

3.8 GENERAL SCIENCE (237)

3.8.1 General Science Paper 1 (237/1)

SECTION A: BIOLOGY (34 marks)

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

- 1 (a) Name **one** example of an organism in the kingdom *monera*. (1 mark)
- (b) State **one** function for each of the following parts of a light microscope:
- (i) coarse adjustment knob; (1 mark)
  - (ii) diaphragm. (1 mark)

- 2 (a) **Figure 1** represents a mammalian heart.

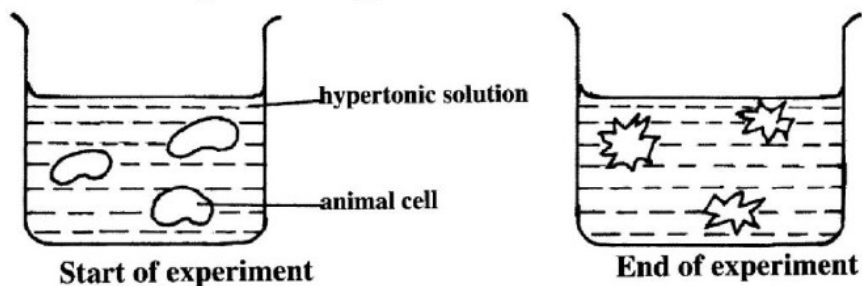


**Figure 1**

On the figure, draw arrows to show the direction of flow of blood in vessels labelled **K** and **L**. (2 marks)

- (b) Students carried out an experiment in which two strips of cobalt chloride paper were clipped one on the upper surface and the other on the lower surface of a leaf of a terrestrial plant. The experimental set-up was left for sometime.
- (i) On which side of the leaf did the cobalt chloride paper change colour faster? (1 mark)
  - (ii) Give a reason for your answer in (b) (i) above. (1 mark)

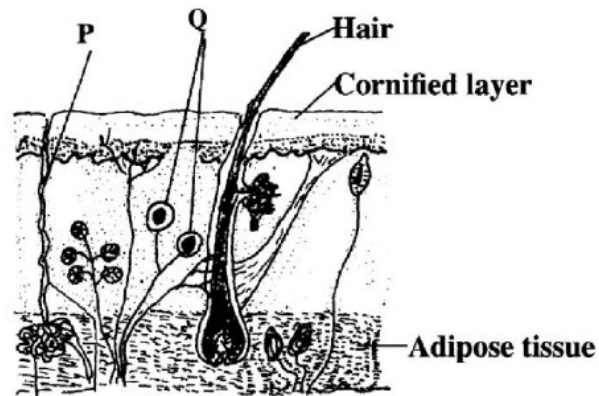
- 3 **Figure 2** illustrates a set-up that was used to demonstrate a process that takes place when animal cells are placed in a hypertonic solution.



**Figure 2**

- (a) Describe the shape of the cells at the end of the experiment. (1 mark)

- (b) Explain the observation made at the end of the experiment. (2 marks)
- 4 (a) State **two** factors that determine energy requirements in human beings. (2 marks)
- (b) Distinguish between autotrophic and heterotrophic nutrition. (2 marks)
- 5 (a) State **two** differences between aerobic and anaerobic respiration. (2 marks)
- (b) Name the branch of biology that deals with the study of relationships between organisms and their environment. (1 mark)
- 6 (a) State **two** features in lungs that make them suitable for gaseous exchange. (2 marks)
- (b) State **one** symptom of asthma. (1 mark)
- 7 (a) **Figure 3** represents a transverse section of a mammalian skin.



**Figure 3**

Name the structures labelled **P** and **Q**.

- (i) **P** ..... (1 mark)
- (ii) **Q** ..... (1 mark)
- (b) Explain how the kidney regulates the amount of water in the body. (2 marks)
- 8 (a) State **two** ways of controlling liver cirrhosis. (2 marks)
- (b) What is excretion? (1 mark)
- 9 (a) State the meaning of the following terms:
- (i) tissue; (1 mark)
- (ii) cell. (1 mark)
- (b) State **one** importance of scientific naming of organisms. (1 mark)

- 10 (a) State ways by which mineral salts and water are absorbed into the root hairs of plants.
- (i) Mineral salts; (1 mark)
- (ii) Water. (1 mark)
- (b) Explain how one can determine if a food substance contains proteins. (2 marks)

