PHYSICS

Paper – 2

(PRACTICAL)

Three hours and a quarter

(The first 15 minutes of the examination are for reading the paper only.

Candidates must NOT start writing during this time).

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

Read the questions carefully and follow the given instructions.

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

Marks are given for clear record of observations actually made and correct significant figures and units wherever applicable.

A statement of the method is NOT necessary. The theory of the experiment is not required unless specifically asked for.

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

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

The intended marks for questions or parts of questions are given in brackets [ ].

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*Answer **all** questions.*
You should not spend more than one and a half hours on Question 1.

Question 1. **[10]**

Determine the focal length of lens A and lens B by projecting the image of a distant object on a wall. Record the values of the focal length of the lens A(f_A) and lens B(f_B).

Place the convex lenses A and B in their upright positions such that the distance between them is equal to f_B. Now place an optical pin M 20 cm away from lens A on the side opposite to lens B. Place a second optical pin N beyond lens B. Thus the two lenses are in the middle

with the uprights on either side as shown in figure 1 given below. Now adjust the second pin N to remove the parallax between pin M and pin N. At no parallax position, record the positions of lens A, lens B, optical pin M and optical pin N (Table 1).

Obtain the object distance $ML_1 = u$ and the image distance $NL_2 = v$.

Now calculate $x = \frac{100}{u}$ and $y = \frac{100}{v}$.

Tabulate u, v, x and y (Table 2).

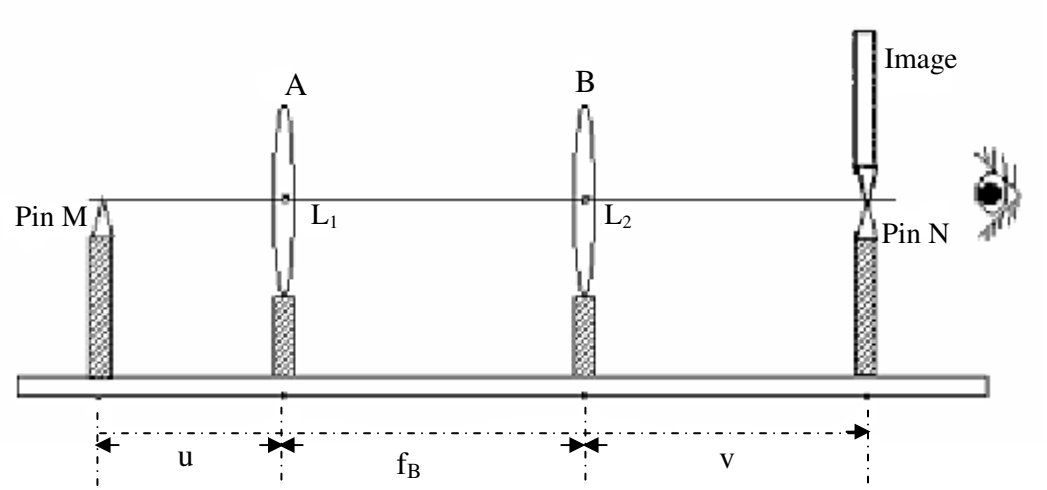

Figure 1

Keeping the two lenses fixed i.e AB = f_B throughout, repeat the experiment moving the object pin M away by about 4 cm each time while setting pin N in the no parallax position in each case.

Take at least *five* sets of observations.

Plot a graph of y against x. (The scale should be so chosen that the points plotted are spread over at least 60% of the graph paper).

Obtain the slope of the best fit line.

Question 2.

You are provided with a 100 cm long wire fixed on a wooden board with a meter scale attached, an ammeter, a voltmeter, a resistance box, a jockey and a key. Use d.c source of approximately 4V emf. Set-up the circuit as shown in figure 2.

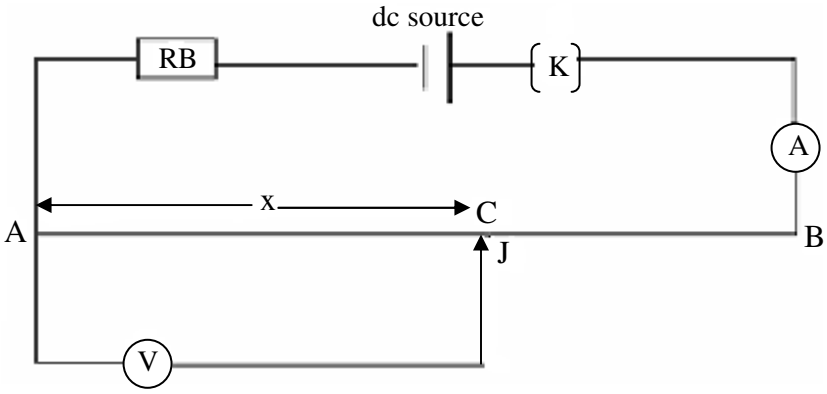

Figure 2

Record the least count and range of ammeter and voltmeter. Close the key K. Touch the jockey J at the end B of the wire AB. Adjust the value of resistance R in the resistance box to make the voltmeter reading maximum but within the scale of both the voltmeter and ammeter. Keep the value of R constant throughout the experiment. Record the values of ammeter reading I and R.

Now place the jockey at point C on the wire AB such that the length AC = x = 20 cm.

Record the voltmeter reading V and the distance x in a table.

Repeat the experiment to obtain five sets of x and v taking as wide range of x as possible.

Tabulate your results with proper units at the head of each column.

Plot a graph of v and x. Draw the best fit line and extend it to touch the y-axis.

Calculate its slope $S = \frac{\Delta v}{\Delta x}$. Write the value of S upto 3 significant figures with proper unit.

Question 3.

Rearrange the circuit as shown in figure 3.

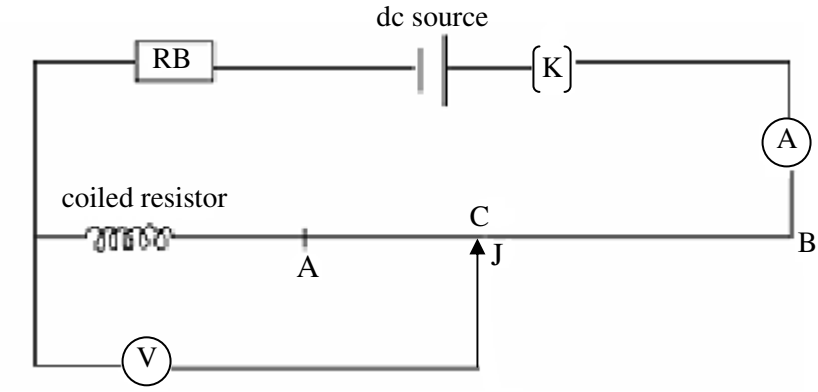

Figure 3

Touch the jockey near end B and adjust the value of resistance R in the resistance box to make the ammeter reading as close to the value of I as in Question 2. Record the value of R in the R.B and the ammeter reading I'.

Find the range of AC = x for which the voltmeter gives maximum reading within scale. Obtain five sets of x and V within this range at equal interval of x. Tabulate your results with proper units at the head of each column.

Use the same graph paper with the same axes and scale to plot the graph of V against x. From the two best fit lines, read the difference in the values of V for x = 0 and let it be denoted by ΔV. Calculate $\frac{\Delta V}{I'}$ and record it with proper unit.

Answer the following questions.

(i) What is the physical meaning of $\frac{\Delta V}{I'}$?

(ii) In figure 2, calculate the theoretical value of V, the voltmeter reading if the resistance of wire AB is 4Ω/m, x = 40 cm, resistance R= 1Ω and dc source = 4V.