P510/3
PRACTICAL PHYSICS
Paper3
2023
3 ¼ hours

ASK INTERGRATED TEACHERS' MOCK EXAMINATIONS BURREAU

AITEL JOINT MOCK EXAMINATION

Uganda Advanced Certificate of Education

Paper 3

Time: 3 ¼ hrs

INSTRUCTIONS TO CANDIDATES:

- *Answer **question 1** and **one** other question.*
- *Candidates are **not** allowed to use the apparatus or write for the first fifteen minutes.*
- *Graph papers are provided.*
- *Write on **one side of the paper only**.*
- *Candidates are expected to record on their scripts all their observations as these observations are made and to plan the presentation of the records so that it is **not** necessary to make a fair copy of them. The working of the answers is to be handed in.*
- *Details on the question paper should not be repeated in the answer, nor is the theory of the experiment required unless specifically asked for. Candidates should, however, record any special precautions they have taken and any particular feature of their method of going about the experiment.*
- *Marks are given mainly for a clear record of the observations actually made, for their suitability and accuracy, and for the use made of them.*

 Turn over

1. In this experiment, you will determine the moment of inertia of a metre rule by two methods.

METHOD I

a) Clamp a metre rule, **P** horizontally with its scale facing you.

b) Measure and record, the mass, **M** of a metre rule **Q**.

c) Tie one end of the thread at the 5.0 cm mark and another at 95.0cm mark of the metre rule, **Q**.

d) Suspend the metre rule, **Q** from the clamped metre rule, **P** as shown in figure 1.

Make sure that the scale of rule **Q** faces up wards.

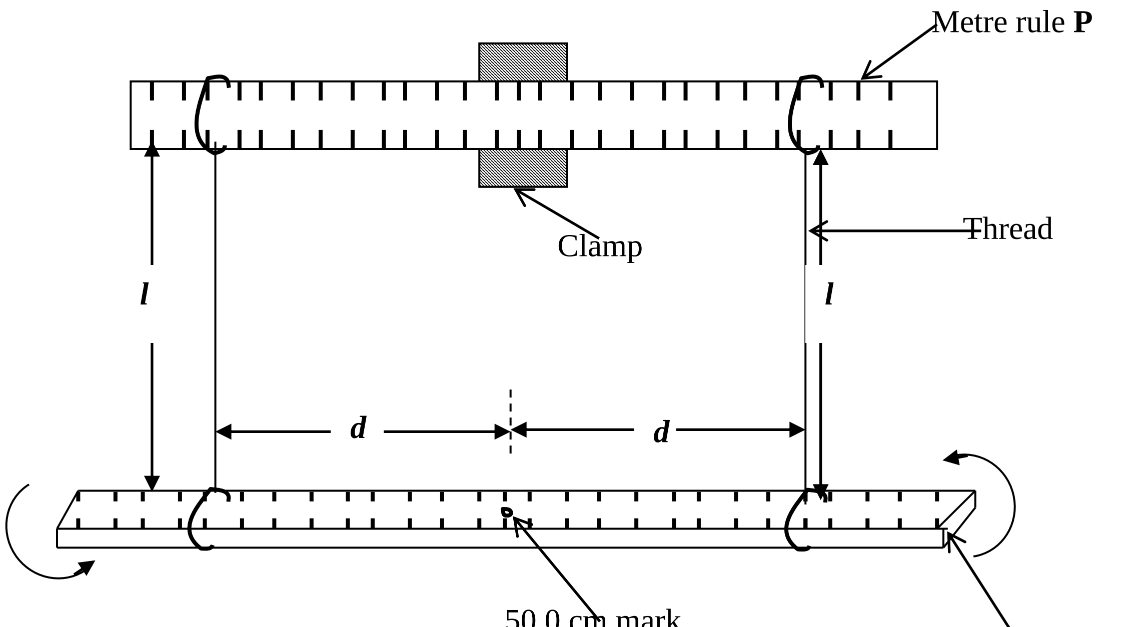

Fig.1

e) Adjust the length *l* of the parallel pieces of thread to 0.500m.

f) Turn the metre rule, **Q** through a small angle about a vertical axis through the centre and release it to oscillate.

g) Measure the time for 20 oscillations.

h) Determine the time , **T,** for one oscillation of metre rule **Q.**

i) Calculate the moment of inertia, **I** of the metre rule, **Q,** from the expression.

$$\mathbf{I = \frac{Mgd^2T^2}{4\pi^2 \mathit{l}}}$$

Where g = 10 ms^{-2} and d is the distance of either piece of thread from the 50.0 cm mark of the metre rule **Q.**

METHOD II

a) Place two 50.0 g masses on the metre rule Q as shown in figure 2.

