4.6.2 General Science Paper 2 (237/2)

SECTION A: BIOLOGY (34 marks)

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

1. (a) State **three** ways in which the cactus plant is physically adapted to arid habitats. (3 marks)

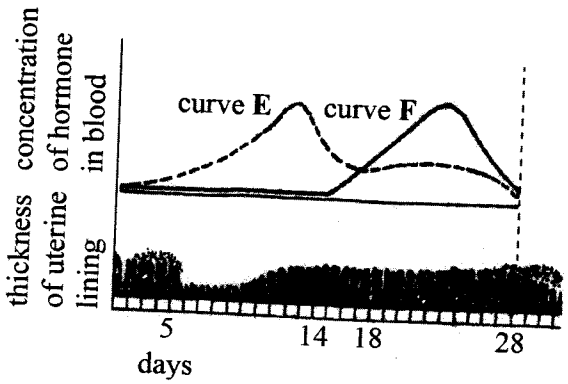
(b) Explain **three** effects of discharging raw sewage into Lake Victoria. (3 marks)

2. Explain what is meant by each of the following terms:

(a) sexual reproduction (1 mark)

(b) gestation (1 mark)

3. The graph below illustrates the hormonal changes that occur during the menstrual cycle.



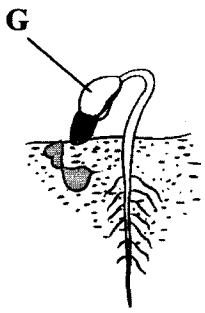
(a) Name the hormone represented by the curve labelled **F**. (1 mark)

(b) Explain the effect of the hormone labelled **E** on the lining of the uterus. (1 mark)

(c) Name the hormone whose concentration increases on the 14th day of the menstrual cycle. (1 mark)

(d) A female human being expects ovulation to occur on the 14th day of her menstrual cycle. Give a reason why she is likely to conceive if she had sex few days before and after the 14th day. (1 mark)

4. The diagram below illustrates a germinating seed.



(a) Name the type of germination illustrated. (1 mark)

(b) Explain how the type of germination illustrated occurs. (1 mark)

(c) State **one** function of the part labelled **G**. (1 mark)

(d) Explain how the seedling finally straightens. (2 marks)

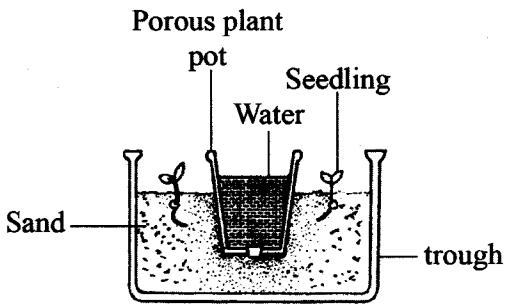
5. Explain how a man determines the sex of a child. (3 marks)

6. A mother of blood group **B** has two children. One child is blood group **A** while the other is blood group **O.**

(a) State the blood group of the father. (1 mark)

(b) What is the probability that the next child will be of blood group **AB**? Show your working. (2 marks)

7. The diagram below illustrates a setup used by students to investigate responses in plants.

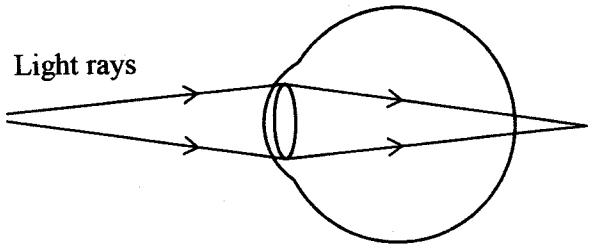


(a) Name the response illustrated by the roots of the seedlings. (1 mark)

(b) State the survival value of the response illustrated by the roots of the seedlings. (1 mark)

(c) Explain how the response illustrated by the roots of the seedlings occurs. (1 mark)

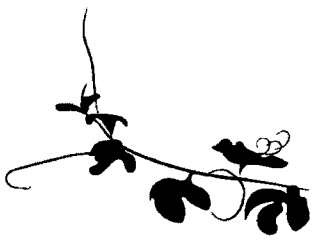
8. The diagram below illustrates an eye defect.



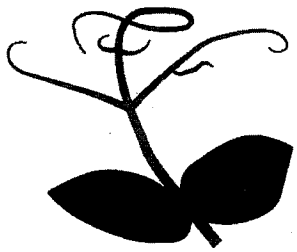
(a) Name the eye defect illustrated. (1 mark)

(b) Draw a well labelled diagram to show how the defect is corrected. (2 marks)

9. The diagram below illustrates support structures in passion and garden pea plants. Carefully study the position of tendrils in each plant.



