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.*

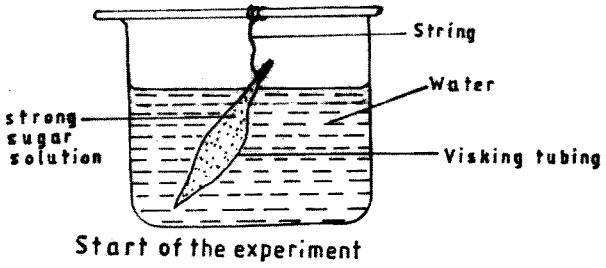
1 (a) Give **two** reasons why a child requires more energy than an adult. (2 marks)

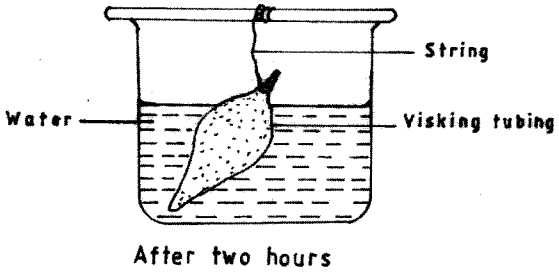
(b) How can the presence of lipids in a food substance be confirmed without using chemical reagents? (2 marks)

2 (a) State **one** example of an organism in the kingdom protoctista. (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.

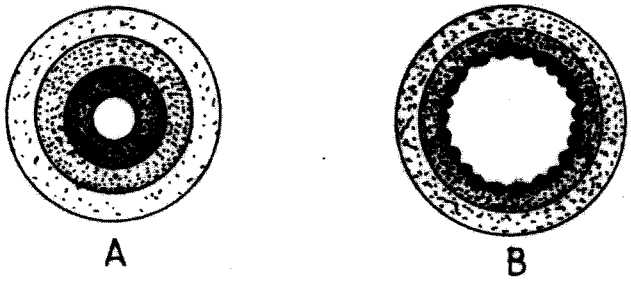




(a) Name the physiological process that was being demonstrated. (1 mark)

(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)

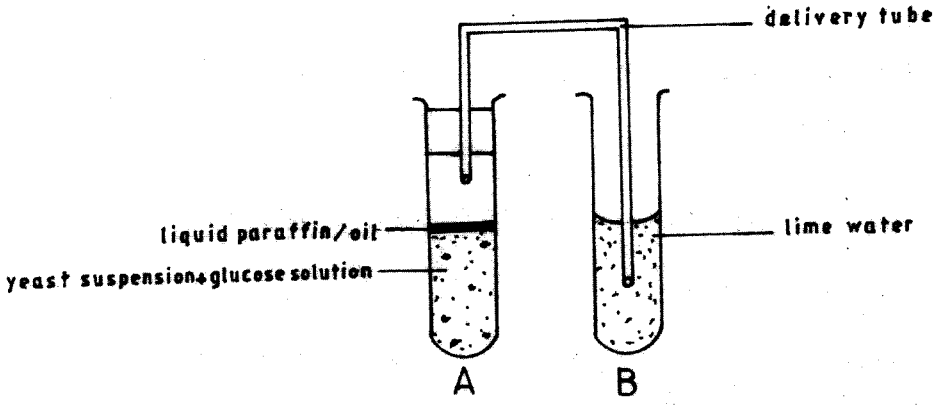
(b) How is the blood vessel labelled B adapted to its function? (2 marks)

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)

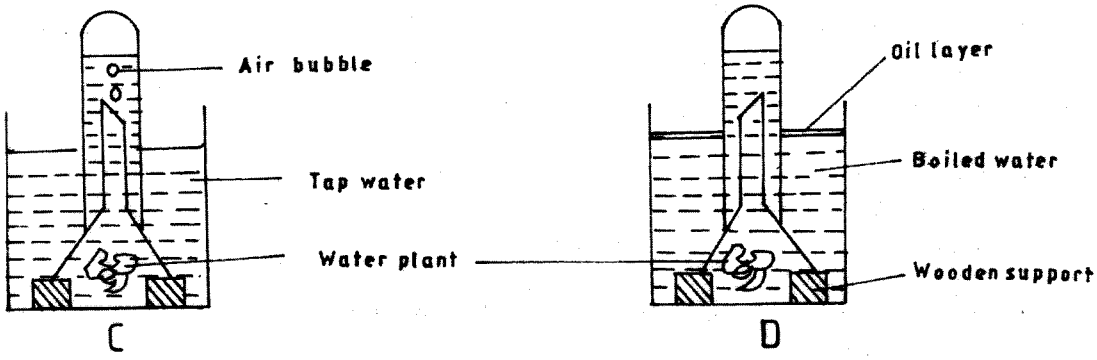
6 The diagram below shows an experimental set-up to demonstrate a biological process.



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

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

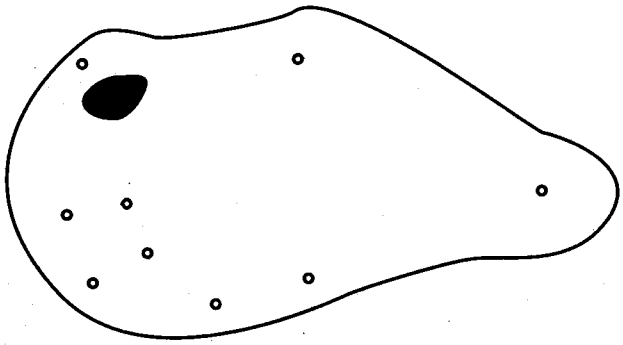
7 Form one students set up an experiment to demonstrate a physiological process as shown in the diagrams below.