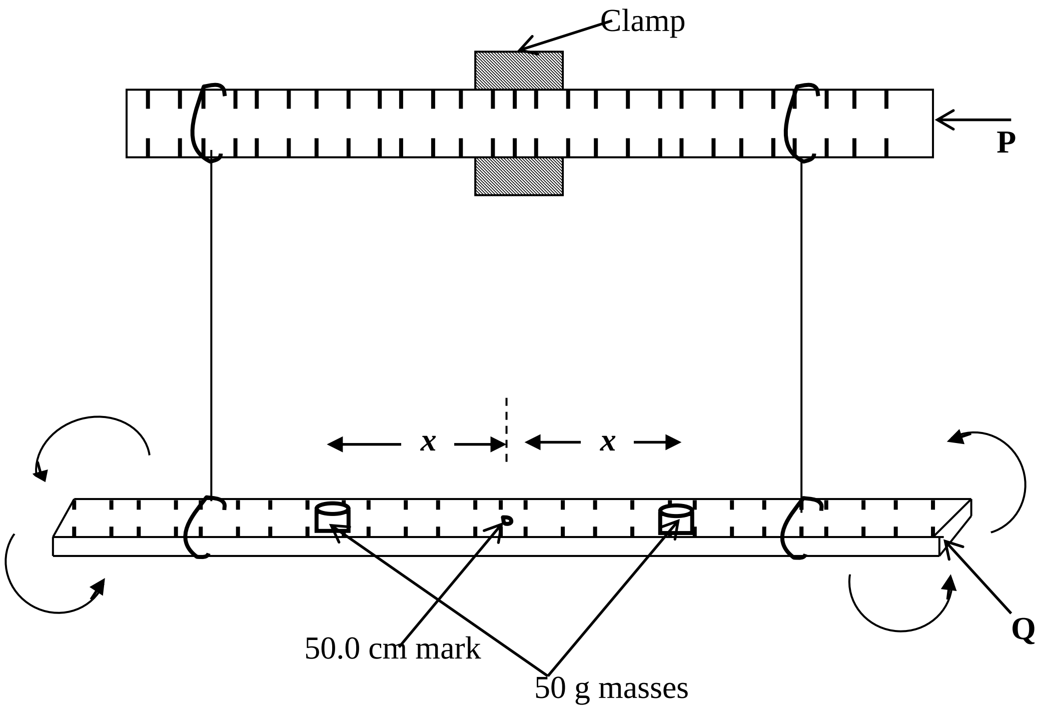

Fig.2

b) Adjust the masses so that the distance ***x*,** between each of them and the 50.0cm mark of metre rule, **Q** such that **x** = 0.10m.

c) Set the loaded metre rule oscillating as in the method I.

d) Measure and record the time for 20 oscillations.

e) Calculate the time, **T,** of one oscillation.

f) Repeat procedures (b) to (e) for x = 0.15, 0.20, 0.25, 0.30 and 0.35m.

g) Tabulate your results in a suitable table including values of T^2 and X^2.

h) Plot graph of T^2 against X^2.

i) Determine the slope, S, and the intercept,C on the T^2 axis of the graph.

j) Calculate the moment of inertia, I of the metre rule from the expression,

$$\mathbf{I = \frac{2mc}{S}}$$

Where m is the value of each mass.

2. In this experiment, you will determine the focal length F_1 and F_2 of the lenses labeled L_1 and L_2 respectively.

PART I

a) Place an optical pin, **P,** in a holder at a distance U = 40.0cm from lens, L_1 as shown in figure 3.