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

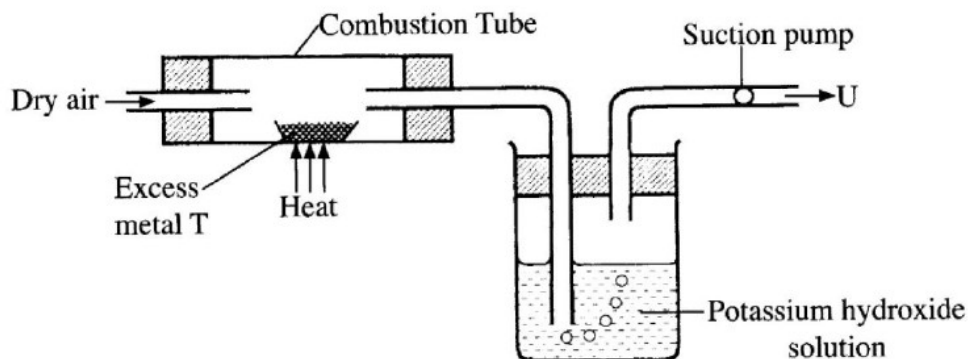
Answer ALL the questions in this section in the spaces provided.

- 11 Table 1 shows the pH values of solutions P, Q, R and T.

**Table 1**

Solution	P	Q	R	T
pH	9	6	11	2

- (a) State the observations made when both blue and red litmus papers are dipped into solution P. (1 mark)
- (b) Name the type of reaction that occurs when solution R reacts with solution T. (1 mark)
- 12 (a) Given the following reagents; lead (II) oxide, dilute nitric (V) acid and sodium sulphate solution, describe how a student can prepare a sample of lead (II) sulphate. (3 marks)
- (b) State **one** use of calcium sulphate salt. (1 mark)
- 13 Figure 4 shows a set-up that was used to investigate the properties of some of the components of air.



**Figure 4**

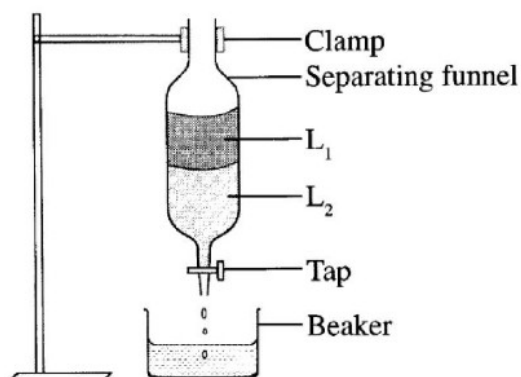
- (a) Metal T is in group two of the periodic table. Write the formula of the product formed in the combustion tube. (1 mark)

- (b) State the role of potassium hydroxide solution. (1 mark)
- (c) Identify the main gas in U. (1 mark)
- 14 (a) An atom of element D has a mass number of 19 and 10 neutrons.
- (i) Write the electron arrangement of the atom. (1 mark)
- (ii) In which period does element D belong? (1 mark)
- (b) A compound has a formula  $X_2Y_3$ . In which group of the periodic table does X belong? (1 mark)
- 15 The elements L, M and N are in the same group. Study **Table 2** and answer the questions that follow. The letters are not the actual symbols of the elements.

**Table 2**

Element	Atomic number	Atomic radius (nm)	First ionization energy in $\text{kJmol}^{-1}$
L	4	0.089	900
M	12	0.136	736
N	20	0.174	590

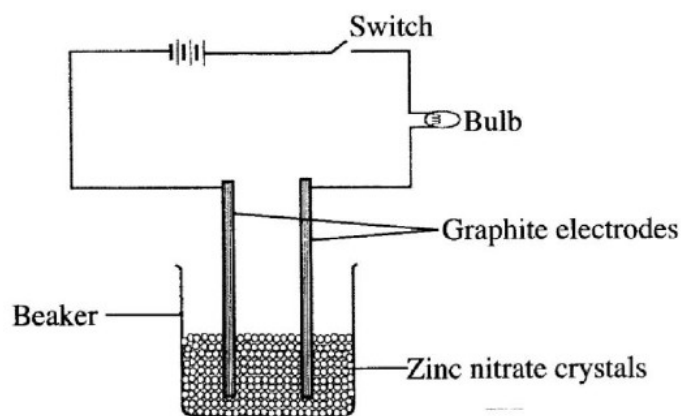
- (a) (i) Explain why the atomic radius of N is larger than that of L. (1 mark)
- (ii) Arrange the elements in order of reactivity starting with the **least** reactive. (1 mark)
- (b) Why does the 1<sup>st</sup> ionisation energy of the elements decrease down the group? (2 marks)
- 16 (a) A student used the apparatus in **Figure 5** to separate liquids  $L_1$  and  $L_2$ .