(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)

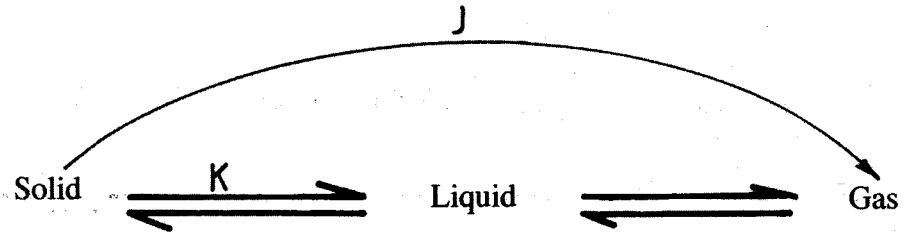


9 State **four** factors that affect the rate of breathing in human beings. (4 marks)

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 .....

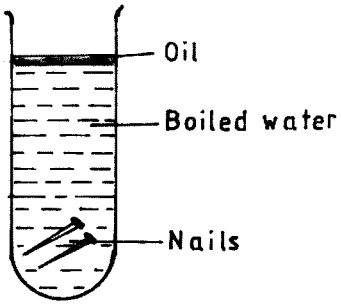
K .....

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

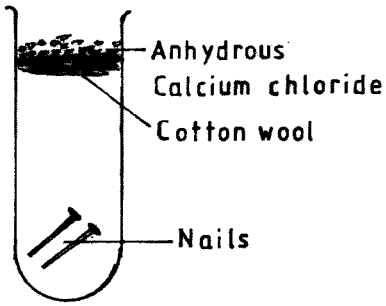
Dilute sulphuric (VI) acid + Solid sodium carbonate

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

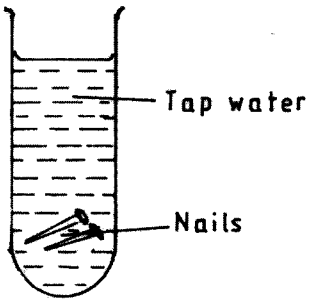
12 Three experiments were set up as shown below to investigate the conditions necessary for rusting to occur.



Experiment I



Experiment II



Experiment III

(a) After three days, only the nails in experiment III had rusted. Why didn't rusting occur in experiments I and II ?

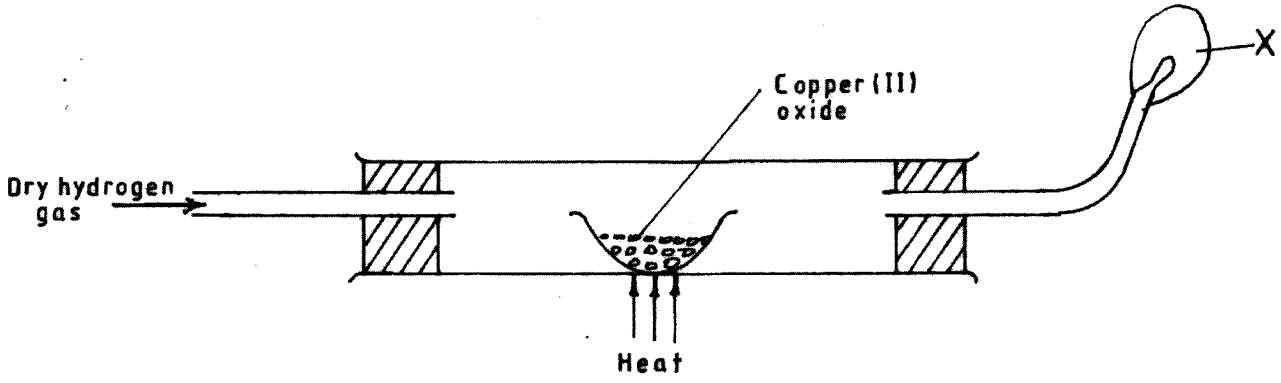
I .....(1 mark)
II .....(1 mark)

(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 $^{12}_{6}C$ and $^{13}_{6}C$ 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)

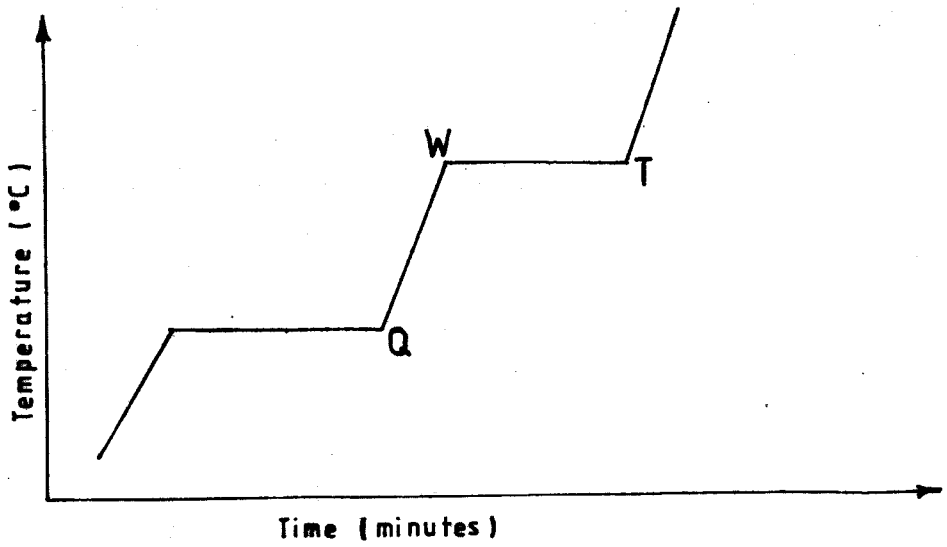
(d) Element P and R would react to form a compound PR. What type of bond exists in compound PR? (½ mark)

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^3 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)