Passion plant with tendrils

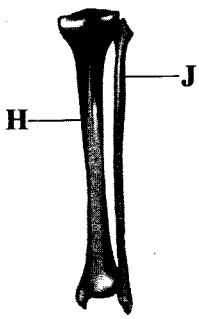


Pea plant with tendrils

(a) In evolution, what name is given to the structures represented by tendrils in both passion and garden pea plants? (1 mark)

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

10. The diagram below illustrates a bone from the hind limb of a mammal.



(a) Name the bones labelled

H ..... (1 mark)

J ..... (1 mark)

(b) Name the type of joint found at the posterior end of **H**. (1 mark)

SECTION B: CHEMISTRY (33 marks)

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

11. A mixture of butene and hydrogen gases was passed over finely divided nickel catalyst at 250 °C.

(a) Draw the structure of the compound that was formed. (1 mark)

(b) State **one** industrial use of the process described above. (1 mark)

12. Study **figure 1** and answer the questions that follow.

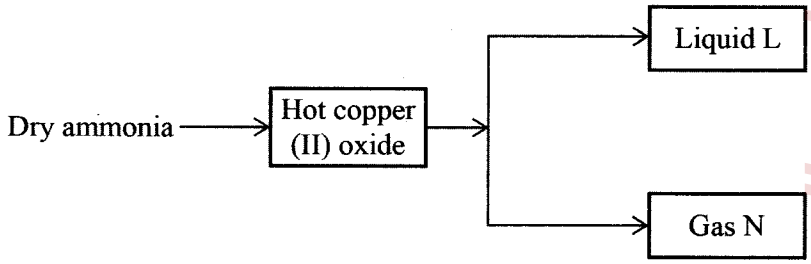


Figure 1

(a) Write an equation for the reaction between ammonia and the hot copper(II) oxide. (1 mark)

(b) State the property of ammonia demonstrated in **figure 1**. (1 mark)

13. (a) Explain the meaning of the term **mole** as used in Chemistry. (1 mark)

(b) A sample of a gas occupies a volume of 300 cm^3 of 760 mm Hg pressure. Calculate the pressure at which the gas will occupy a volume of 800 cm^3. (2 marks)

14. (a) Draw a labelled diagram to show extraction of sulphur by Frasch process. (3 marks)

(b) (i) Explain why the volume of concentrated sulphuric(VI) acid increases when it is left in an open beaker for three days. (1 mark)

(ii) State **one** use of concentrated sulphuric(VI) acid that depends on the property described in 14(b)(i). (1 mark)

15. Consider the following reaction at equilibrium.

$$2RO_{2(g)} + O_{2(g)} \rightleftharpoons 2RO_{3(g)}; \Delta H = -ve$$

State the effect of the following:

(a) Removal of RO_3 from the system on the position of the equilibrium. (1 mark)

(b) Increase in the temperature of the system on the yield of RO_3. (1 mark)

16. (a) Study **figure 2** and answer the questions that follow.

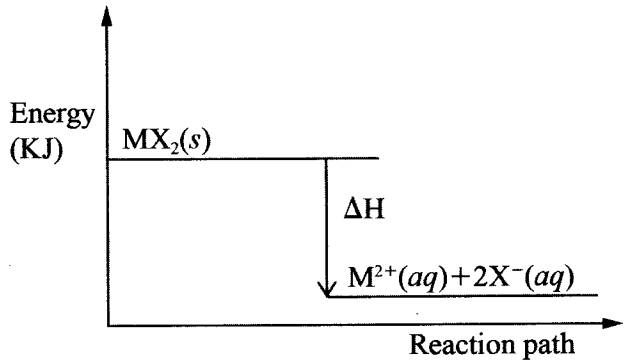


Figure 2

(i) Identify the heat of reaction denoted by **ΔH**. (1 mark)

(ii) Give the sign of **ΔH**. (1 mark)

(b) Explain why the molar heat of neutralisation of strong acids by strong bases is approximately constant at $-57.2\,kJmol^{-1}$. (1 mark)

(c) Give **two** characteristics of a fuel. (2 marks)

17. (a) What is meant by the term polymer? (1 mark)

(b) Polyvinyl chloride (PVC) is a synthetic polymer. State **one** use of this polymer. (1 mark)

18. (a) Two new metals Caburam (Cb) and Laboran (Lb) have just been discovered. The ore of Caburam, Caburam Chloride has the formula CbCl and that of Laboran, Laboran oxide has the formula LbO. Their relative positions in the reactivity series are:

Na > Mg > Al > Cb > C > Zn > Lb > Fe

Name a suitable method of extracting:

(i) Caburam (1 mark)

(ii) Laboran (1 mark)

(b) Draw a diagram to represent a set-up that can be used to extract caburam from its ore. (3 marks)

19. (a) What is meant by the term concentration as used in preparation of solutions? (1 mark)

(b) 28 g of sodium hydroxide was dissolved in enough water to make 2 litres of solution.

