PHYSICS

PAPER – 2

(PRACTICAL)

(Maximum Marks: 30)

(Time allowed: Three hours)

*(Candidates are allowed additional 15 minutes for **only** reading the paper. They must **NOT** start writing during this time.)*

ALL ANSWERS MUST BE WRITTEN IN THE ANSWER BOOKLET PROVIDED SEPARATELY.

If squared paper is used, it must be attached to the answer booklet.

Marks are given for a clear record of observations actually made, for their suitability and accuracy, and for the use made of them.

*Statement of the theory, procedure of the experiment, apparatus, circuit diagrams, precautions are **not** required to be written unless specifically asked for.*

Candidates are advised to record their observations as soon as they have been made.

All working, including rough work, should be done on the same sheet as, and adjacent to, the rest of the answer.

Mathematical tables and squared paper are provided. The intended marks for questions or parts of questions are given in brackets [ ].

Answer **all** *questions.*

You should not spend more than one and a half hours on each question.

Question 1 **[9]**

This experiment determines the **focal length** of the given convex lens by **no parallax method**.

You are provided with:

(a) An optical bench

(b) A lens holder

(c) A convex lens

(d) Two optical pins

Note: *If an optical bench is not available, the experiment may be performed on a table top, using a meter scale.*

(i) Determine the approximate focal length f of the given convex lens by projecting the image of a distant object formed by the lens on a wall or a screen.

Record the value of f in cm, correct upto **one decimal place**.

(ii) Arrange the object pin **O**, the image pin **I** and the lens **L** on the optical bench or table top as shown in ***Figure 1*** below. Adjust the height of the object pin **O** and that of the image pin **I** so that the tips of **O** and **I** lie on the principal axis of the lens.

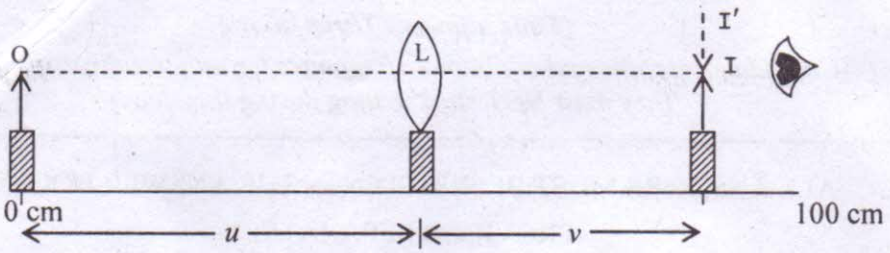

Figure 1

(iii) Place the object pin **O** at the 0 cm mark and the lens **L** at the 70·0 cm mark so that the object distance u = 70.0 cm (i.e. the distance between **L** and **O**)

(iv) Look at the tip of the object pin **O** through the lens from a distance so that you see an inverted image (say I′) of the object pin.

(v) Now, adjust the position of the image pin I in such a way, that there is no parallax between I and I′. Ensure that **tip to tip** parallax is removed.

(vi) At no parallax, note the position of the image pin **I** and measure the image distance v = LI (i.e. the distance between the lens and the image pin) in cm, correct upto **one decimal place**.

(vii) Repeat the experiment for **four** more values of u, i.e. 60·0 cm, 50·0 cm, 40·0 cm and 30·0 cm.

(viii) For each value of u, calculate $x = \frac{u+v}{100}$ and $y = \frac{uv}{10}$.

(ix) Tabulate all **five** sets of u, v, x and y with their units.

(x) **Show the image position when the parallax has been removed, in any one of the readings in (ix) above, to the Visiting Examiner.**

(xi) Plot a graph of y *vs* x. Draw the line of best fit. Calculate its slope **m** using, $\mathbf{m} = \frac{change\ in\ y}{change\ in\ x}$ and record its value, correct upto **three significant figures.**

(xii) Find **F** using, $\mathbf{F} = \frac{m}{10}$ and record its value with proper unit, correct upto **one decimal place.**

Question 2 **[4+2]**

This experiment determines the potential gradient (K) of a potentiometer wire.