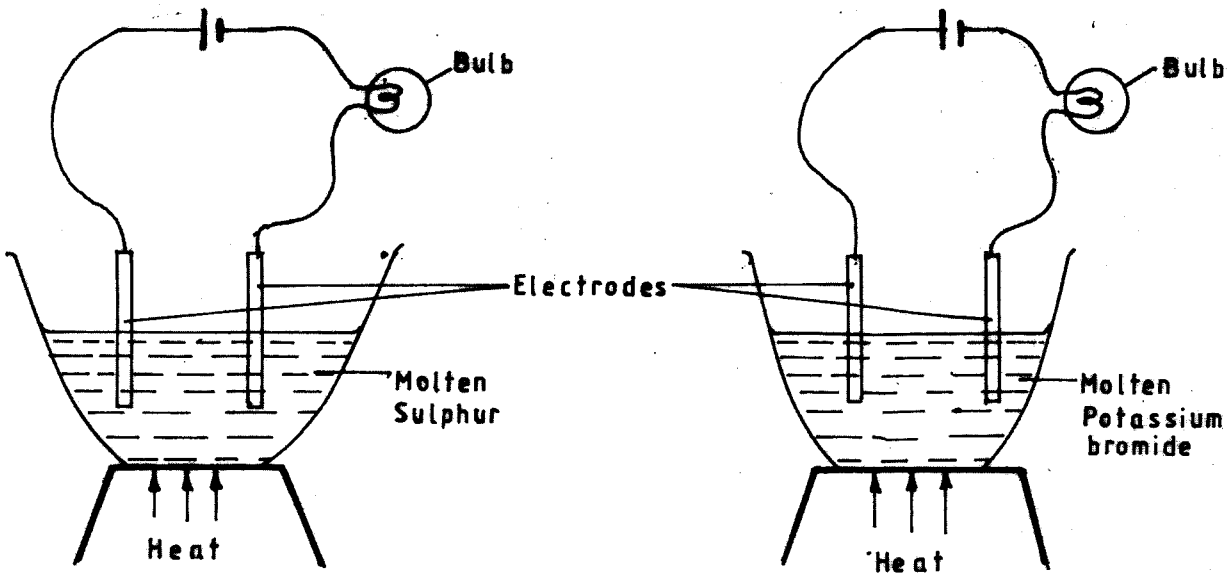
(ii) W and T .....(1½ marks)

(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.



Experiment I Experiment II

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)

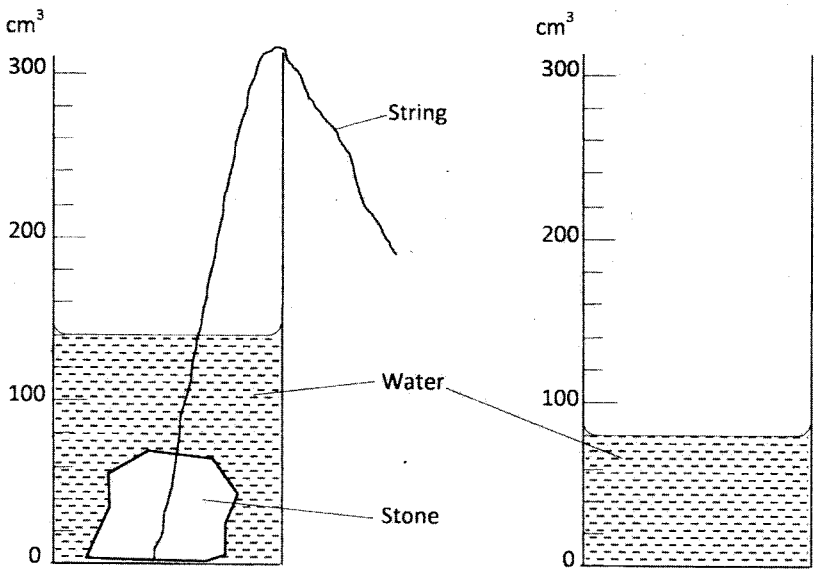


Figure 1(a) **Figure 1(b)**

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 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.

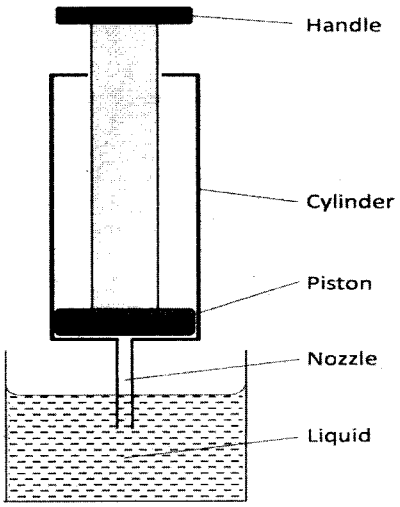


Figure 2

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.

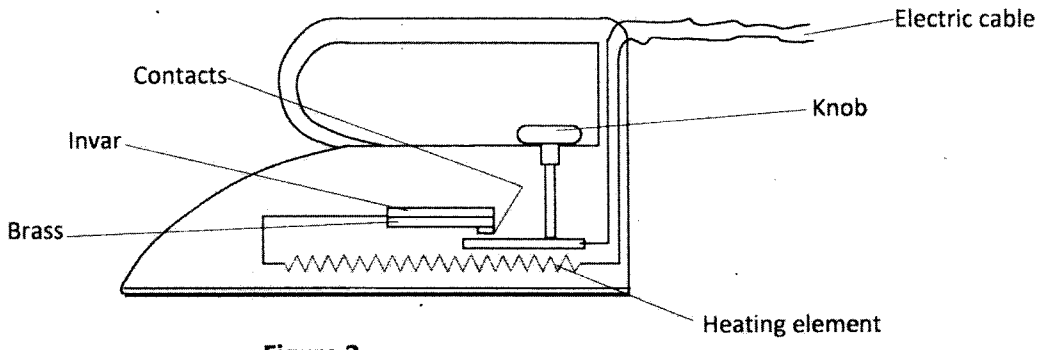


Figure 3

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.

