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 [ ].

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

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) Two optical pins

(b) A convex lens

(c) A lens holder

(d) An optical bench

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

This Paper consists of 4 printed pages.

(i) Arrange the object pin **O**, the image pin **I** and the lens **L** on an optical bench or a 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 their tips lie on the principal axis of the lens.

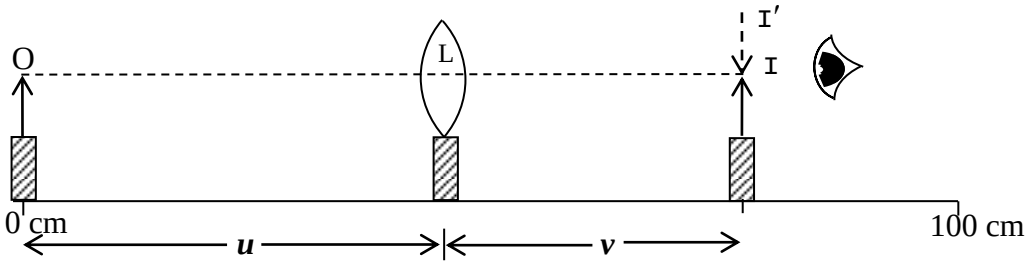

Figure 1

(ii) Place the object pin **O** at the 0·0 cm mark and the lens **L** at 70·0 cm mark so that the object distance $\boldsymbol{u}$ **= 70·0 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 **L** from a distance so that you see an inverted image (**I′**) of the object pin **O**.

(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. If necessary, you may adjust the heights of the two pins **O** and **I**.

(v) At no parallax, note the position of the image pin **I** and record the image distance $\boldsymbol{v}$ = **LI** (i.e. the distance between the lens and the image pin) in cm, correct upto **one decimal place**.

(vi) Repeat the experiment for **five** more values of $\boldsymbol{u}$, i.e. $\boldsymbol{u}$ = **60·0cm, 50·0cm, 40·0cm 30·0cm**. and **20·0cm**. Each time, remove the parallax and find the value of $\boldsymbol{v}$.

(vii) For **each** value of $\boldsymbol{u}$ *and* $\boldsymbol{v}$, calculate $\boldsymbol{y} = \frac{\boldsymbol{uv}}{\boldsymbol{100}}$ and $\boldsymbol{x} = \frac{\boldsymbol{u+v}}{\boldsymbol{10}}$ and record its value upto **two decimal places**.

(viii) Tabulate all **six** sets of values of $\boldsymbol{u}$, $\boldsymbol{v}$, $\boldsymbol{y}$ *and* $\boldsymbol{x}$ with their **units**.

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

(x) Plot a graph of $\boldsymbol{y}$ vs $\boldsymbol{x}$.

(xi) Draw the best fit line. (*It must be thin and uniform.*)

(xii) Find its slope *S*, using $S = \frac{change\ in\ y}{change\ in\ x}$

(xiii) Record the value of $\boldsymbol{S}$, rounded upto **three significant figures**.

(xiv) Find $\boldsymbol{f = S \times 10}$ and record its value in your answer booklet, **correct upto one decimal place with proper unit**.

Question 2 **[6]**

This experiment determines the resistance per unit length of the given 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 binding terminals at its ends.

(b) A resistance box **R**.**B**. of range 0 to 10 Ω.

(c) An ammeter A of range 0 – 1A

(d) A Voltmeter **V** of range 0 – 3**V**

(e) A jockey **J**

(f) A plug key **K**

(g) A 4V d.c. power supply **E**

(h) A few connecting wires.

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

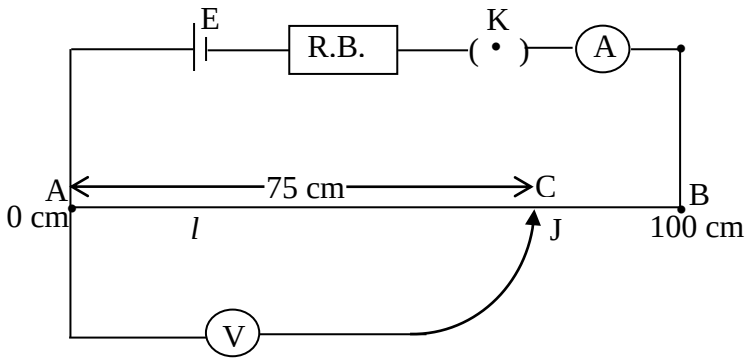

Figure 2

(ii) Close the key K and take out a **1**Ω plug from the resistance box **R**.**B**. so that R = **1**Ω. Ensure that all other plugs in the resistance box are tightly closed.

(iii) Place the jockey **J** at point C on the wire AC such that AC = 75 cm. The reading of the Ammeter and the Voltmeter must be **within its range**. Read and record the readings of the Ammeter and the Voltmeter, i.e. **V** and **I** with proper units.

(iv) Repeat the experiment to obtain **four** more values of R , i.e. R = **2**Ω, **3**Ω, 4Ω and **5**Ω. Each time, record readings of **R**, **V** and **I**. Ensure that the jockey is always kept at the same position **C**, such that **AC** = **75 cm** in all **five** sets of readings.

(v) Determine the value of r using $r = \frac{V}{I}$ for each set, correct upto **three significant figures**.

(vi) Tabulate all the five sets of values of **R**, **V**, **I** and ***r*** with proper units.

(vii) **Show any one of the above readings in (vi) above, to the Visiting Examiner**

(viii) Find $\boldsymbol{r_0}$ the mean of all the **five** values of ***r*** and record its value in your answer booklet, upto **one decimal place** with proper unit.

(ix) Calculate **K** = $\frac{\boldsymbol{r_0}}{\mathbf{75}}$ and record its value correct upto **one decimal place** with proper unit, in your answer booklet. (*where* **K** *is resistance per unit length*)

Question 3

Show the following to the Visiting Examiner for assessment:

Project **[10]**

Physics Practical File. **[5]**