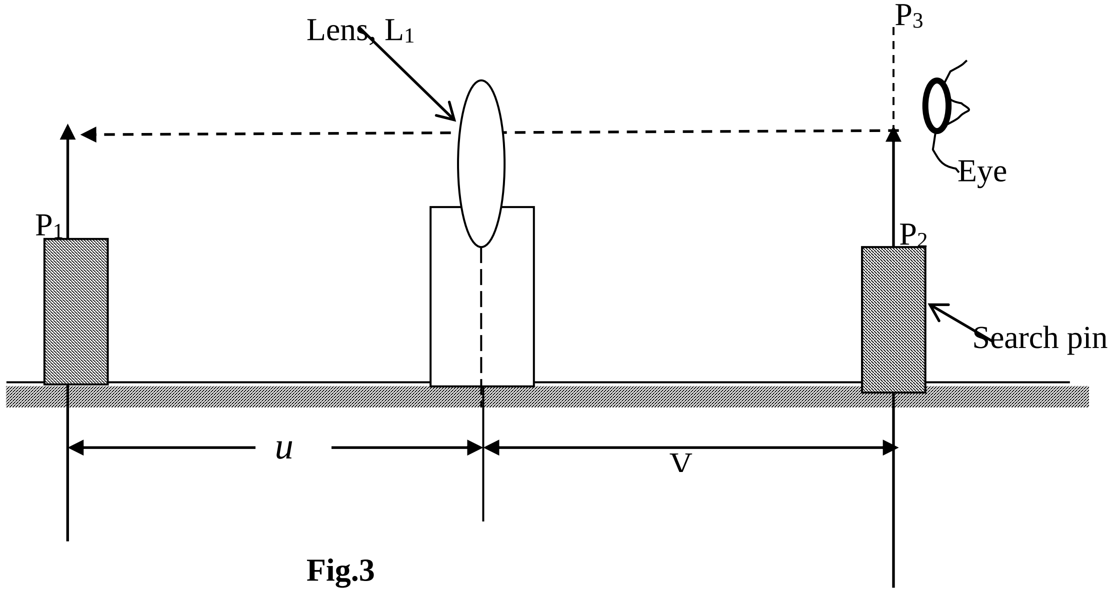

Fig.3

b) Place the second pin P_2 (search pin) also in a holder on the other side of the lens so that the tips of P_1 and P_2 are along the principal axis of the lens L_1.

c) Looking through this common axis, move P_2 until the image P_3 of P_1 by refraction through L_1 exactly coincides with P_2 as shown in figure 3.

d) Measure and record the distance V between P_2 and L_1.

e) Calculate the focal length, F of the lens, L_1 using the relation.

$$\mathbf{F_1 = \frac{UV}{U + V}}$$

PART II

a) Place the lens labeled L_2 in contact with the lens L_1.

b) Fix the lenses on a wooden block using plasticine.

c) Focus a distant object on to the white screen provided.

d) Measure the distance, F of the screen from the centre of the lenses.

e) Place the pin, P_1 at a distance, x = 40.0cm from the combined lenses as shown in figure 4.