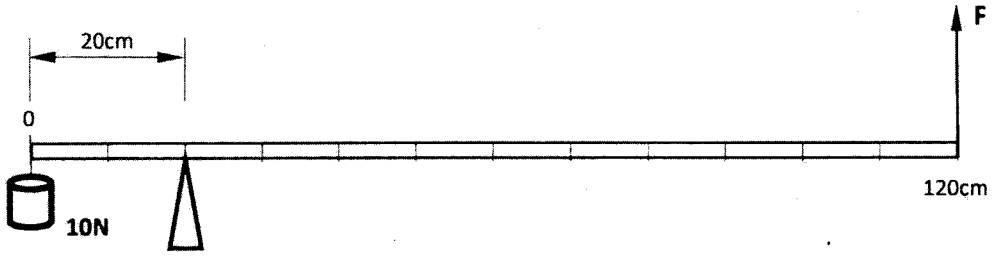


Figure 4

Determine the magnitude of F. (3 marks)

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

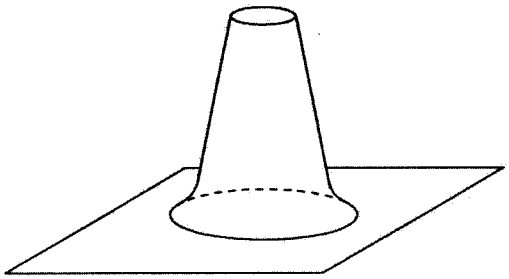


Figure 5

(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.

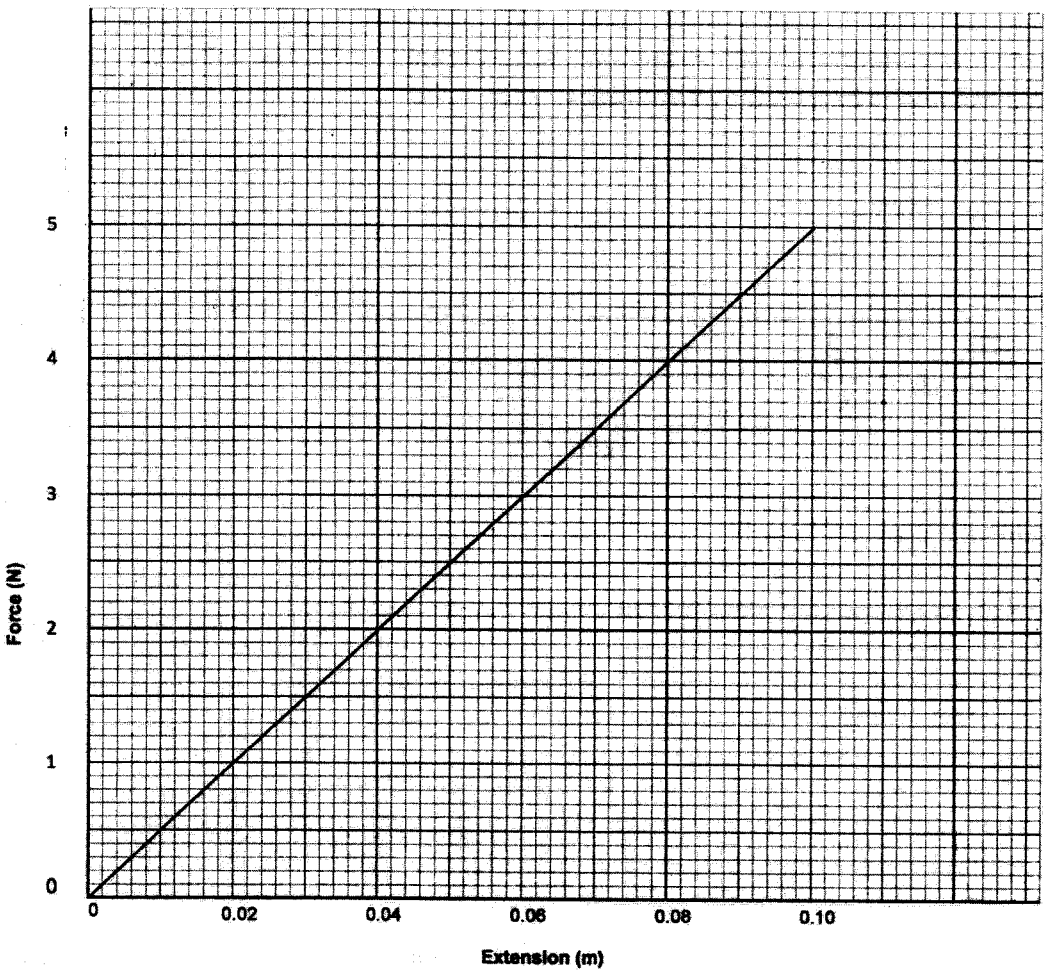
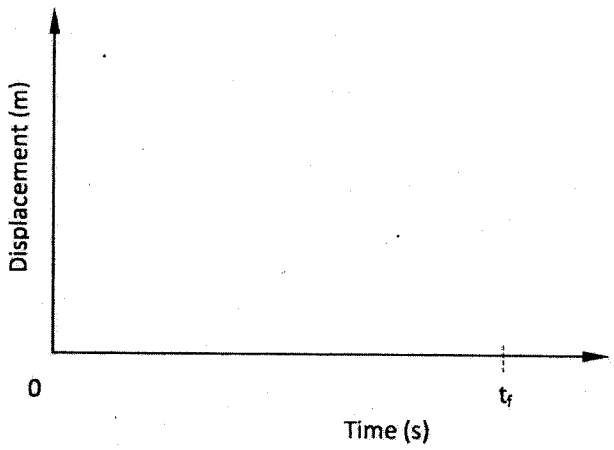


FIGURE 6

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.

