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]**

This experiment determines the focal length of the given convex lens from the intercept reading from graph.

Determine the approximate focal length of the given convex lens by projecting the image of a distant object on a wall or on a screen. Measure and record the focal length of the lens (f) in cm upto three significant figures.

Record the range and least count of the optical bench. Arrange the object pin O, the image pin I and the lens L on an optical bench as shown in figure 1.

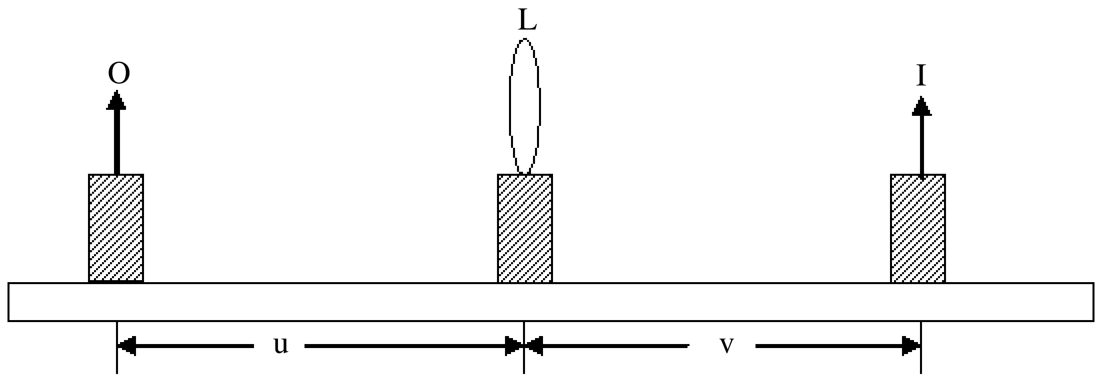

Figure 1

Now, place the object pin O at the zero mark of the optical bench. Move the lens L away from the object pin O till the distance between object pin O and lens L is equal to twice the rough focal length. Adjust the position of the image pin I in such a way that tip-to-tip parallax is removed between the image and image pin I.

Note the position of O, L, and I in this position and find u=OL and v=LI.
Repeat the experiment four more times by increasing u by about 5 cm in each set.

Tabulate five sets of your observations including u, v, $x = \frac{500}{u}$ and $y = \frac{500}{v}$.

Round off the calculated values of x and y upto three significant figures.

Plot a graph of y against x taking origin (0,0) and determine its slope,
[S= change in y ÷ change in x] upto three significant figures with proper units.

From the graph, read the intercept x_0 i.e. the value of x when $y = 0$ and y_0 i.e the value of y when $x = 0$.

Calculate $F = \frac{1000}{x_0 + y_0}$, up to 3 significant figures with proper units.

Question 2.

Set up the circuit as shown in figure 2 given below.

Record the zero error if any, the least count and range of the ammeter and voltmeter. Take out any plug from the resistance box to introduce a resistance R and plug the key K. The ammeter should not go out of scale. If it does, increase R in the resistance box. Touch the jockey at point C such that AC is about 70 cm. The reading of the voltmeter should be within its range.