(i) Calculate the number of moles of sodium hydroxide. (2 marks)

(ii) Calculate the molarity of the solution. (1 mark)

(iii) Convert the molarity in (b)(ii) to concentration in grams per litre.
[Na = 23.0 ; O = 16.0 ; H = 1.0] (1 mark)

20. **Figure 3** shows a curve obtained from reacting a certain mass of zinc powder with 2 M hydrochloric acid.

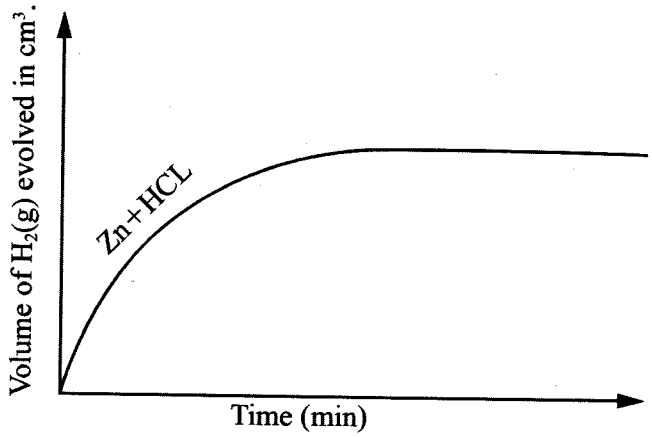


Figure 3

(a) State the effect on rate of evolution of hydrogen gas if 4 M hydrochloric acid is used in place of 2 M hydrochloric acid. (1 mark)

(b) Sketch on the same axes, a curve that would be obtained when the concentration of hydrochloric acid is halved. (1 mark)

SECTION C: PHYSICS (33 marks)

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

21. (a) State **two** characteristics of images formed by a concave mirror. (2 marks)

(b) **Figure 4** shows an image formed by a concave mirror.

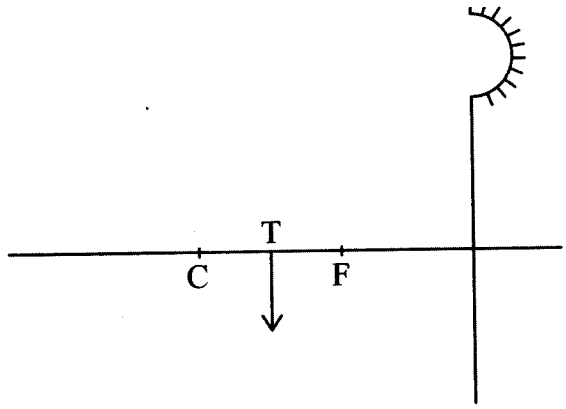


Figure 4

Complete the figure by drawing a ray diagram to show the position of the object. (3 marks)

22. **Figure 5** shows a ray of light moving from water to kerosene.

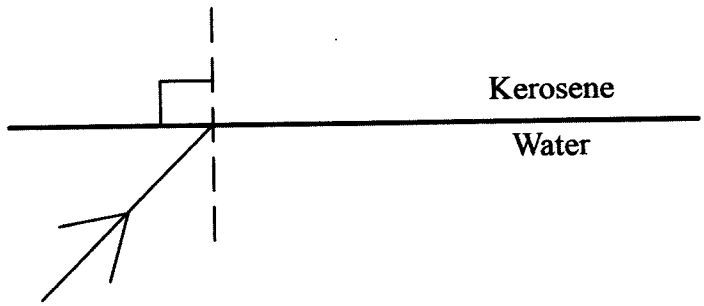


Figure 5

Given that kerosene is optically denser than water, complete the figure to show the path of the ray in kerosene. (1 mark)

23. **Figure 6** shows a fixed positively charged rod placed between two freely suspended charged rods X and Y.

