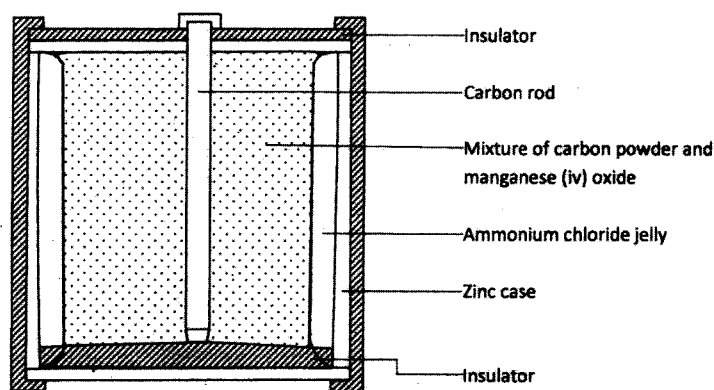
- (b) Explain the effect of increasing pressure on the position of equilibrium of the above reaction. (2 marks)
- (c) Give **one** use of sulphur (VI) oxide. (1 mark)
- 17 Charcoal and kerosene are some of the fuels commonly used in Kenyan homes.
- (a) What is meant by the term fuel? (1 mark)
- (b) Write a chemical equation for the complete combustion of charcoal. (1 mark)
- (c) Give **two** advantages of using kerosene as a fuel over charcoal. (2 marks)
- (d) Name **two** sources of energy in Kenya that are environmentally friendly. (1 mark)
- 18 142g of sodium sulphate were dissolved in 200 cm<sup>3</sup> of distilled water. More water was added to make up to 500 cm<sup>3</sup> of solution.
- (a) Calculate the molarity of the solution formed (Na = 23.0; S = 32.0; O = 16.0). (2 marks)
- (b) What volume of the solution is required to make a litre of solution of 0.5M. (2 marks)
- 19 (a) The raw materials used in the extraction of iron are iron ore, calcium carbonate, coke and air.
- (i) Write an equation for a reduction process in the blast furnace if the ore used was iron (III) oxide. (1 mark)
- (ii) What is the purpose of the calcium carbonate? (1 mark)
- (iii) Explain how the silica impurities are removed from the blast furnace. (2 marks)
- (b) Give **one** alloy that contains iron. (1 mark)

### SECTION C: PHYSICS (33 marks)

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

- 20 An object of height 24 cm is placed in front of a concave mirror. The magnification of the image is 0.5. Determine the height of the image. (3 marks)
- 21 It is observed that when a glass rod is brought near a positively charged sphere, repulsion occurs. State a reason for the repulsion. (1 mark)

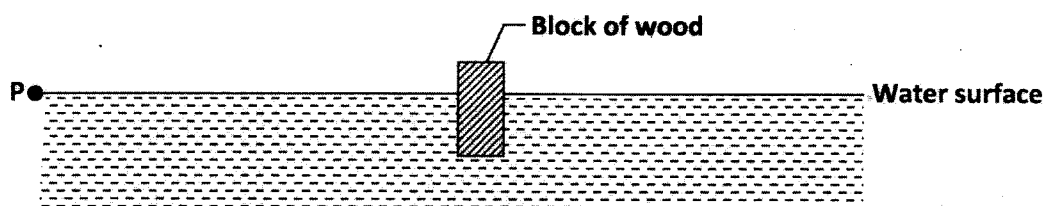
- 22 **Figure 1** represents a dry lechlanché cell.



**Figure 1**

State the use of:

- (a) carbon powder; ..... (1 mark)
- (b) manganese (IV) oxide. .... (1 mark)
- 23 In a laboratory there are two soft iron bars and two bar magnets. In the space provided draw a diagram to show how the two bar magnets and the soft iron bars can be arranged so that the strength of the magnet is maintained for a long time. (1 mark)
- 24 **Figure 2** shows a block of wood floating in water.



**Figure 2**

A wave is generated at point P. After some time the block of wood is seen to move up and down. State, with a reason the type of wave formed in the water. (2 marks)

- 25 **Figure 3** represents a set up that is used to study a property of sound. The pump in the set up is used to remove air from the jar.

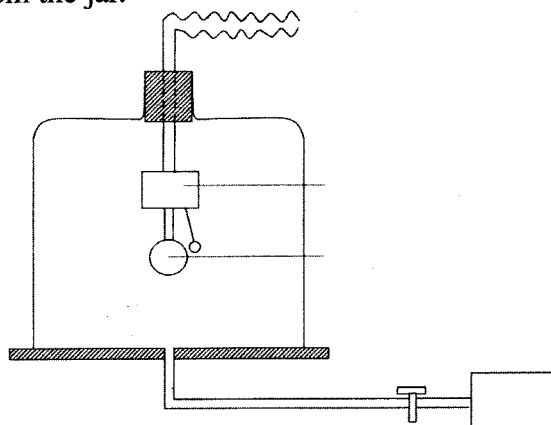


Figure 3

As the air was being removed from the jar the loudness of the sound of the bell decreased until the sound could no longer be heard. Explain why the sound could no longer be heard although the bell continued working. (2 marks)

- 26 (a) **Figure 4** shows a battery whose potential difference is 3 V connected in series with resistors  $R_1$  and  $R_2$ . A voltmeter  $V$  is connected across  $R_2$ .