**Figure 5**

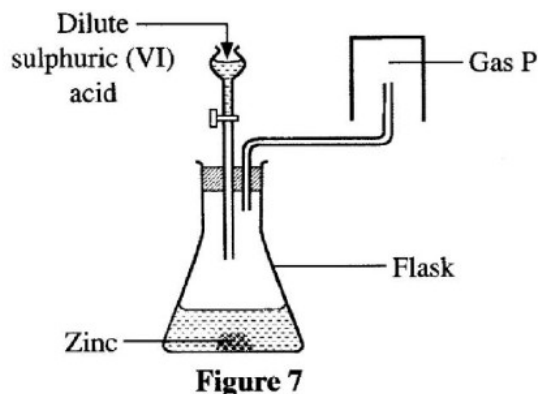
State **two** physical properties that enabled liquids  $L_1$  and  $L_2$  to be separated. (2 marks)

- (b) What precaution should be taken to ensure complete separation of the two liquids? (1 mark)
- 17 (a) Explain why diamond is the hardest substance. (2 marks)
- (b) State **one** use of diamond. (1 mark)
- 18 The set-up shown in **Figure 6** was used by a student to investigate the effect of electric current on zinc nitrate crystals.



**Figure 6**

- (a) When the switch was put on, the bulb did not light. When water was added into the beaker, the bulb lit. Explain. (2 marks)
- (b) Identify the ions that were attracted to the cathode. (1 mark)
- 19 (a) Describe how temporary hard water is formed. (2 marks)
- (b) State **one** advantage of drinking hard water. (1 mark)
- 20 Study the set-up shown in **Figure 7** and answer the questions that follow.



**Figure 7**

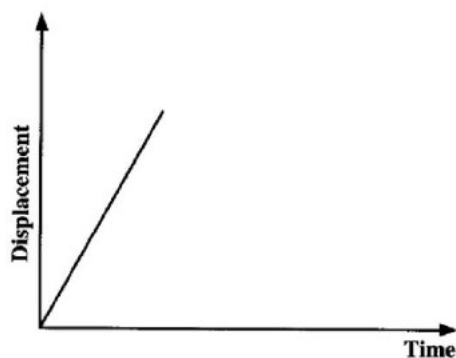
- (a) Write an equation for the reaction that occurs in the flask. (1 mark)
- (b) Explain why the gas is collected as shown in the set-up. (1 mark)

- (c) State **one** commercial use of gas P. (1 mark)
- 21 State **two** physical properties that are used to determine purity of a substance. (2 marks)

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

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

- 22 A stopwatch used to time a falling object started 0.20 s after the start button was pressed. The time recorded was 3.22 s, determine the time of the fall. (2 marks)
- 23 Describe adhesive forces. (2 marks)
- 24 It was observed that a partially inflated balloon becomes fully inflated as it rises. Explain this observation. (2 marks)
- 25 Fine chalk dust particles are suspended in water then observed through a microscope. The particles are observed to move in a random manner. Explain this observation. (2 marks)
- 26 Name **two** types of thermometers. (2 marks)
- 27 Explain why a metallic seat inside a room feels cooler than a wooden seat in the same room. (2 marks)
- 28 Ventilation holes in a room are placed at a higher level than the doors and windows. Explain how they work to keep the room ventilated. (2 marks)
- 29 (a) Define the term displacement as used in linear motion. (1 mark)
- (b) **Figure 8** represents a displacement-time graph of a body in motion.



**Figure 8**

- Describe the motion of the body. (2 marks)

- 30 Figure 9 shows a set-up that was used to determine the weight ( $w$ ) of a wooden plank.