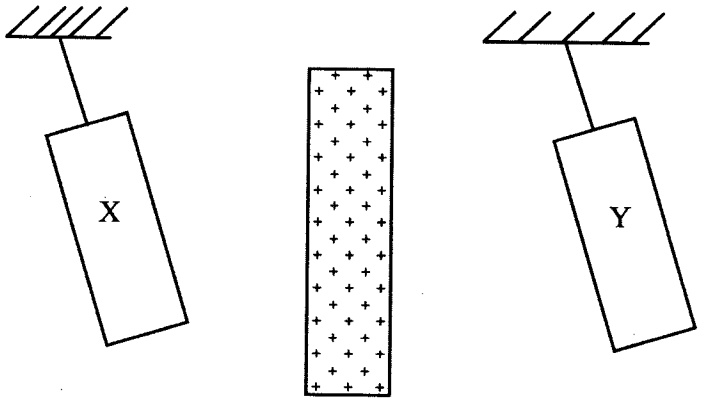


Figure 6

(a) Identify the type of charge on rods X and Y. (1 mark)

(b) Explain why sparks are observed when a person combs dry hair using a plastic comb in a dark room. (2 marks)

24. Draw a diagram to show the following:

25. **Figure 7** shows the displacement – time graph of a certain wave motion.

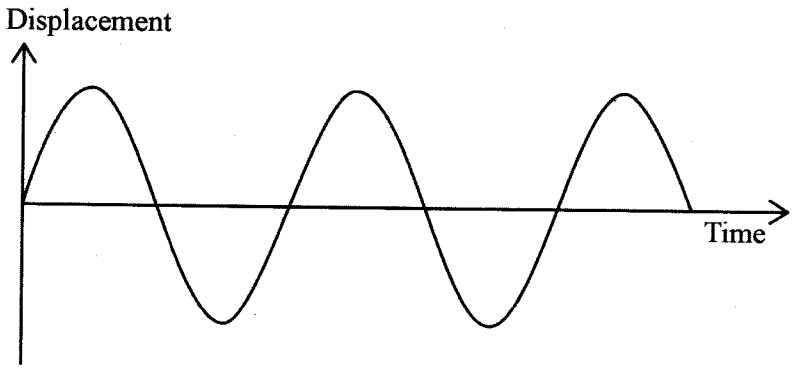


Figure 7

On the diagram, indicate the wavelength (λ) and amplitude (a) of the wave using the symbols **λ** and **a** respectively. (2 marks)

26. (a) Define the term "echo". (2 marks)

(b) Describe how wind affects the speed of sound in air. (2 marks)

27. (a) State the reason why a freely suspended magnet always settles in a particular direction. (1 mark)

(b) State **one** application of magnets in hospitals. (1 mark)

28. Draw a circuit diagram using circuit symbols to show how a variable resistor, a bulb, 2 dry cells in series, an ammeter and a voltmeter may be connected in order to determine whether the bulb obey's Ohm's law. (4 marks)

29. **Figure 8** shows a heater used to heat some water initially at 20 °C.

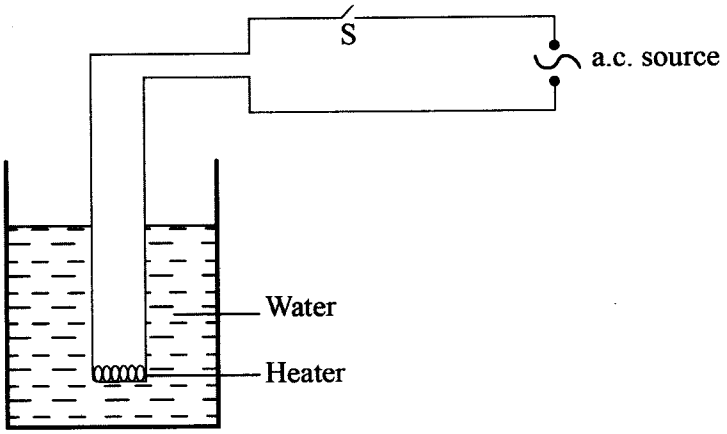


Figure 8

State **two** factors that determine the time taken for the water to boil. (2 marks)

30. A radioactive material of mass 20 g is observed to reduce to 5 g in 48 hours. Determine its half life. (2 marks)

31. (a) Define the term "doping". (1 mark)

(b) Draw the circuit symbol of a junction diode. (1 mark)

32. (a) State **two** properties of cathode rays. (2 marks)

(b) State **one** use of X-rays. (1 mark)

33. State the reason why in a house the bulbs that are **not** being used should be switched off. (1 mark)