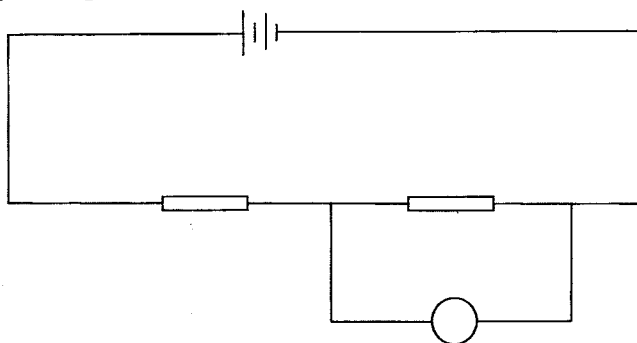


Figure 4

The potential difference across  $R_1$  is 2 V. Determine the reading of the voltmeter,  $V$ .

(1 mark)

- (b) **Figure 5** shows part of a circuit containing three resistors  $R_3$ ,  $R_4$  and  $R_5$  and an ammeter. A current of 0.4 A is flowing through  $R_3$  and a current of 0.1 A is flowing through  $R_4$ .

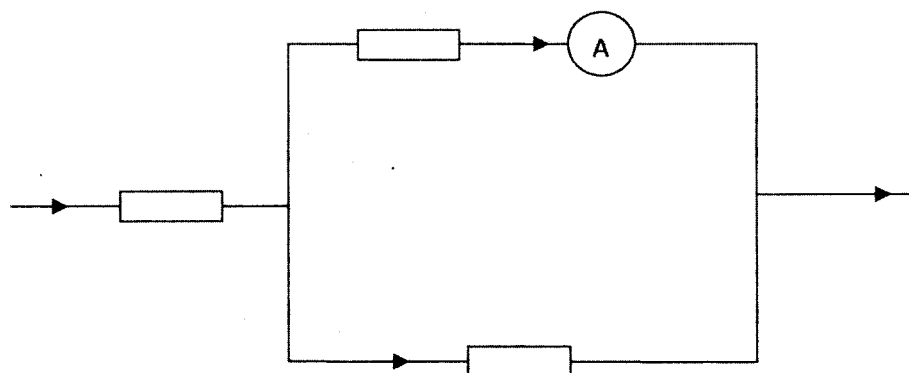
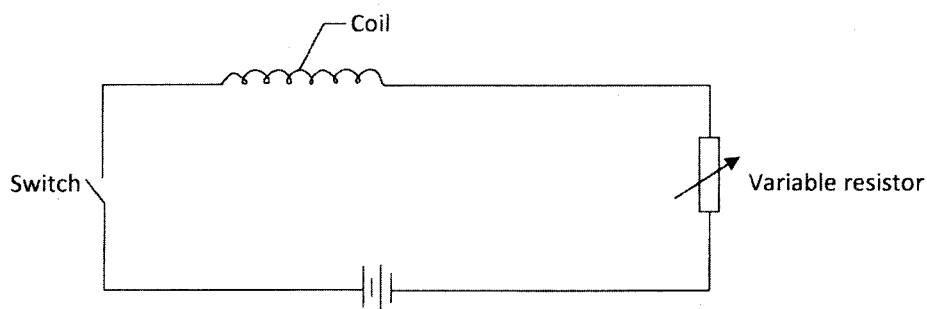


Figure 5

Determine the reading on the ammeter.

(1 mark)

- 27 **Figure 6** shows a circuit in which a coil of wire is connected in series with a variable resistor, a battery and a switch.

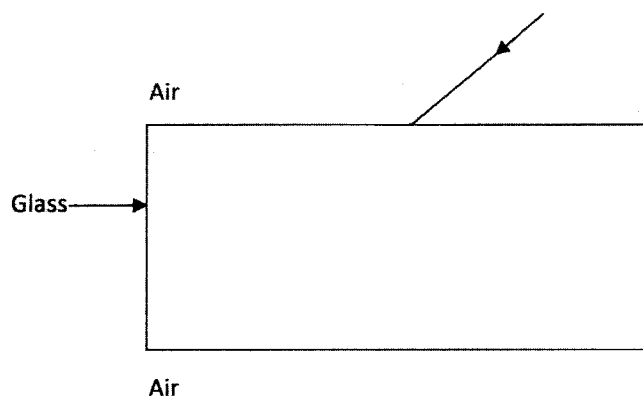


**Figure 6**

The coil gets heated when the switch is put on. The resistance in the circuit is then reduced using the variable resistor. State, with a reason the effect on the heat produced in the coil.

(2 marks)

- 28 **Figure 7** shows a ray of light in air incident to a rectangular glass block.