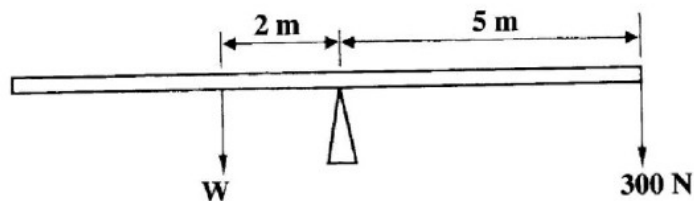


Figure 9

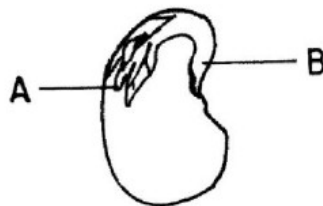
- Calculate the value of  $w$ . (3 marks)
- 31 A cork with a narrow tube through it is used to seal a conical flask full of water at  $0^{\circ}\text{C}$ . The water level in the tube is above the cork. The flask is held vertically and lowered into hot water. Explain what is observed. (2 marks)
- 32 State the energy changes that take place when a stone is thrown vertically upwards, reaches the highest point then starts falling. (2 marks)
- 33 A student observed that a string extended by 3 cm when supporting a load of 4.5 N. Determine its spring constant. (3 marks)
- 34 Define the term **centre of gravity**. (1 mark)
- 35 A bag of maize at the back of an open pick-up slides backward when the pick-up suddenly starts moving forward. Explain the reason why this happens. (2 marks)
- 36 A piece of steel sinks in water. Explain how it can be made to float. (3 marks)

**3.8.2 General Science Paper 2 (237/2)**

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

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

- 1** (a) What is meant by the following terms:
- (i) habitat; (1 mark)
  - (ii) population? (1 mark)
- (b) Explain **one** effect for each of the following air pollutants to the environment:
- (i) sulphur (IV) oxide; (2 marks)
  - (ii) smoke. (2 marks)
- 2** (a) Explain the significance of the position of testis in humans. (2 marks)
- (b) State **two** reasons why reproduction is important. (2 marks)
- 3** (a) **Figure 1** illustrates a longitudinal section of a bean seed.



**Figure 1**

Name the parts labelled **A** and **B**.

**A** ..... (1 mark)

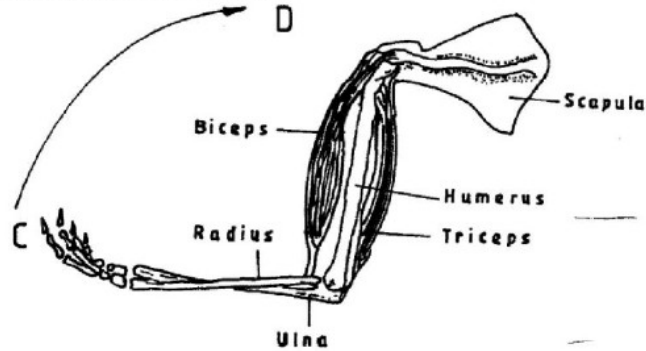
**B** ..... (1 mark)

- (b) (i) Distinguish between the terms epicotyl and hypocotyl. (1 mark)
- (ii) Name a plant hormone that promotes apical dominance. (1 mark)
- 4** (a) State the meaning of the following terms:
- (i) genetics; (1 mark)
  - (ii) genes. (1 mark)



- (b) What is meant by:
- (i) complete dominance; (1 mark)
- (ii) phenotype? (1 mark)
- 5 (a) Explain why Lamarck's evolution theory was discredited. (2 marks)
- (b) What is meant by complete metamorphosis in insects? (1 mark)
- 6 State **two** similarities between the endocrine and the nervous system. (2 marks)
- 7 (a) How are the vascular bundles arranged in young:
- (i) monocotyledonous stem; (1 mark)
- (ii) dicotyledonous stem? (1 mark)

(b) **Figure 2** illustrates the human arm.



