3.6.2 Physics Paper 2 (232/2)

SECTION A: (25 marks)

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

1   **Figure 1** shows three mirrors arranged at right angles to each other. A ray of light is incident on one of the mirrors.
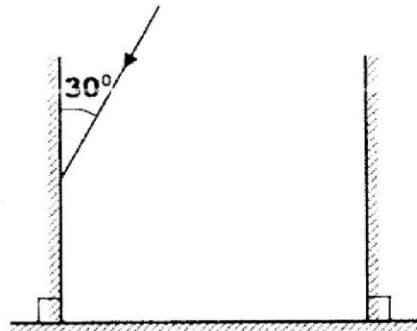

Figure 1

Complete the diagram to show the path of the ray after reflection on each of the mirrors.

(3 marks)

2   It is observed that when a charged body is brought near the cap of a positively charged electroscope, the divergence of the leaf increases. State the type of charge on the body.

(1 mark)

3   State the reason for topping up a lead - acid accumulator with distilled water.   (1 mark)

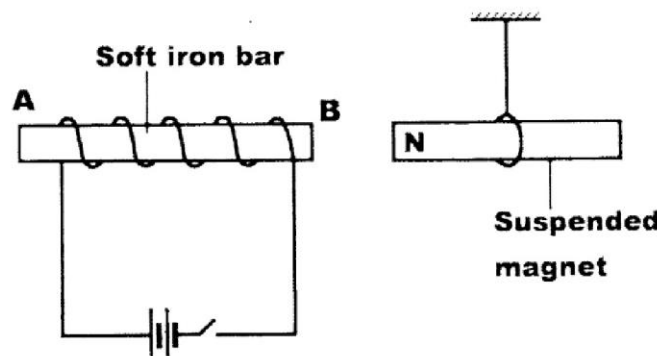4   **Figure 2** shows a soft iron bar **AB** placed in a coil near a freely suspended magnet.

Figure 2

Explain the observation made when the switch is closed.   (2 marks)

5   State the reason why a convex mirror is preferred over a plane mirror for use as a driving mirror.   (1 mark)

6   State **two** ways in which the strength of an electromagnet can be increased.   (2 marks)

7   State **two** differences between electromagnetic waves and mechanical waves.   (2 marks)

8   **Figure 3** shows straight waves incident on a diverging lens placed in a ripple tank to reduce its depth.

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Complete the diagram to show the waves in both the shallow region and beyond the lens.
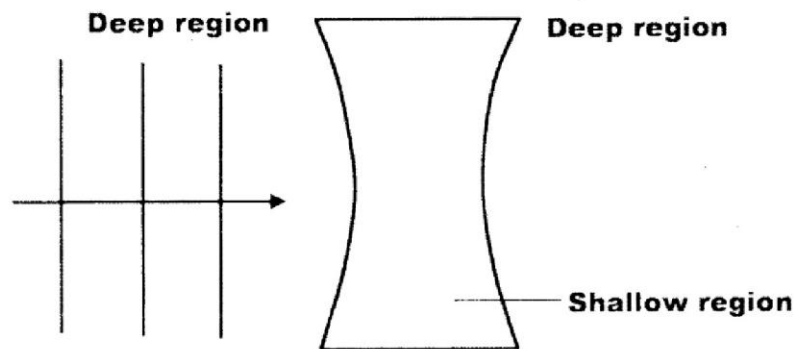
(2 marks)

Figure 3

9   A ship in an ocean sends out an ultra sound whose echo is received after 3 seconds. If the wavelength of the ultra sound in water is 7.5 cm, and the frequency of the transmitter is 20 kHz, determine the depth of the ocean. (3 marks)

10 A nail at the bottom of a beaker containing glycerine appears to be 6.8 cm below the surface of glycerine. Determine the height of the column of glycerine in the beaker.
(*take the refractive index of glycerine as 1.47*) (3 marks)

11 State **one** application of thermionic emission. (1 mark)

12 **Figure 4** shows a cathode ray entering into a region between two charged plates.
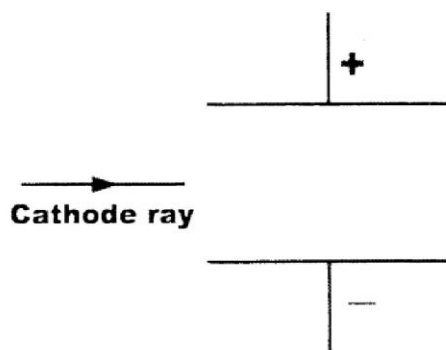

Figure 4

Complete the diagram to show the path of the ray in the field. (1 mark)

13 When a transformer is connected to an ac source, the output voltage is found to be 24 V. If the power input is 200 W, determine the output current. (*Assume the transformer is 100% efficient*). (3 marks)

SECTION B: (55 marks)

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

14 (a) State **two** factors that affect photoelectric emission. (2 marks)