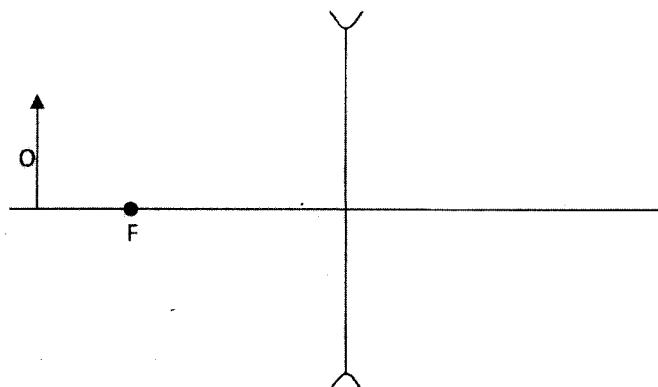


**Figure 7**

Complete the diagram to show the path of the ray as it passes through the glass into the air.

(2 marks)

- 29 **Figure 8** shows an object O in front of a diverging lens. The principal focus of the lens is marked F.

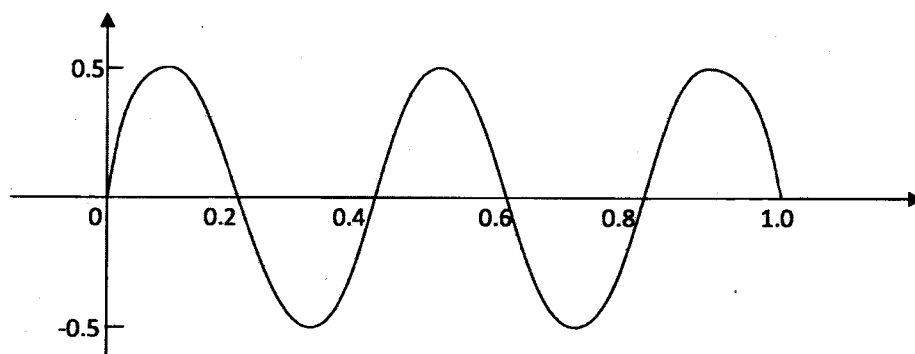


**Figure 8**

On the figure, draw a ray diagram to locate the image.

(3 marks)

- 30 **Figure 9** shows a graph of amplitude against time for a wave.



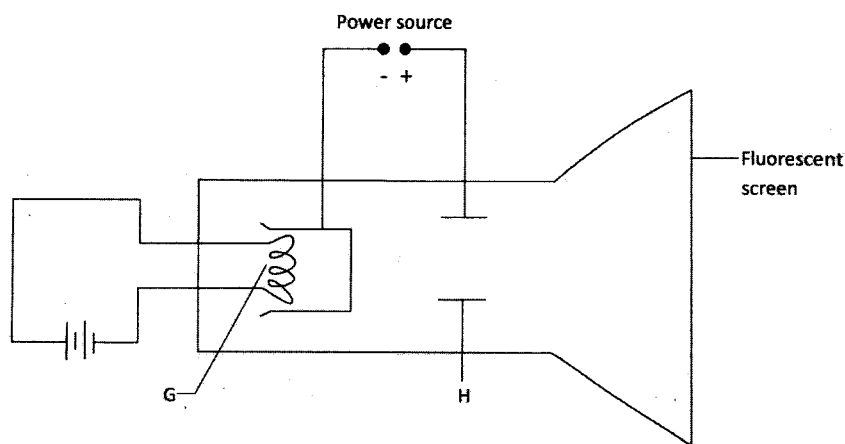
**Figure 9**

Using the figure, determine the period of the wave.

(1 mark)

- 31 (a) Explain why the voltage of the mains electricity from a generating station is stepped up before the electricity is transmitted over long distances. (2 marks)
- (b) State why a fuse should be connected to the live wire in a domestic wiring circuit. (1 mark)

- 32 **Figure 10** shows a simplified cathode ray tube.



**Figure 10**

- (a) Name the part labelled H. (1 mark)
- (b) State the purpose of the part labelled G. (1 mark)
- (c) State how the cathode rays affect the screen. (1 mark)



## 4.6 HOME SCIENCE (441)

### 4.6.1 Home Science Paper 1 (441/1)

#### SECTION A (40 marks)

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

- 1 Give **two** functions of Vitamin A in the body. (2 marks)
- 2 State **two** symptoms of goitre. (2 marks)
- 3 Outline **two** precautions to take when handling calabashes. (2 marks)
- 4 Give **two** reasons for using dried fruits in cake making. (2 marks)
- 5 Distinguish between **shallow** and **deep** fat frying. (2 marks)
- 6 Give **two** methods of removing dust from surfaces in a home. (2 marks)
- 7 Give **two** advantages of using loose covers in the home. (2 marks)
- 8 State **two** ways of disposing refuse economically. (2 marks)
- 9 Define good grooming. (1 mark)
- 10 Give **two** ways in which medicine can be abused. (2 marks)
- 11 State **two** benefits of manipulative play. (2 marks)
- 12 State **two** problems that may occur on the feet as a result of wearing tight fitting shoes. (2 marks)
- 13 Giving an example in each case, differentiate between **goods** and **services**. (2 marks)
- 14 List **two** vegetable stains that commonly occur in homes. (1 mark)
- 15 Give **two** reasons for starching articles. (2 marks)
- 16 State **two** precautions to take when laundering viscose rayon. (2 marks)
- 17 Give **two** examples of inconspicuous seams. (2 marks)
- 18 Identify **two** functions of openings on a garment. (2 marks)
- 19 State **two** advantages of using tacking stitches. (2 marks)
- 20 Differentiate between **trimmings** and **trimming** as used in clothing construction. (2 marks)