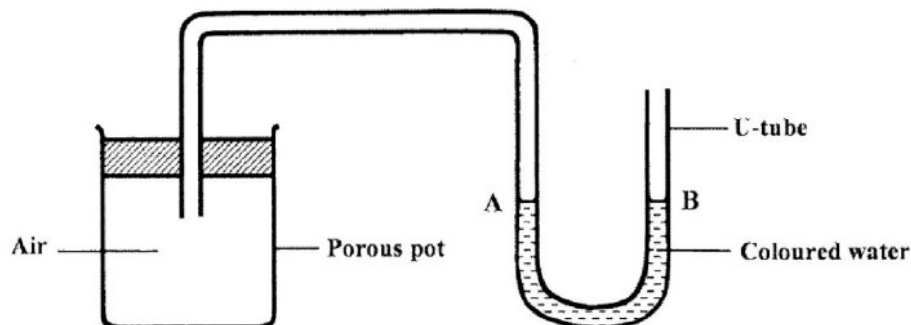
**Figure 2**

- Describe how the muscles work to move the forearm from point C to D. (1 mark)
- 8 (a) Name the causative agent of syphilis. (1 mark)
- (b) Which hormone brings about ovulation in humans? (1 mark)
- 9 (a) State **two** ways in which genetic counselling is used in the community. (2 marks)
- (b) State how the following eye defects can be corrected:
- (i) short sightedness; (1 mark)
- (ii) astigmatism. (1 mark)
- 10 State **two** differences between simple reflex action and conditioned reflex action. (2 marks)

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

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

- 11** (a) State the **two** conditions under which Graham's Law of diffusion operates. (1 mark)
- (b) **Figure 3** shows a set-up in which the porous pot contained air.



**Figure 3**

- (i) State the observation made in the U-tube if air was replaced with carbon (IV) oxide. (1 mark)
- (ii) Explain the observation made in (b) (i) above. (1 mark)
- 12** (a) What is meant by the term **molarity** of a solution? (1 mark)
- (b) 100 cm<sup>3</sup> of 0.1 M sodium hydroxide solution was mixed with 100 cm<sup>3</sup> of 1 M sodium hydroxide solution.
- (i) calculate the number of moles contained in the mixture; (2 marks)
- (ii) Determine the molarity of the mixture. (2 marks)
- 13** (a) Complete the following table:

Polymer	Use
Cellulose	.....
.....	Plastic water pipes

- (2 marks)
- (b) State **two** pollution effects of detergents to the environment. (2 marks)

14 Explain the following statements:

(a) sulphur (IV) oxide is a bleaching agent in wet conditions; (2 marks)

(b) newspapers turn yellow-brown after exposure to sunlight over a period of time. (1 mark)

15 **Figure 4** is a representation of Down's cell used in the extraction of sodium metal. Study it and answer the questions that follow.