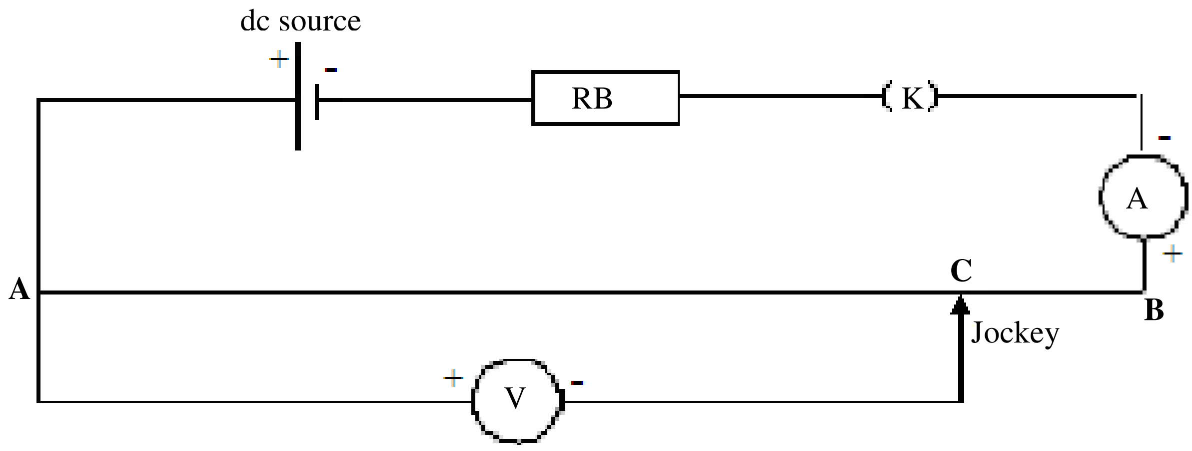

Figure 2

Record the resistance R, current I and potential difference V between A and C. Repeat the experiment to obtain four more sets by increasing R by 1Ω each time.

Tabulate five sets of I, V and R with proper units.

Plot a graph of V against I and determine its slope $S = \frac{\Delta V}{\Delta I}$ upto 3 significant figures.

Calculate $\lambda = \frac{S}{L_0}$, where S = slope of the graph and L_0 = AC with proper units upto 3 significant figures.

Question 3.

Disconnect the voltmeter and connect a fresh dry cell and a centre zero galvanometer G as shown in figure 3 given below.

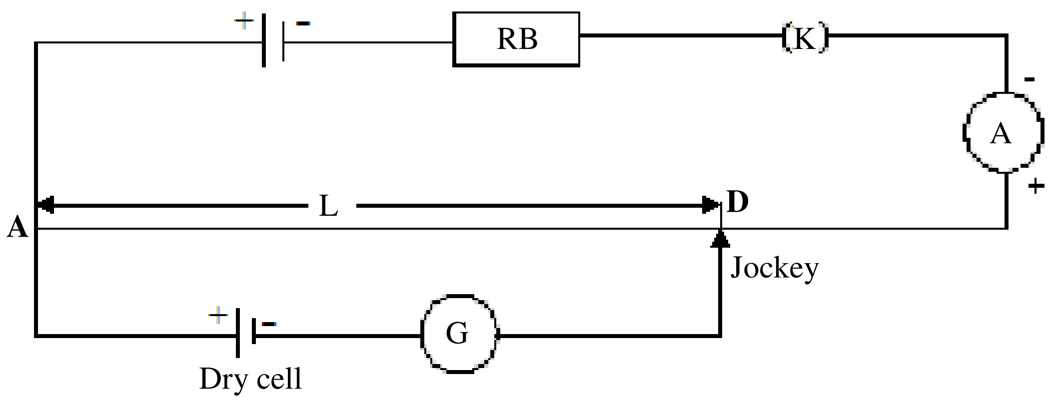

Figure 3

Take out the 1Ω plug from the resistance box and plug in the key. Obtain the position D for the jockey on wire AB such that there is no deflection in the galvanometer.

Repeat the experiment by taking out $R = 2\Omega$ and $R = 3\Omega$. Record the corresponding readings for current I and length AD = L in a tabular column.

If the ammeter reading goes out of scale and/or the null point D is not obtained within the length AB, the values of the emf of the dc source and/or the resistance R in the resistance box may be changed. For each set of observation, calculate the emf of the dry cell.

$E = I\lambda L$, here λ is the result obtained in question 2.

Calculate the average value of emf of the dry cell.

Answer the following questions.

(i) Mention ***two*** factors on which the value of λ depends.

(ii) Explain briefly why the emf of the dry cell is equal to the value of $E = I\lambda L$.

(iii) Is it better to measure the emf of a cell with a voltmeter? Explain your answer.