## 5.5 GENERAL SCIENCE (237)

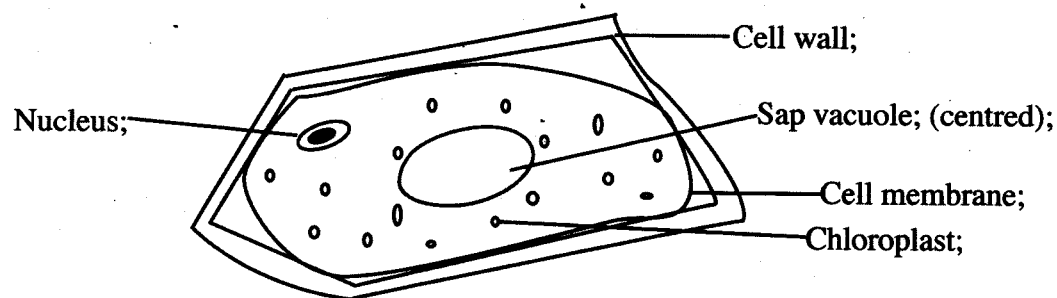
### 5.5.1 General Science Paper 1 (237/1)



#### SECTION A: BIOLOGY (34 marks)

1. (a) The child requires more energy than an adult for rapid cell division/ growth; and high activity/ high metabolic rate; (2 marks)  
(b) A translucent mark; when the food substance is rubbed on a piece of paper confirms presence of lipids; (2 marks)
2. (a) Amoeba/ plasmodium/ paramecium/ spirogyra; (1 mark)  
(b) Kingdom: plantae; (1 mark)  
Division: spermatophyta; (1 mark)
3. (a) Osmosis; (1 mark)  
(b) Visking tube bulged because sugar solution is hypertonic; and distilled water is hypotonic; therefore water molecules moved into the visking tube by osmosis; (3 marks)
4. (a) (i) Artery; (2 marks)  
(ii) Thick walled/ small lumen;  
(b) Have valves; to prevent backflow of blood;  
Has large lumen/ is lined with smooth muscles; to facilitate smooth flow of blood;  
Any one correct (2 marks)
5. (a) Excretion is the elimination of metabolic waste products;  
Egestion is the elimination of undigested and indigestible materials from the alimentary canal; (mark as a whole) (2 marks)  
(b) The hypothalamus sends impulses to the liver to increase exothermic metabolic reactions; when the temperature is low/ increase endothermic metabolic reactions when the temperature is high; (2 marks)  
(c) Poor diet lacking certain vitamins and inadequate water intake;  
Chemical salts in urine; (2 marks)
6. (a) Fermentation/ anaerobic respiration; (1 mark)  
(b) Lime water turns white/ white precipitate is formed; air bubbles produced; (2 marks)
7. (a) Boiled water contained no gases/ carbon (IV) oxide; oil layer prevented entry of atmospheric carbon (IV) oxide; (2 marks)  
(b) oxygen; (1 mark)

8.



(3 marks)

9. (i) Exercise

(ii) Age

(iii) Emotions

(iv) Health

(4 marks)

### SECTION B: CHEMISTRY (33 marks)

10. J - Sublimation  $\sqrt{1/2}$ , K - Melting  $\sqrt{1/2}$ .

11. (a) Dilute sulphuric (VI) acid + solid Sodium carbonate  $\longrightarrow$   $\sqrt{1}$   
Sodium sulphate + Carbon (IV) oxide + water.

(b) Used in making drugs, soap, soapless detergents, fertilizers and in cleaning metals.

(Any one correct)  $\sqrt{1}$

12. (a) I - In I there is no air/dissolved oxygen since water is boiled  $\sqrt{1}$ .

II - In II there is no water vapour/water.  $\sqrt{1}$

(b) Rusting would take less time/ Nails would rust more and faster.  $\sqrt{1}$

(c)

Substance	Type of oxide	
Hydrogen	Neutral	
Phosphorus	Acidic	$\sqrt{1/2}$
Magnesium	Basic	$\sqrt{1/2}$

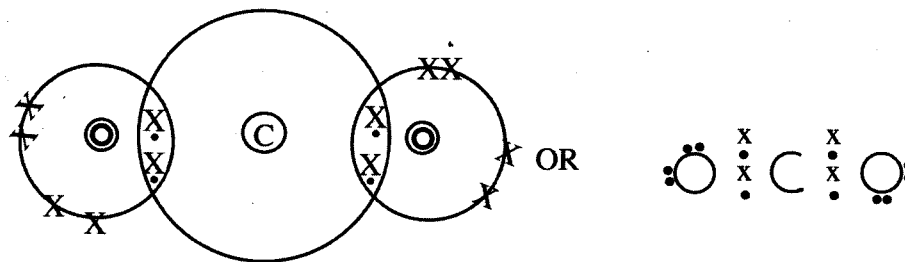
13. (a)  $\text{H}_2(\text{g}) + \text{CuO}(\text{s}) \longrightarrow \text{Cu}(\text{s}) + \text{H}_2\text{O}(\text{l})$ .  $\sqrt{1}$  Accept  $\text{H}_2\text{O}_{(\text{g})}$