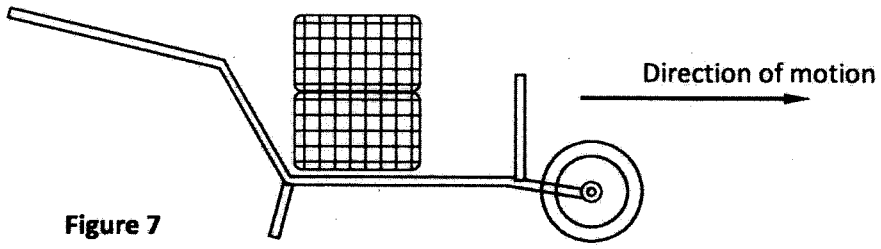


Figure 7

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.

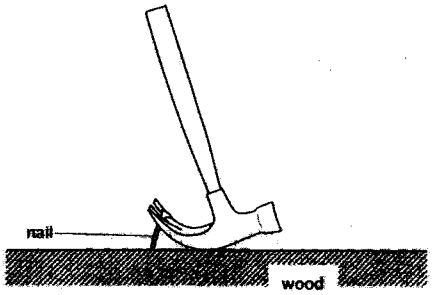


Figure 8

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.

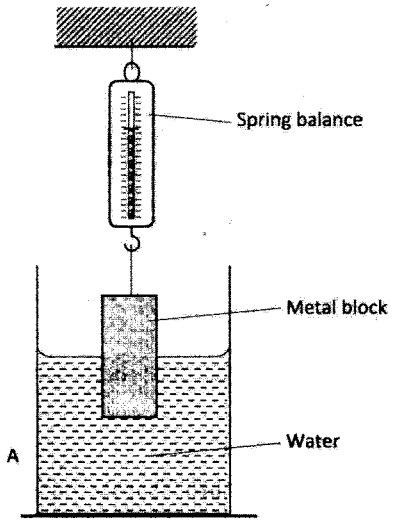


Figure 9

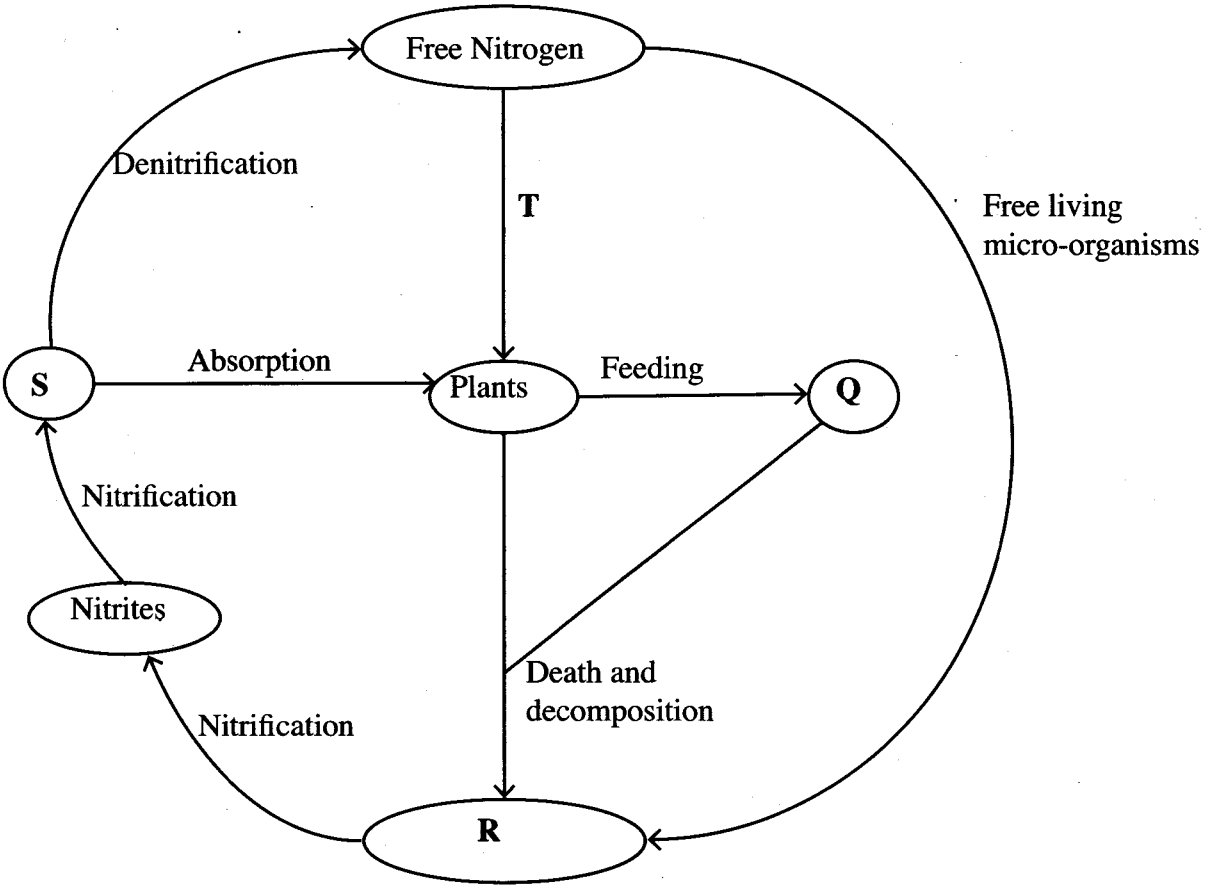
(a) State what will be observed in the reading of the balance if the block is lowered further into the water. (1 mark)

(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)