You are provided with:

(a) A 100 cm long and uniform metallic wire **AB** attached to a metre scale on a wooden board. It is provided with connecting terminals at its ends.

(b) A 4 V d.c. source **E**.

(c) A dry cell ε.

(d) An ammeter **A** of range 0 - 1 A.

(e) A voltmeter **V** of range 0 - 3 V.

(f) A galvanometer **G**.

(g) A plug key **K**.

(h) A jockey **J**.

(A) (i) Determine and record the least count of the given ammeter and voltmeter.

(ii) Arrange the circuit as shown in ***Figure 2(a)*** below. Make sure that all connections are tight.

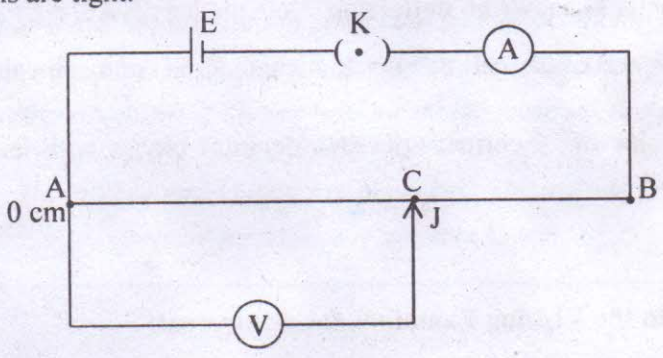

Figure 2(a)

(iii) Keep the value of E at about 3·5V to 4V.

(iv) Close the key **K**. Record the ammeter reading **I**, in your answer booklet.

(v) Place the jockey **J** at a point C on the wire AB such that AC = 20·0 cm. Note and record the reading of the voltmeter.

(vi) Repeat the experiment to obtain **four more values** of l, i.e. **AC** = 40·0 cm, 60·0 cm, 80·0 cm and 100·0 cm. Each time, note and record the reading of the voltmeter.

(vii) For **each value** of V, calculate $K = \frac{V}{l}$ correct upto **three decimal places**.

(viii) Tabulate **all five** sets of values of V, l, and K with their units.

(ix) **Show any one of the readings in (viii) above, to the Visiting Examiner.**

(x) Find K_0, the mean of **all the five** values of K and record its value with unit, in your answer booklet.

(B) This part of the experiment determines the emf of the given dry cell ε.

(i) Replace the voltmeter in the ***Figure 2(a)*** with a dry cell ε and a central zero galvanometer **G** and set up a new circuit as shown in ***Figure 2(b)***, below:

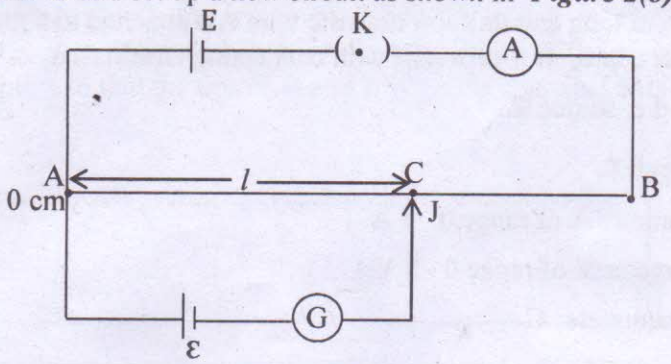

Figure 2(b)

(ii) Close the key **K**, touch the jockey **J** near the ends of **A** and **B** of the wire **AB**. The galvanometer needle must show deflection in the opposite directions.

(iii) Place the jockey gently at different points on the wire **AB** till at a certain point **C**, the galvanometer **G** shows **no deflection**. Note the length **AC** = l.

(iv) Now calculate emf of dry cell ε. $\varepsilon = K_0 l$ where K_0 is the mean value obtained in Question 2(A).

(v) Record the value of ε correct upto **two decimal places** with its unit, in your answer booklet.

Question 3

Show the following to the Visiting Examiner for assessment:

Project **[10]**

Physics Practical File. **[5]**