(b) Hydrogen is oxidised, since it gains oxygen to form water.  $\sqrt{1}$

(c) Excess / unreacted hydrogen burns/hydrogen.  $\sqrt{1}$

14. (a)  $\frac{12 \times 98.8 + 13 \times 1.2}{100} = \frac{1185.6 + 15.6}{100} \sqrt{1}$  or  $\left(\frac{12 \times 98.8}{100}\right) + \left(\frac{13 \times 1.2}{100}\right)$   
 $= \frac{1201.2}{100} = 12.012 \sqrt{1/2}$   
or  
 $= 12.01 \sqrt{1/2}$  = 12.012 (2 marks)
- (b) (i)  $X^{3+} \rightarrow 2.8 \sqrt{1/2}$   
(ii)  $Y \rightarrow 2.8.7 \sqrt{1/2}$
- (c)  $XY_3 \sqrt{1}$
15. (a) T,  $\sqrt{1/2}$  has highest number of energy  $\sqrt{1/2}$  levels, with one electron in outermost  $\sqrt{1/2}$  energy level which is weakly attracted by the nucleus hence readily removed during reaction.  $\sqrt{1/2}$  (2 marks)
- (b) S because its outermost energy level has the maximum number of electrons (octet) hence stable/has the outermost energy level filled.  $\sqrt{1}$
- (c) Q  $\sqrt{1/2}$  /Be/Beryllium
- (d) ionic/ electrovalent.  $\sqrt{1/2}$
16. (a) Mainly caused by sulphates ( $SO_4^{2-}$ ) of either  $Mg^{2+}$  or  $Ca^{2+}$  /dissolved  $MgSO_4$ ,  $CaSO_4$  or  $MgCl_2$  and  $CaCl_2$ . (2 marks)
- (b) Boiling. (1 mark)
17. Add solid Calcium carbonate in small amounts to the hydrochloric acid while stirring and continue until in excess when effervescence stops  $\sqrt{1}$ . Filter the mixture to collect the calcium chloride filtrate  $\sqrt{1}$ . Heat the filtrate to dryness to obtain the solid calcium chloride  $\sqrt{1}$ . (3 marks)
18. (a) (i) The water molecules absorb heat energy  $\sqrt{1/2}$  increasing their kinetic energy,  $\sqrt{1/2}$  resulting in increased collisions among molecules  $\sqrt{1/2}$ . (1 1/2 marks)
- (ii) The energy absorbed  $1/2$  by the water molecules is used to break the intermolecular forces  $\sqrt{1/2}$  making water molecules to change to vapour  $\sqrt{1/2}$ . (1 1/2 marks)
- (b) Separating funnel/ burette/dropping funnel. (1 mark)

19. (a)



(2 marks)

(b) Graphite has delocalised electrons/mobile electrons.

(1 mark)

20. Experiment II ✓ because molten potassium bromide ✓ contains free/ mobile ions.

(2 marks)

### SECTION C: (33 marks)

21. Volume =  $(140 - 80) \text{ cm}^3 = 60 \text{ cm}^3$ ;

$$\text{Density} = \frac{\text{mass}}{\text{volume}} = \frac{144\text{g}}{60\text{cm}^3};$$

$$= 2.4 \text{ g cm}^{-3}.$$

(3 marks)

22. Weight = mass × acceleration due to gravity;

$$\text{Mass} = \frac{\text{weight}}{\text{acceleration}} = \frac{23.5}{10};$$

$$= 2.35 \text{ kg}.$$

(3 marks)

23. (a) The height of the air column at sea level is greater than the height of the air column at the higher altitude.

(1 mark)

(b) When the piston is pulled upward the pressure inside the syringe becomes less; than the atmospheric pressure. The atmospheric pressure then pushes the liquid into the syringe.

(2 marks)

24. The tiny particles of a gas are free to move to occupy any available space in the container.

(1 mark)

25. (a) The degree of hotness (or coldness);

(b) When the bimetallic becomes very hot it bends upward and disconnects the circuit; when the bimetallic cools it straightens and reconnects the circuit.

(3 marks)

26. Heated molecules vibrate faster and make the neighbouring molecules to also vibrate faster.

(2 marks)

Vibration is relayed to other molecules in the solid hence conduction of heat.