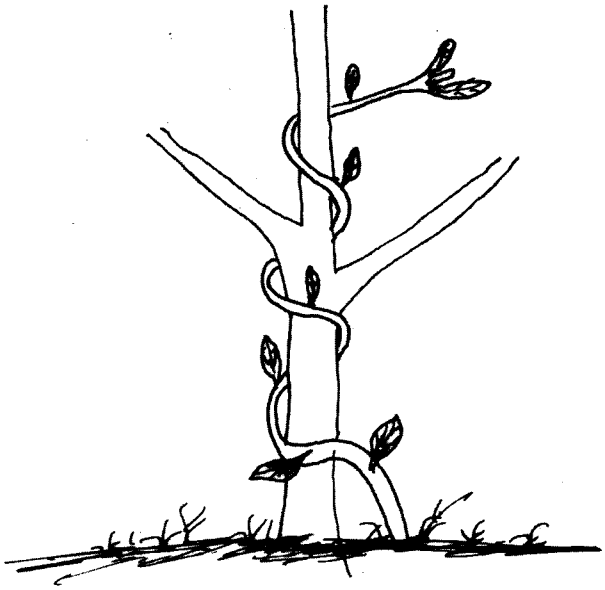
(b) What is the importance of dormancy in seeds? (3 marks)

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)

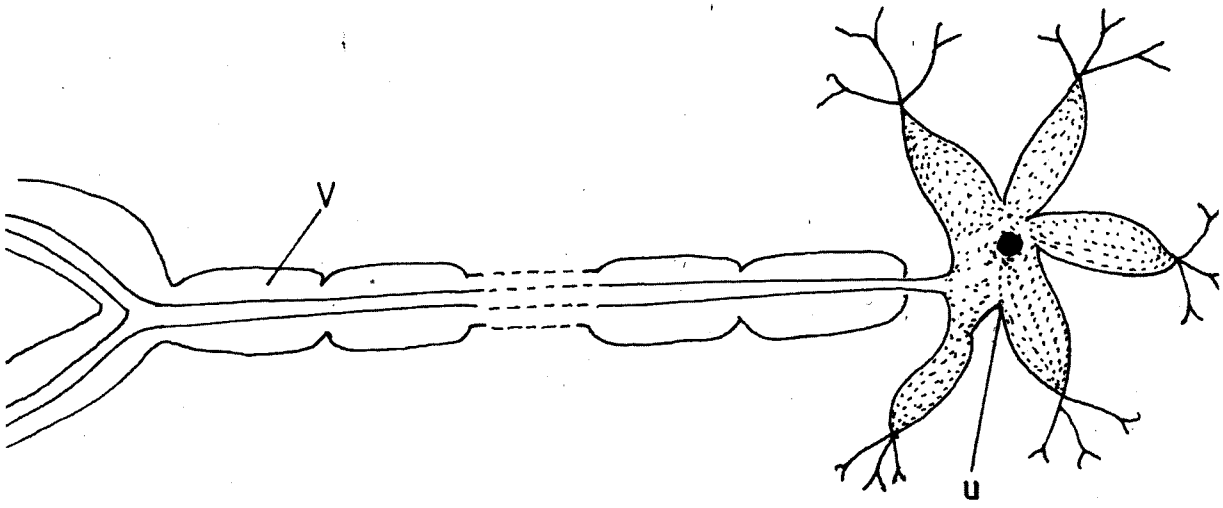
6 The diagram below illustrates a certain tropic response.



(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)

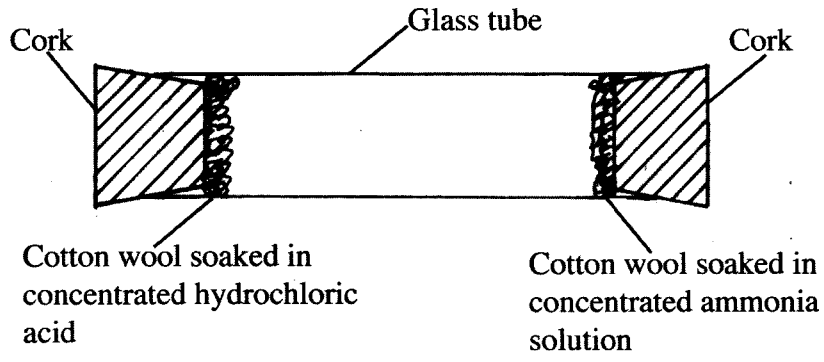
(b) State **two** ways of reducing the spread of herpes simplex. (2 marks)

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)

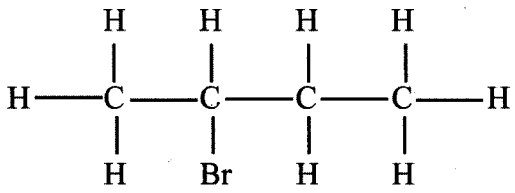
12 Calculate the mass that is contained in 0.1 moles of calcium carbonate.
(Ca = 40.0; C = 12.0; O = 16.0). (2 marks)

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)