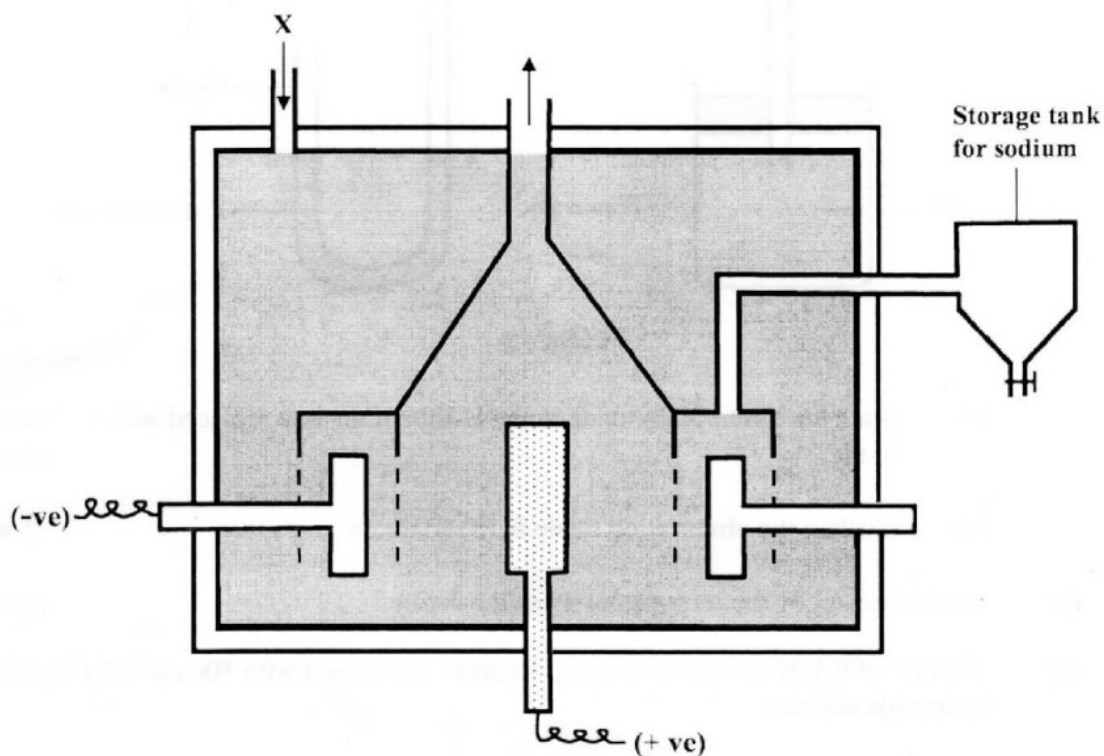


Figure 4

(a) Name the materials that are introduced at X. (1 mark)

(b) Write an equation for the reaction that occurs at the anode. (1 mark)

(c) What material is the cathode made of? (1 mark)

(d) Give **two** industrial uses of sodium metal. (1 mark)

16 (a) What is meant by “enthalpy of combustion”? (1 mark)

- (b) The table below shows heating values of some fuels. Use it to answer the questions that follow.

Fuel	State at room temperature	Heating value in $\text{kJg}^{-1}$
Ethanol	Liquid	30
Kerosene	Liquid	48
Charcoal	Solid	33
Propane	Gas	50

- (i) Identify the best fuel for use in jet engines. (1 mark)
- (ii) Give **two** reasons for the answer in b(i) above. (1 mark)
- (iii) Which fuel has the greatest pollution effect? Explain. (2 marks)

17 Explain how each of the following affects rate of chemical reaction.

- (a) Increase in surface area; (2 marks)
- (b) Decrease in concentration. (2 marks)

18 (a) When chlorine gas is passed through a solution of potassium iodide, the following reaction takes place.



Identify the oxidising agent in the reaction. (1 mark)

- (b) Explain the pollution effects of chlorofluorocarbons (CFCs) to the environment. (2 marks)

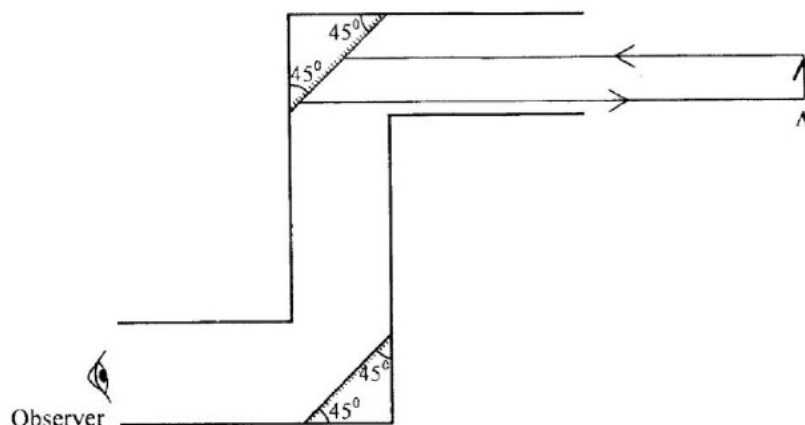
19 When a green solid is heated, it forms a black residue and produces a colourless gas which forms a white precipitate with a solution of calcium hydroxide.

- (a) Identify the green solid. (1 mark)
- (b) Write an equation for the reaction that produces the white precipitate. (1 mark)

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

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

- 20** Figure 5 is a diagram of a periscope.