27.  $20 \times 10 + 100 F = 15 \times 40$ ;

$$100 F = 600 - 200$$

$$F = \frac{400}{100} = 4 \text{ N};$$

(3 marks)

28. (a) Stable; (1 mark)
- (b) When displaced slightly, the glass does not topple the C.O.G is raised/ C.O.G remains within the base. (1 mark)

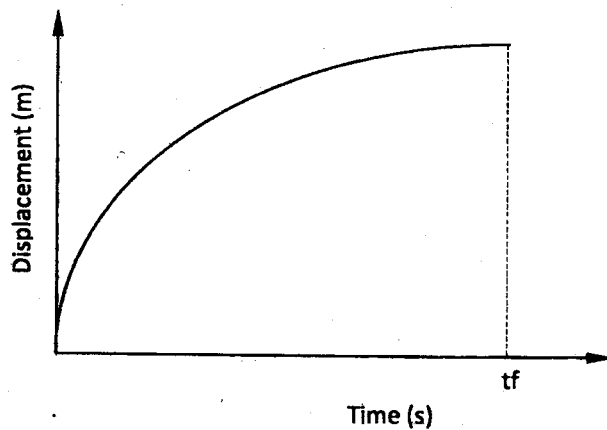
29. Spring constant = slope;

$$= \frac{(5-0)N}{(0.10-0)M} \quad ; \text{substitution}$$

$$= 50 \text{ N/m.}$$

(3 marks)

30.



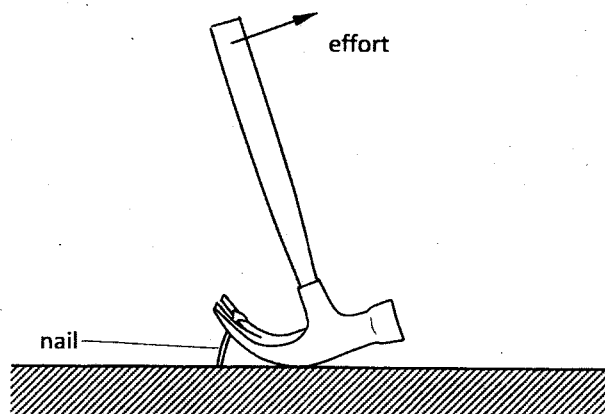
- curve of decreasing gradient;
- gradient of curve is zero at point tf.

(2 marks)

31. When the wheelbarrow is in motion the box is also in motion; When the wheelbarrow is stopped suddenly the box continues in its state of motion and hence slides forward.

(2 marks)

32. (a)



(1 mark)

- (b) Light energy changes to electrical energy; Electrical energy changes to chemical energy; in the car battery.

OR

Light

Electrical

Chemical

(2 marks)

33. (a) Reading decreases; (1 mark)

(b) Block displaces more water; hence more upthrust on the block. (2 marks)

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

#### SECTION A: BIOLOGY

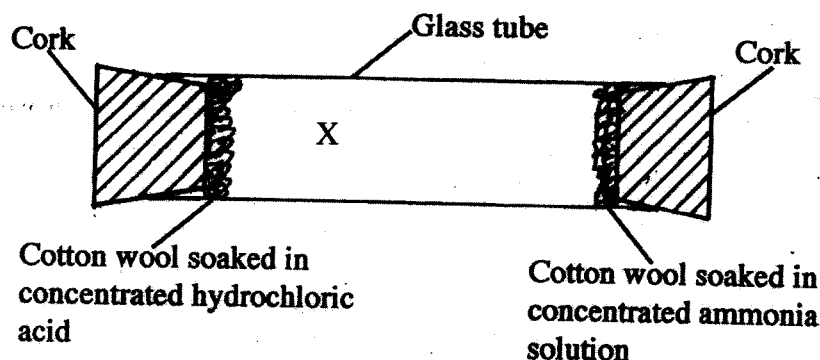
1. (a) Q - Animals;  
R - Ammonia/NH<sub>4</sub>;  
S - Nitrates; (3 marks)
- (b) Nitrogen fixation; (1 mark)
- (c) Fungi/saprophytic organisms; Bacteria;  
(any one correct) (1 mark)
2. (a) (i) Produce ova; produce hormones;  
(any one correct) (1 mark)
- (ii) Temporary storage of sperms;  
place where sperms develop motility;  
(any one correct) (1 mark)
- (b) The time between fertilization and birth. (1 mark)
3. (a) Growth is quantitative increase in size which is permanent;  
Development is qualitative changes involving differentiation; to form  
tissues. (1 mark)
- (b) To survive adverse conditions;  
To allow dispersal;  
To allow embryo to mature; (1 mark)
4. Continuous variation has intermediates for a particular characteristic while  
discontinuous variation has no intermediates; (1 marks)
- Continuous variation is influenced by both genes and environment while  
discontinuous variation is influenced by genes only; (1 mark)
5. (a) (i) Organisms with favourable variations survive and reproduce while  
those with unfavourable variations reduce in numbers/become extinct; (1 mark)
- (ii) Industrial melanism/peppered moth;  
Resistance to drugs/pesticides/antibiotics;  
(any one correct) (1 mark)
- (b) Thick cuticle; secretion of antienzymes/mucus;  
(any one correct) (1 mark)
6. (a) Thigmotropism/Haptotropism; (1 mark)
- (b) Support; exposure to light; (2 marks)