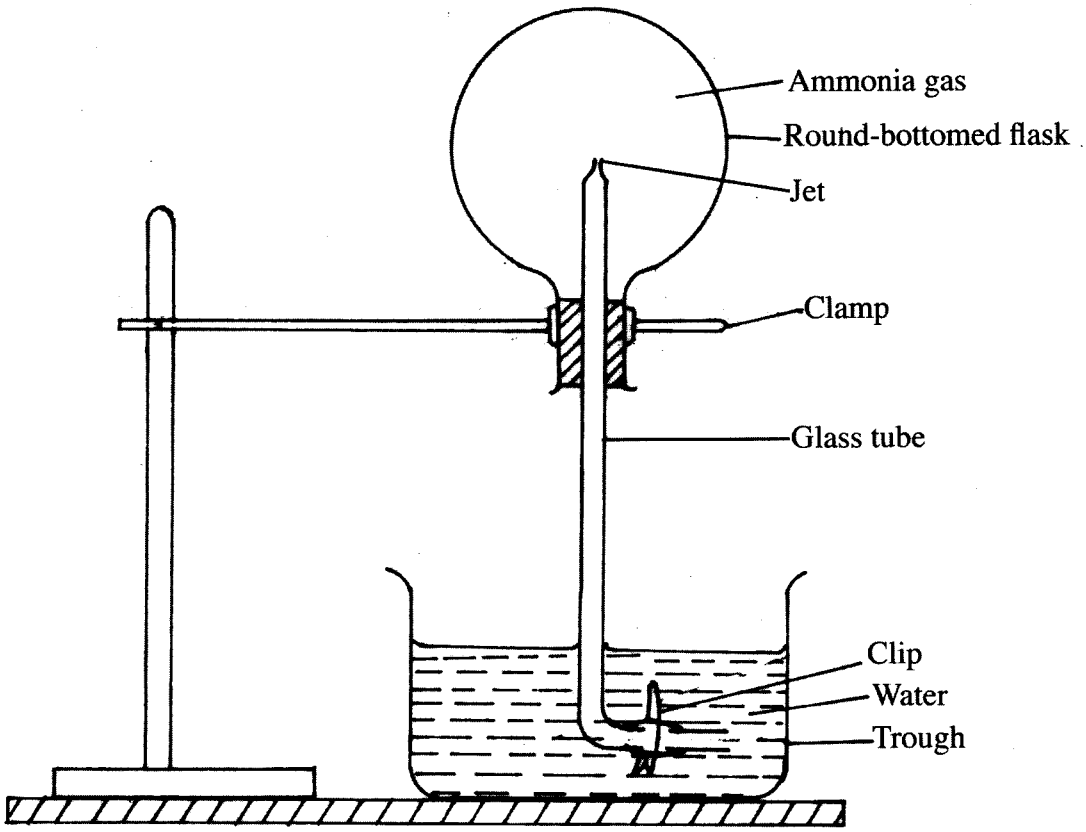


(ii) Draw the structure of pent-2-ene. (1 mark)

(b) Describe a chemical test that can be used to distinguish between butane and but-l-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. (½ mark)

(ii) Explain the answer in a(i) above. (1½ 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.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \; ; \; \Delta H = -ve$$

(a) What is meant by ΔH = -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^3 of distilled water. More water was added to make up to 500 cm^3 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.

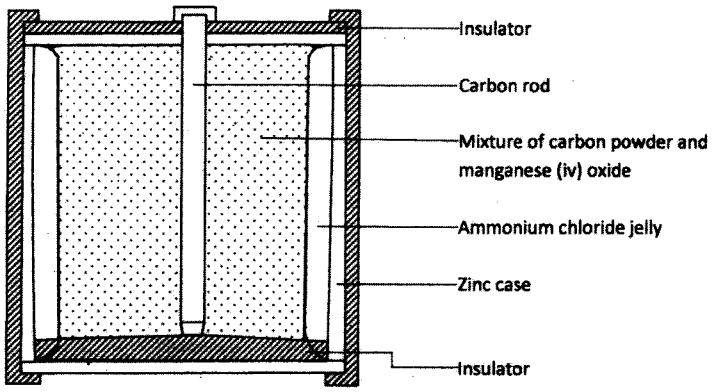


Figure 1

State the use of:

(a) carbon powder; ..... (1 mark)

(b) mangenese (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.

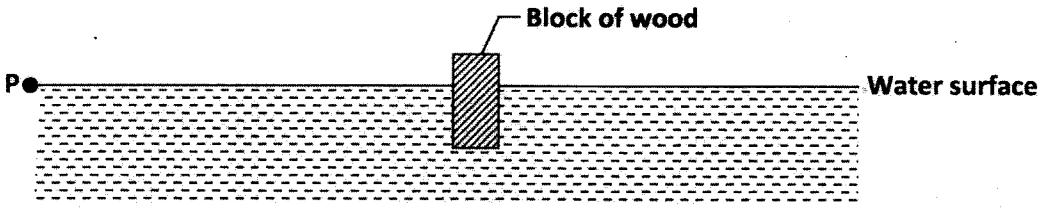


Figure 2

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.

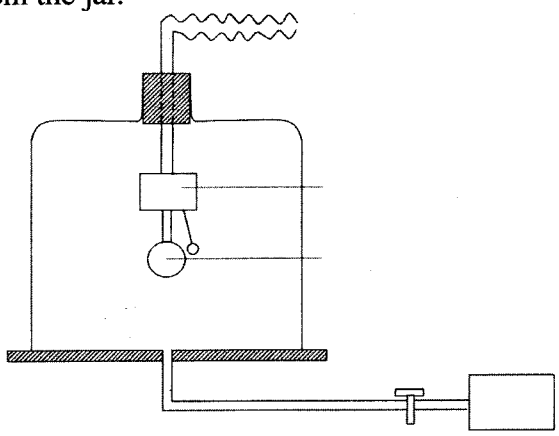


Figure 3

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.

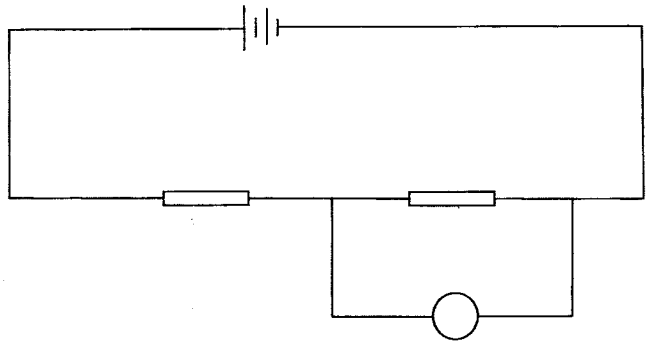


Figure 4

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.

