

# 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.)

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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 [ ].*

**Note: Procedure of the Experiment, ray diagram, circuit diagram and precautions are not to be written in your answer booklet.**

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*Answer **all** questions.*

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

#### Question 1

[9]

This experiment determines **emf** of the given cell, using a **potentiometer**.

You are provided with:

- A 100 cm long and uniform metallic wire **AB** fitted on a wooden board with terminals at **A** and **B**.
  - A resistance box having a range of 0 to  $10\Omega$  or more. It is labelled as **R.B**.
  - A 4V dc source (an accumulator or an electronic battery). It is labelled as **D**.
  - A dry cell. It is labelled as  $\mathcal{E}$ .
  - A central zero galvanometer (**G**).
  - A plug key (**K**).
  - A jockey (**J**)
  - A few connecting wires.
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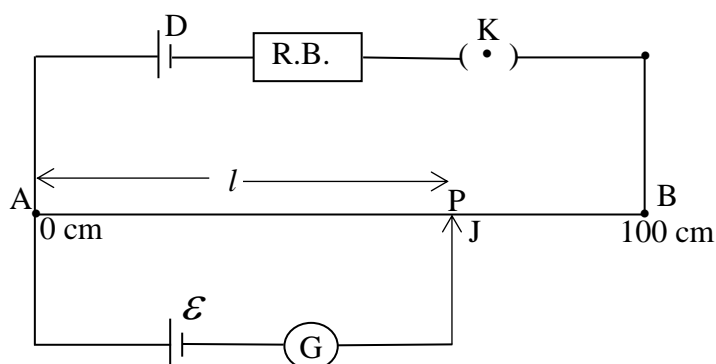
**This Paper consists of 3 printed pages and 1 blank page.**

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**Turn over**

- (i) Set up the circuit as shown in *Figure 1* below:



*Figure 1*

Ensure that all connections are **tight**.

- (ii) Keep the value of **D** at **4 V**.  
 (iii) Close the key **K**. Remove  $2\Omega$  plug from the resistance box so that **R =  $2\Omega$** .  
 (iv) Now, gently touch the jockey **J** on the wire **AB** and locate the balance point **P**, such that the galvanometer shows no deflection. Ensure that all other plugs in the resistance box are kept tightly closed.

Note and record the balancing length **AP =  $l$  cm**, correct up to **one decimal place**.

- (v) Repeat the experiment for **five more** values of **R** such that **R =  $3\Omega$ ,  $4\Omega$ ,  $5\Omega$ ,  $6\Omega$  and  $7\Omega$** . Each time, find the balance point and obtain the balancing length  **$l$** .  
 (vi) Tabulate all **six** sets of values of  **$l$**  and  **$R$**  with their units.  
 (vii) **Show any one of the readings in (vi) to the Visiting Examiner.**  
 (viii) Plot a graph of  **$l$  vs  $R$** , taking  **$l$**  on y axis and  **$R$**  on x axis.

Draw the line of best fit.

- (ix) From the graph, find  **$l_0$** , the value of  **$l$  when  $R = 0$** .  
 (x) Calculate the value of  **$\mathcal{E}$**  using:

$$\mathcal{E} = \frac{l_0}{25}$$

and record its value with proper unit, correct up to **two decimal places**.

## Question 2

[6]

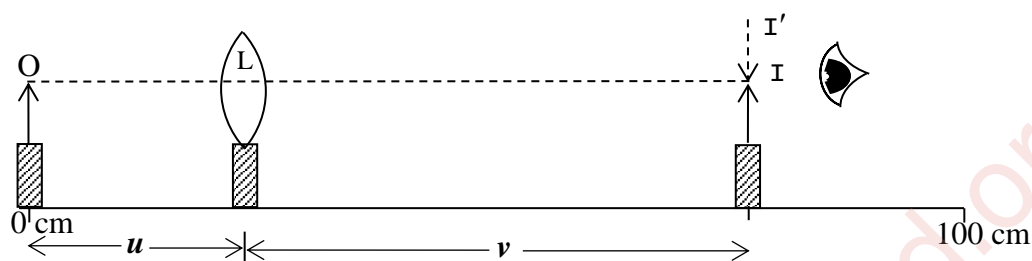
This experiment determines the **focal length** of the given convex lens by **no parallax** method.

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 metre scale.

- (i) Arrange the object pin **O**, the lens **L** and the image pin **I** on an optical bench or a table top as shown in **Figure 2** below. Adjust the heights of the object pin **O** and the image pin **I** so that the tips of **O** and **I** lie on the principal axis of the lens.



**Figure 2**

- (ii) Place the object pin **O** at the 0 cm mark and the lens **L** at the 30.0 cm mark, so that the object distance  $u = 30.0$  cm (i.e. the distance between the lens and the object pin).
- (iii) 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.
- (iv) 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.
- (v) 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 up to **one decimal place**.
- (vi) Repeat the experiment for **four more** values of  $u$ , i.e.  $u = 40.0$  cm,  $50.0$  cm,  $60.0$  cm and  $70.0$  cm.
- (vii) For each value of  $u$ , calculate  $m = v/u$  and  $f = \frac{v}{m+1}$  up to **three significant figures**.
- (viii) Tabulate all **five** sets of  $u$ ,  $v$ ,  $m$  and  $f$  with their units (if any).
- (ix) **Show the image position when the parallax has been removed, in any one of the readings in (viii) above, to the Visiting Examiner.**
- (x) Find **F**, the average of all the five values of  $f$  from the observation table and record its value with proper units. Write your answer up to **one decimal place**.

### Question 3

Show the following to the Visiting Examiner for assessment:

Project [10]

Physics Practical File. [5]