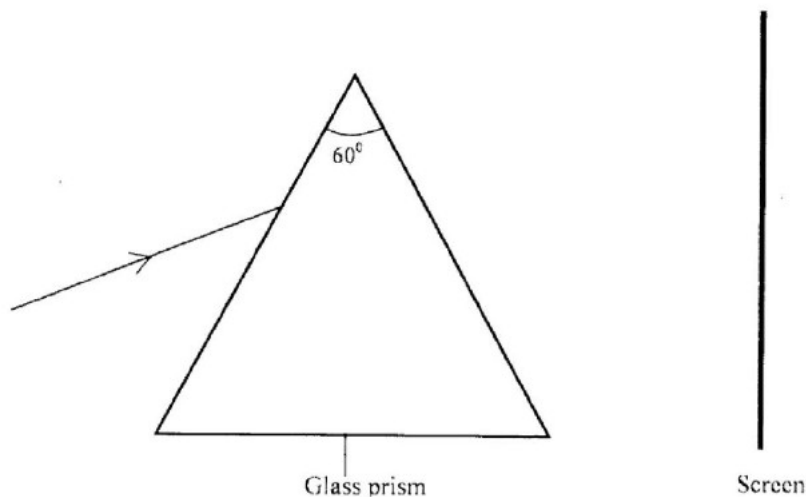
**Figure 5**

Complete the ray diagram to show the image of object A as seen by the observer.

(3 marks)

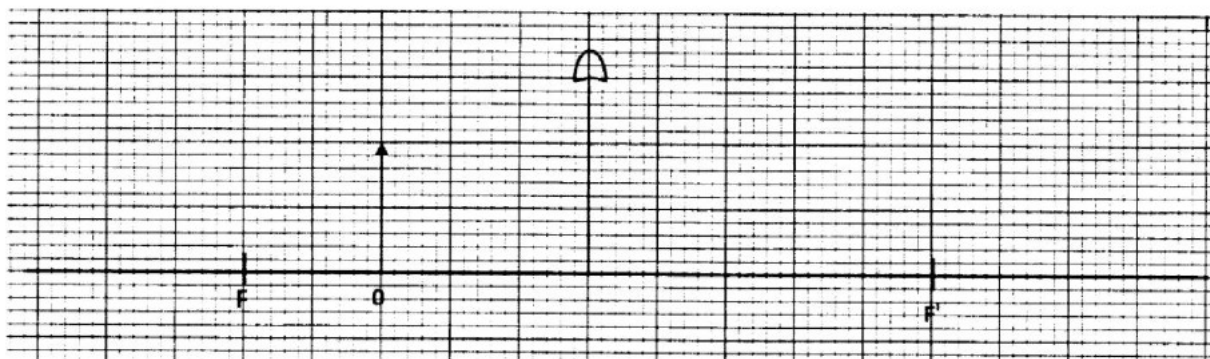
- 21** An ebonite rod is charged by rubbing with fur. The rod becomes negatively charged while the fur becomes positively charged. Explain how this happens. (2 marks)
- 22** Draw and label a simple electric circuit diagram having a cell, a bulb, a switch and an ammeter. (Use circuit symbols) (2 marks)
- 23** State **two** factors that affect the speed of sound in air. (2 marks)
- 24** Describe a:
- (a) transverse wave; (1 mark)
  - (b) longitudinal wave. (1 mark)
- 25** A student placed two iron nails in contact with one end of a bar magnet. The student observed that the free ends of nails moved apart from each other. Explain this observation. (3 marks)
- 26** Define electrical resistance and state its SI unit. (2 marks)

- 27 **Figure 6** shows a set-up used to study the effect of placing a triangular glass prism in the path of white light.



**Figure 6**

- (a) State what will be observed on the screen. (1 mark)
- (b) Name the phenomenon being studied. (1 mark)
- 28 A student made two heating coils using two different wires and used the coils to heat equal amounts of water in identical containers for the same length of time. At the end of heating, water in one of the containers was at a higher temperature than the other. State **two** factors that would have led to the difference in temperatures. (2 marks)
- 29 **Figure 7** shows an object O placed in front of a converging lens which has the principle focus at F. (3 marks)



On the figure, construct a ray diagram to locate the image formed.

- 30** A shopkeeper pays an electricity bill of ksh. 180.90 for using four identical bulbs for 3 hours per day for 30 days. If the cost of electricity is ksh. 6.70 per kilowatt hour, determine the power of each bulb. (3 marks)
- 31** State the role of the control grid in a cathode ray oscilloscope (CRO). (1 mark)
- 32** State any **two** dangers of exposure to X-rays. (2 marks)
- 33** Explain how a photographic film is used to detect radiations. (2 marks)
- 34** Explain how a P-N junction diode can be forward biased. (2 marks)