7. (a) (i) Myelin sheath; (1 mark)  
(ii) U-has dendrites which receive impulses from other neurones; (1 mark)
- (b) Semi-circular canals; (1 mark)
8. (a) hinge joints; ball and socket joints; gliding joints; pivot joint; (2 marks)  
(first two correct)
- (b) Packing; mechanical support; (1 mark)  
(first one correct)
9. (a) Attachment of zygote to the wall of the uterus; (1 mark)
- (b) Avoid indiscriminate sex/kissing; (2 marks)  
Avoid sharing of needles and syringes;
10. Father produces two types of gametes/sperms X and Y;  
Mother produces only one type of gamete/ova X;  
When an ovum is fertilized by the Y sperm, a boy results;  
An ovum fertilized by the X sperm forms a girl; (4 marks)

## SECTION B

### CHEMISTRY (33 Marks)

11. (a) A white ring is formed in the glass tube. (1 mark)
- (b) (i) The cross (X) should be nearer to the source HCl (g). (1 mark)



- (ii) Since ammonia (RMM = 17) is less dense than HCl gas (RMM = 36.5), it will diffuse faster than HCl. (1 mark)



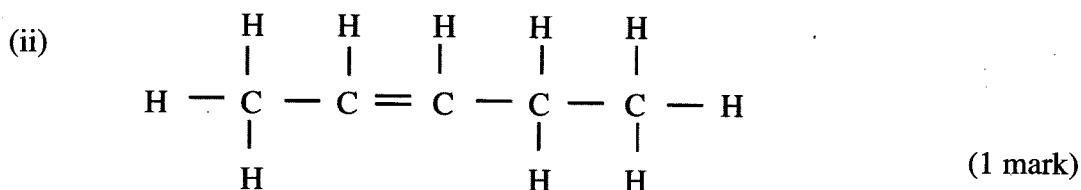
12.  $\text{CaCO}_3 \checkmark = 40 + 12 + 48 = 100 \checkmark$

$$\frac{0.1 \times 100}{1} = 10 \text{g} \checkmark \quad (2 \text{ marks})$$

13. (a) Blue litmus paper will turn to red and then bleached/turns white. (1 mark)

(b) Litmus paper turned to red because chlorine is acidic and then decolourised/turned white because the gas is a bleaching agent. (1 mark)

14. (a) (i) 2 - bromobutane (1 mark)



(b) Place acidified potassium manganate (VII)/bromine water in separate test tubes. Bubble the gases separately through the solutions. With but-1-ene, the two solutions will be decolourised while butane will not decolourise both solutions. (2 marks)

15. (a) (i) The water comes out in form of a "fountain". (½ mark)  
 (ii) This is due to the partial vacuum  $\sqrt{1/2}$  that is created in the flask as a lot of the ammonia gas dissolves  $\sqrt{1/2}$  in the first drop of water and the water is forced rapidly up the tube and enters the flask as fountain.  $\sqrt{1/2}$  (1½ marks)

(b) Ammonium chloride salt ( $\text{NH}_4\text{Cl}$ )  
 Calcium hydroxide ( $\text{Ca}(\text{OH})_2$ ) (1 mark)

(i) Bubble but-1-ene and butane through separate test tubes containing acidified potassium manganate (vii). Acidified  $\text{KMnO}_4$  will turn from purple to colourless with butane.

(ii) Bubble but-1-ene and Butane through separate test tubes containing bromine water. Bromine water is decolourised by but-1-ene but it remains brown with butane.

But-1-ene burns with sooty luminous flame but butane burns with blue non-luminous flame.

Bubble but-1-ene and butane through separate test tubes containing acidified potassium dichromate (VI).

But-1-ene turns acidified potassium dichromate (VI) from orange to green but remains orange with butane.

- (c)
- Large quantities of ammonia gas used to make fertilizers
  - Liquid ammonia used as a refrigerant
  - Ammonia solution is used as a solvent in laundry
  - Manufacture of ammonia salts.
  - Ammonia gas used in manufacture of nitric (V) acid.
  - Manufacture of dyes and fibres.
  - Manufacture of fibres.

- Used to soften hard water.

(Any two correct)

(1 marks)

16. (a) the reaction is exothermic.  $\sqrt{1}$  (1 mark)
- (b) The equilibrium will shift to the right since the volume of product is less than that of reactants.  $\sqrt{1}$  (2 marks)
- (c)
  - Purifying petroleum products
  - Manufacture of sulphuric (VI) acid
  - Bleaching fumigant and as food preservative. (Any one correct)(1 mark)
17. (a) A fuel is a material that releases heat energy when burned. (1 mark)
- (b)  $C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$  (1 mark)
- (c)
  - High heat content
  - Does not lead to deforestation
  - Easy to transport
  - Cleaner fuel than charcoal.
  - Easier to ignite
- (d) Solar, Geothermal, wind, hydroelectricity & tidal waves. (Any two correct marks) (2 marks)
18. (a)  $Na_2SO_4$  RFM =  $(23 \times 2) + 32 + (16 \times 4)$   
 $= 46 + 32 + 64 = 142 \sqrt{1/2}$   
 $= \frac{142}{142} = 1 \text{ mole } \sqrt{1/2}$   
 500cm<sup>3</sup> contains 1 mole  
 1000cm<sup>3</sup> would contain ?  
 $\frac{1000}{500} \times 1 \sqrt{1/2}$   
 $= 2 \text{ M } \sqrt{1/2}$  (2 marks)
- (b)  $M_1 V_1 = M_2 V_2$   
 $2 \times V_1 = 0.5 \times 1000 \sqrt{1/2}$   
 $V_1 = \frac{0.5 \times 1000}{2} \sqrt{1/2} = 250 \text{ cm}^3 \sqrt{1}$  (2 marks)
19. (a) (i)  $Fe_2O_{3(s)} + 3CO_{(g)} \longrightarrow 2Fe_{(l)} + 3CO_{2(g)}$  (1 mark)
- (ii) Decomposes to give carbon (IV) oxide and calcium oxide which are both used in the process. (1 mark)
- (iii) Calcium oxide react with silica to give calcium silicate (slug) which form a liquid layer on top of liquid iron as it flows away. (2 marks)
- (b) Steel (1 mark)