(b) Light of wavelength 4.3×10^{-7}m is incident on two different metal surfaces, nickel and potassium. *(Take speed of light as 3.0×10^8 ms^{-1} and planks constant h as 6.63×10^{-34}Js).*

(i) Determine the energy of the incident radiation. (3 marks)

(ii) If the work function of nickel is 8.0×10^{-19}J and that of potassium is 3.68×10^{-19}J, state with a reason from which of the two metals the given light will eject electrons. (2 marks)

(iii) Determine the velocity of the emitted electrons from the metal surface in b(ii). *(Take the mass of an electron as 9.1×10^{-31} kg).* (3 marks)

15 (a) State **two** factors that determine the resistance of a metallic conductor. (2 marks)

(b) Explain how a fuse safeguards electrical appliances against excessive currents. (2 marks)

(c) A hair dryer is rated 2.5 kW, 240 V.

(i) Determine whether a 10 A fuse may be suitable for the hair dryer. (3 marks)

(ii) Determine the cost of using the hair dryer for 3 hours if the cost of electricity is Ksh 0.80 per kilowatt hour. (2 marks)

16 (a) It is observed that alpha (α) particles have a lower penetrating power than beta (β) particles. Explain this observation. (2 marks)

(b) A radioactive substance has a half life of 12 years. Determine the time it would take to decay to 12.5% of its original value. (2 marks)

(c) A Geiger Müller (GM) tube is used for detecting radiations from a radioactive source. State the function of:

(i) the mica window; (1 mark)

(ii) bromine gas in the tube. (1 mark)

(d)   (i)   In a diffusion chamber, explain why some of the tracks formed are observed to be;

        (I)   Short,   (2 marks)

        (II)   Straight.   (2 marks)

    (ii)   State **two** advantages of using a GM tube instead of a diffusion cloud chamber to detect radiations from radioactive substances.   (2 marks)

17   (a)   State **three** factors that affect the capacitance of a parallel plate capacitor.

                                                                              (3 marks)

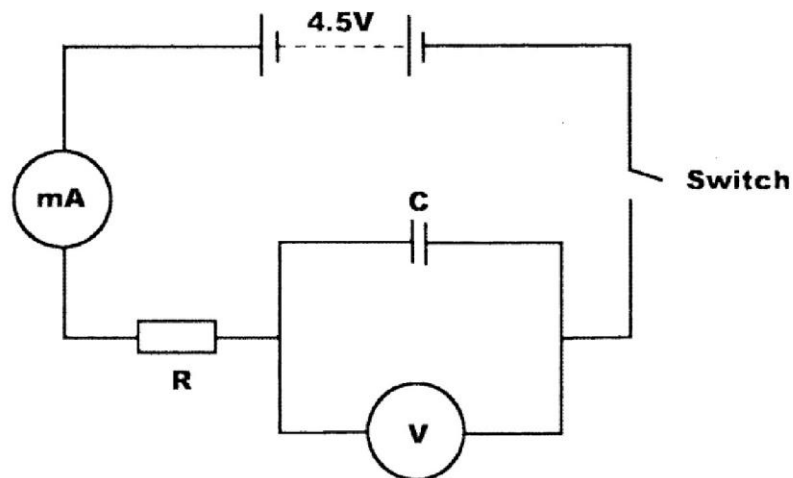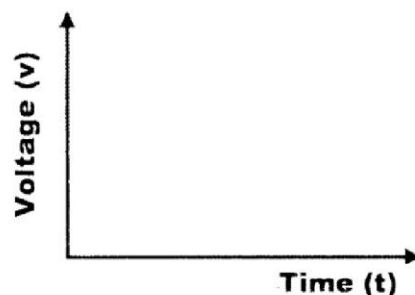   (b)   **Figure 5** shows the circuit used to charge a capacitor C.

Figure 5

    (i)   State what would be observed on the following when the switch is closed:

        (I)   the milliammeter;   (1 mark)

        (II)   the voltmeter;   (1 mark)

    (ii)   Explain how the capacitor gets charged.   (3 marks)

    (iii)   State the purpose of the resistor R.   (1 mark)

    (iv)   On the axes provided, sketch the graph of voltage (V) against time (t).
                                                                              (2 marks)

18 (a) Three resistors of resistance $2\,\Omega, 3\,\Omega$ and $4\,\Omega$ are to be connected to a cell such that they have the least effective resistance.

(i) Draw a circuit diagram to show how they can be connected to achieve this.

(2 marks)

(ii) Determine the least effective resistance of the three resistors. (3 marks)

(b) A real object of height 1 cm placed 50 mm from a converging lens forms a virtual image 100 mm from the lens.

(i) Determine the:

(I) focal length of the lens; (3 marks)

(II) magnification. (2 marks)

(ii) On the grid provided draw to scale the ray diagram for the set up, to show how the image is formed. (3 marks)