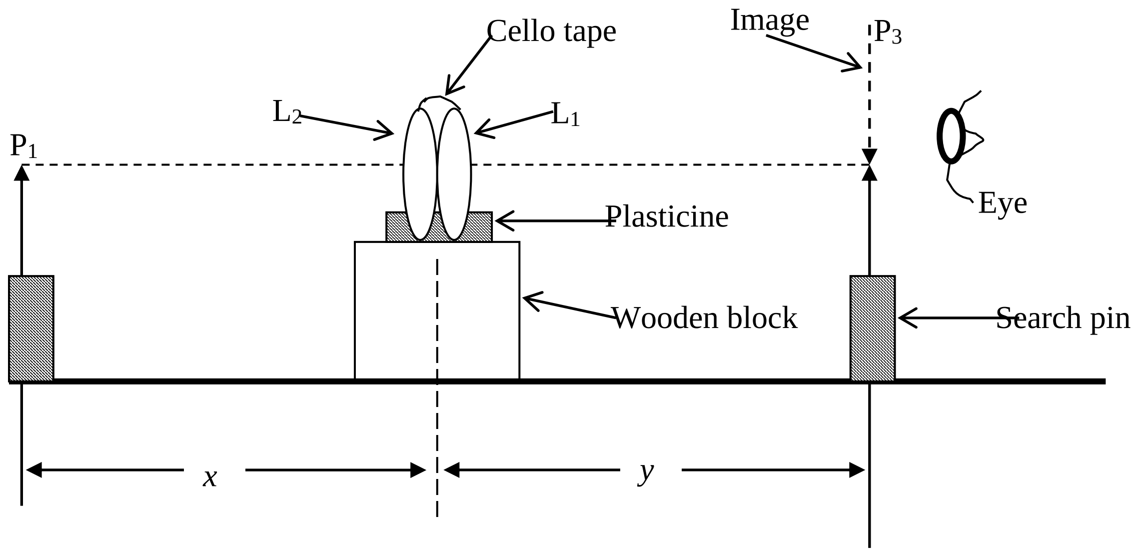

Fig 4.

f) Place the pin P_2 as in part I on the other side of the combined lenses.

g) Move P_2 along the common axis until the image P_3 of P_1 exactly coincides with P_2 as shown in figure 4.

h) Measure the distance y.

i) Repeat procedures (e) to (h) for values of x = 35.0m 30.0, 25.0, 20.0 and 17.5 cm

j) Tabulate your results including values of $\mathbf{M = \frac{y}{x}}$

k) Plot a graph of M against Y.

l) Find the slope, S of the graph.

m) Hence determine the focal length, $\mathbf{F_2}$ of the lens, $\mathbf{L_2}$ using expression

$$f_1 = f_2 (Sf_1 - 1)$$

3. In this experiment, you will determine the resistivity F, of the material of the wire labeled **Z**.

PART I

a) Measure and record the radius, r, in metres of the wire, **Z**.

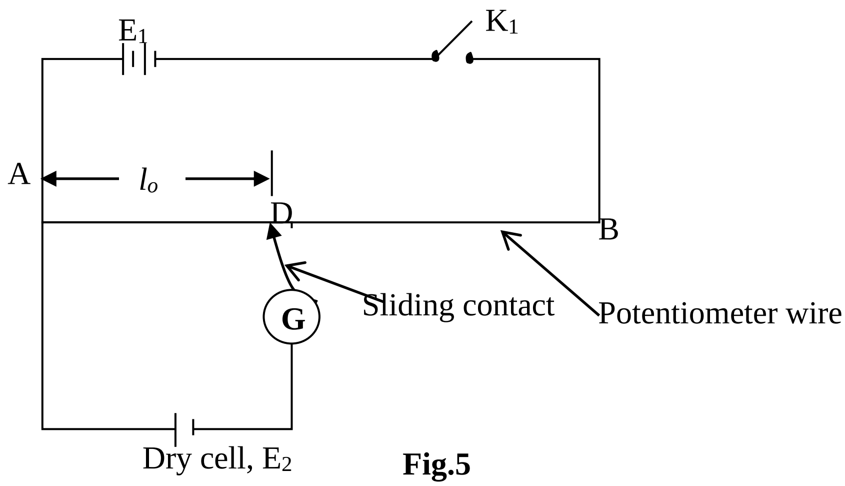

Fig.5

b) Connect the circuit shown in figure 5

c) Close switch K.

d) Move the sliding contact, D along the slide wire, AB until a point is reached where the galvanometer, G, shows no deflection.

e) Measure and record the balance, length L_o (in metres)

f) Open switch, K_1.

g) Disconnect the cell, E_2.