## SECTION C

### PHYSICS (33 Marks)

1. Magnification =  $\frac{\text{Image height}}{\text{object height}}$ ; = 0.5

$$\begin{aligned}\text{Image height} &= 0.5 \times \text{object height} \\ &= 0.5 \times 24 \text{ cm}; \\ &= 12 \text{ cm};\end{aligned}$$

(3 marks)

2. The glass rod is positively charged;

(1 mark)

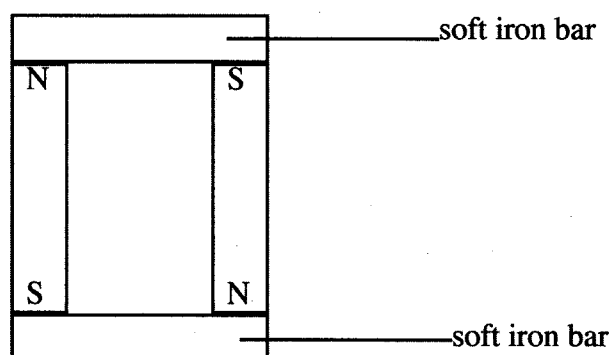
3. (a) carbon powder - to increase conductivity between the carbon rod and the zinc case;

(1 mark)

(b) manganese IV oxide - a depolarizer;

(1 mark)

4.



(1 mark)

5. - Transverse wave;

- Movement of the block is perpendicular to the direction of the wave motion;

(2 marks)

6. A vacuum was created by pumping the air out of the jar;

Sound requires a material medium for propagation;

(2 marks)

7. (a) IV;

(b) 0.3 A;

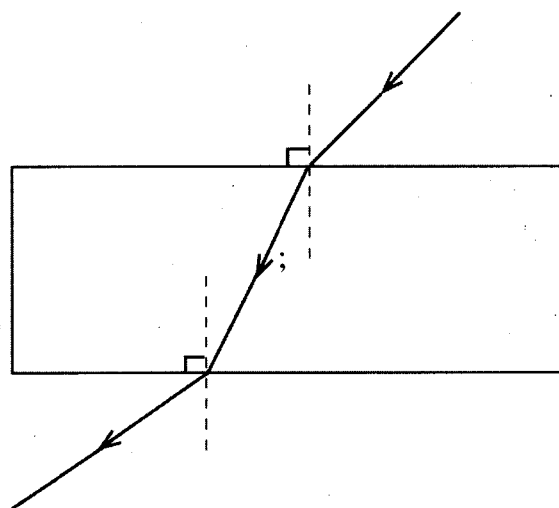
(2 marks)

8. Heat will increase;

Reducing resistance increases the current;

(2 marks)

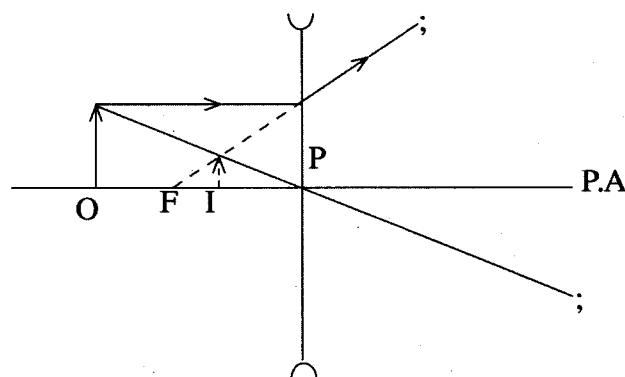
9.



Refracted Ray Bending Towards Normal;  
Emerging ray bending away from normal;

(2 marks)

10.



Ray from O parallel to PA then from lens;  
Ray from O through pole P;  
Image erect virtual at intersection of they rays;

(3 marks)

11. Periodic time = 0.4 seconds;

(1 mark)

12. (a) Stepping up reduces current of transmission;  
hence reducing heat loss;

(2 marks)

(b) To isolate all parts which are connected to the live wire;  
When there is excess current.

(1 marks)

13. (a) Anode;

(b) To heat the cathode;

(c) The screen glows;

(3 marks)

14. (a) Increase the anode voltage;

(b) X-rays have no charge;

(2 marks)

15. Radioactive emission enters the tube and causes ionization; of the gas inside the tube.

Opposite charges are attracted to opposite electrodes creating a current;

(2 marks)

16. By doping; with Group 5 element;

(2 marks)