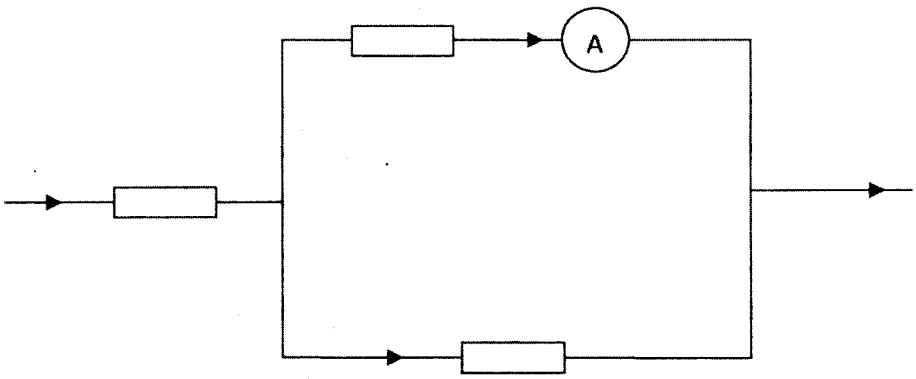


Figure 5

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.

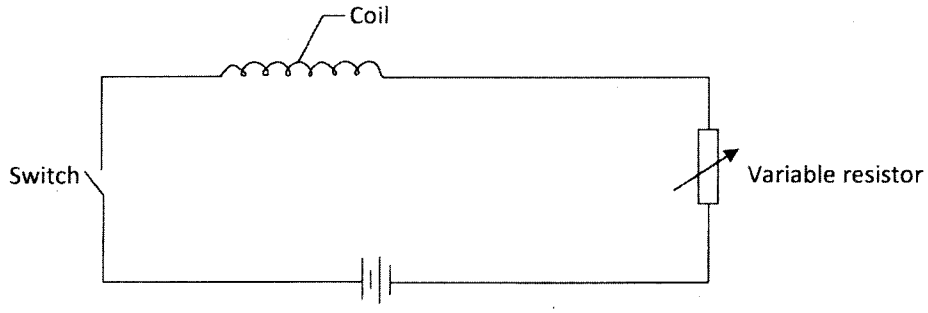


Figure 6

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.

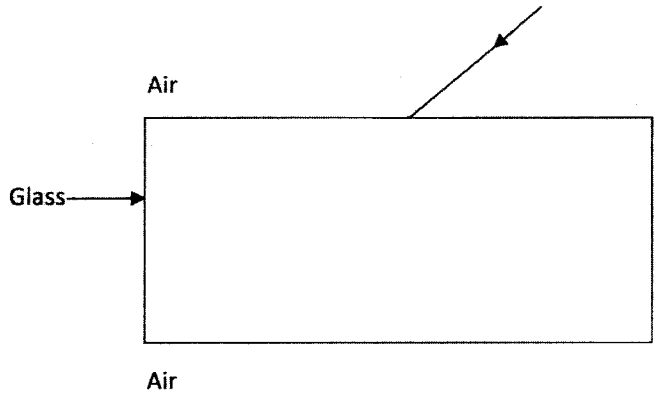


Figure 7

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.

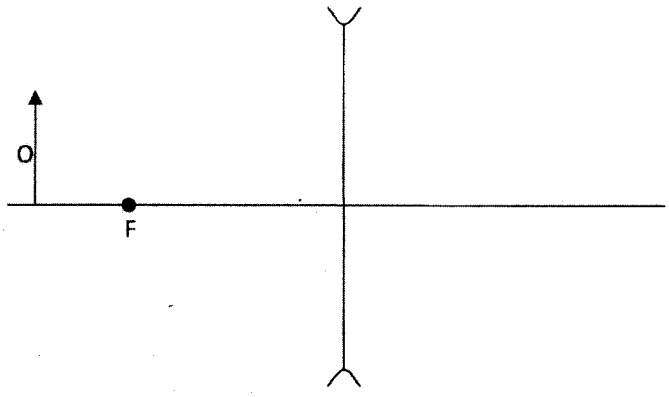


Figure 8

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.

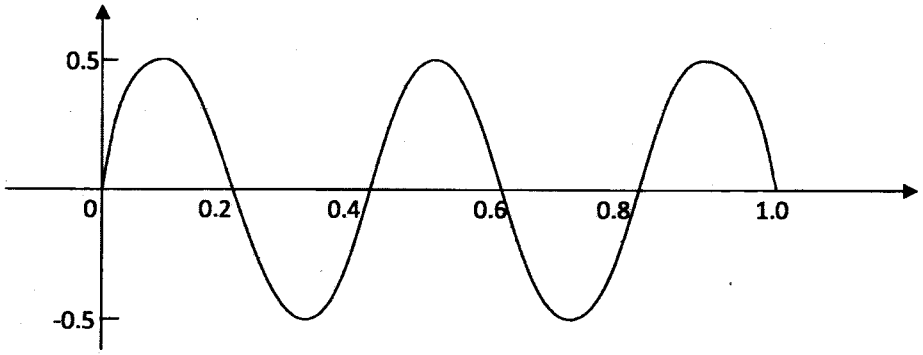


Figure 9

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.

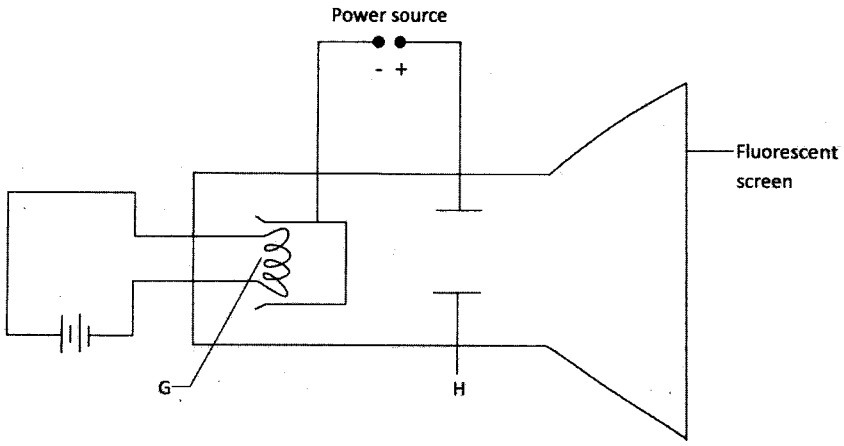


Figure 10

(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)