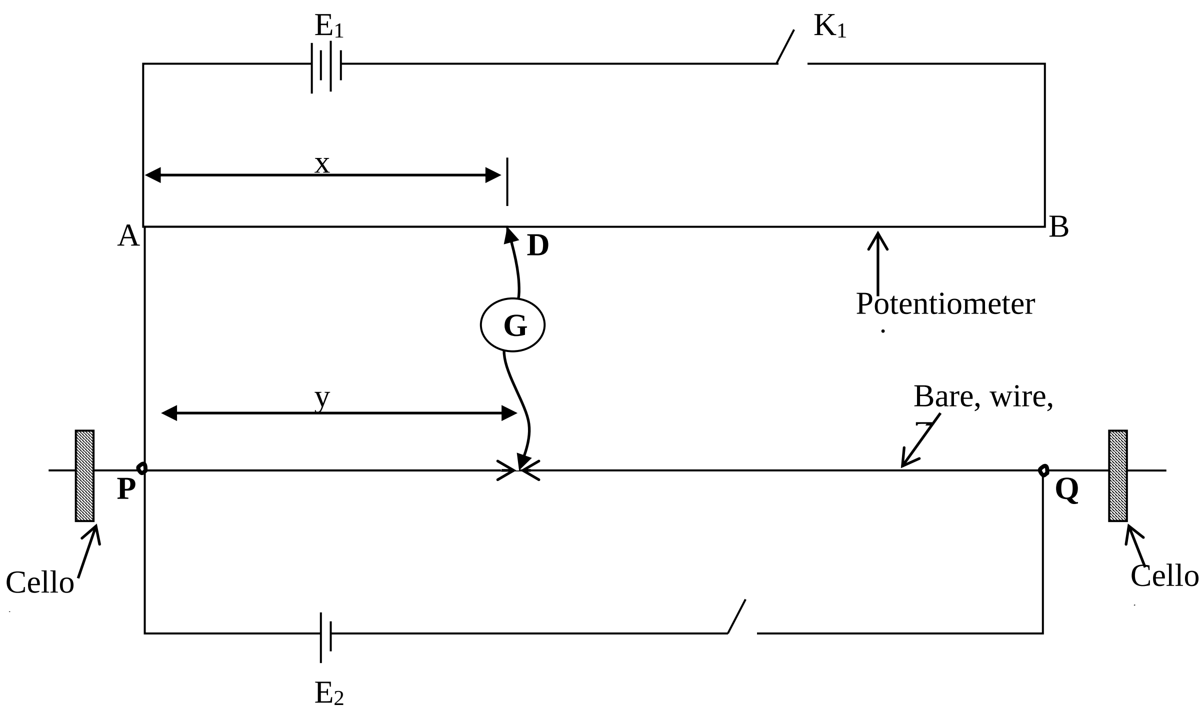

Fig.6

h) Connect the circuit shown in figure 6, such that PQ = 1.00 m adjust the distance Y = 0.200 m.

i) Close switches K_1 and K_2 and use the sliding contact, D to find balance point.

j) Measure and record the balance length, x.

k) Open switches K_1 and K_2.

l) Repeat the procedures in (h) to (k) for values y=0.300, 0.400, 0.500, 0.600 and 0.700 m.

m) Tabulate your results.

n) Disconnect the circuit in figure 6 and connect the circuit in figure 7.

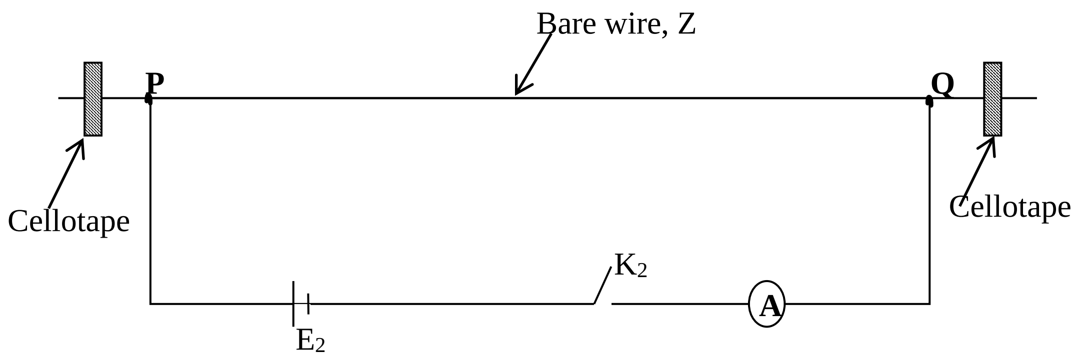

Fig. 7

o) Close switch, K_2.

p) Read and record the current, I_o in the circuit.

q) Disconnect the circuit in figure 7.

r) Connect the voltmeter across cells, E_2 and note the reading, V_o on it.

s) Plot a graph of **X** against **Y**.

t) Find the slope, S of the graph.

u) Calculate the value, R, from the expression.

$$\mathbf{R = \frac{SV_o}{L_oI_o}}$$

v) Calculate the resistivity of the material of the wire from the expression.

$$f = \pi r^2 R$$

END