535/4
PHYSICS
PRACTICAL
Paper 4
Oct./Nov. 2022
2¼ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

PHYSICS
(PRACTICAL)

Paper 4

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Answer Question **1** *and* **one** *other question. Any additional question answered will* **not** *be marked.*

You will **not** be *allowed to start working with the apparatus for the* **first quarter** *of an hour.*

For each question, candidates will be required to select apparatus from the equipment provided.

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.

Candidates are reminded to record their observations as soon as they are made.

Where possible, candidates should put their observations and calculations in a suitable table drawn in advance.

All your work must be in **blue** *or* **black** *ink. Any work done in pencil will* **not** *be marked.*

An account of the method of carrying out the experiment is **not** *required.*

Graph paper is provided.

Mathematical tables and silent non-programmable calculators may be used.

Turn Over

1. In this experiment, you will determine the mass, M_x, of the rubber bung provided. *(30 marks)*

(a) Read and record the mass, M_0, of the metre rule.

(b) Determine the balancing point, G, of the rule and record distance, $AG = x$.

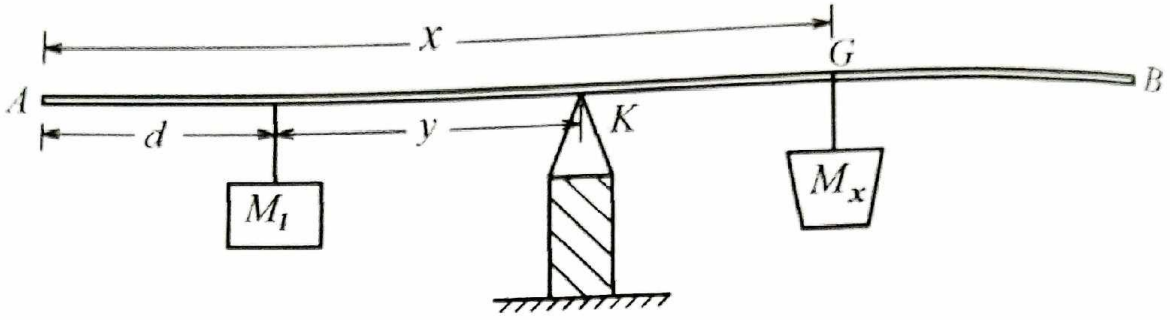

Fig. 1

(c) Tie firmly masses, $M_1 = 50$ g at a distance, $d = 2.0$ cm from end A and M_x at G.

(d) Adjust the position of the knife edge, K, until the system balances as shown in Figure **1**.

(e) Measure and record distance y.

(f) Repeat procedure (c) to (e) for $M_1 = 100,\ 150,\ 200,\ 250$ and 300 g.

(g) Tabulate your results including values of $M_1 y$ and $G - (y + d)$.

(h) Plot a graph of $M_1 y$ (**along the vertical axis**) against $x - (y + d)$ (**along the horizontal axis**).

(i) Determine the slope, S, of the graph.

(j) Calculate M_x from the expression, $M_x = S - M_0$.

(k) State the sources of errors.

DISMANTLE THE SET UP.

2. In this experiment, you will determine the constant, β, of the glass block provided. *(30 marks)*

(a) Place the glass block on a white sheet of paper and trace its outline $ABCD$.

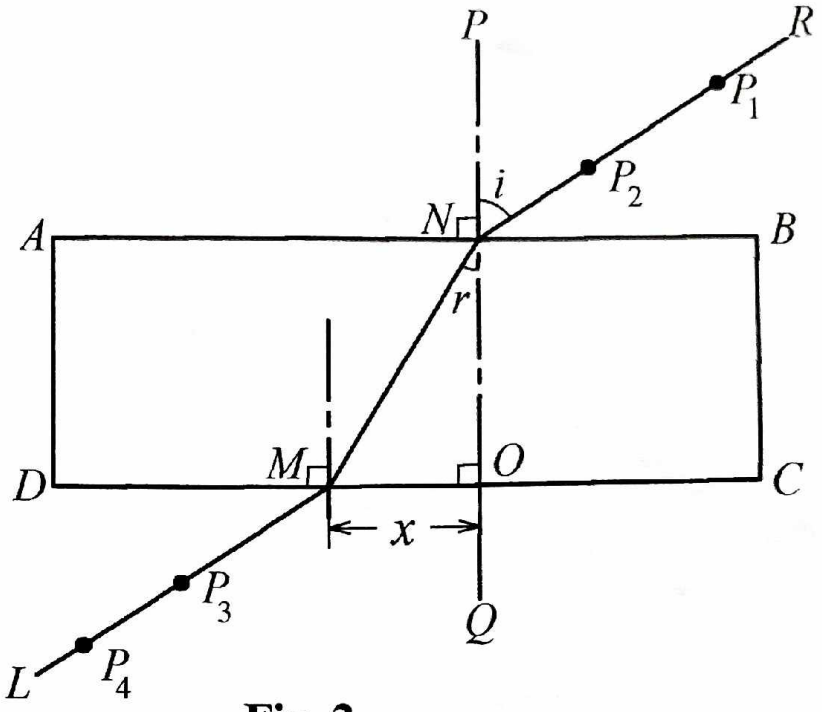

Fig. 2

(b) Remove the glass block.

(c) Draw a normal PQ through N and O such that $NB = 2$ cm.

(d) Draw a line RN at angle, $i = 15^{\circ}$.

(e) Replace the glass block into its outline $ABCD$.

(f) Fix pins, P_1 and P_2 vertically along RN.

(g) While looking through the block from side DC, fix pins P_3 and P_4 such that they appear to be in line with P_1 and P_2.

(h) Remove the glass block and pins P_1, P_2, P_3 and P_4.

(i) Draw a line through P_3 and P_4 to meet DC at M.

(j) Join M to N.

(k) Measure and record angle, r and distance, x.

Turn Over

(l) Repeat the procedure (d) to (k) for values of $i = 20^{o}$, 25^{o}, 30^{o}, 35^{o}, and 55^{o}.

(m) Tabulate your results in a suitable table including values of $tan\ r$.

(n) Plot a graph of x (**along the vertical axis**) against $tan\ r$ (**along the horizontal axis**).

(o) Find the slope, β, of your graph.

(p) Measure and record NM and its corresponding value of x when $r = 20^{o}$.

(q) Calculate the value of T from the expression:

$$T = \sqrt{(NM - x)(NM + x)}.$$

(r) Compare the values of β and T.

(s) State the possible sources of errors.

HAND IN YOUR TRACING TOGETHER WITH YOUR SCRIPT.

3. In this experiment, you will determine the constant, μ, of the bare wire and the constant, γ of the dry cell provided. *(30 marks)*

PART I

(a) Connect the voltmeter across the dry cell as shown in Figure **3 a**.

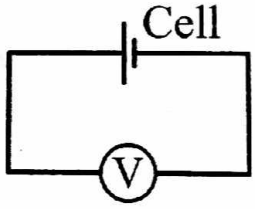

Fig. 3 a

(b) Read and record the emf, E, of the cell.

PART II

(a) Connect the circuit as shown in Figure 3 b.

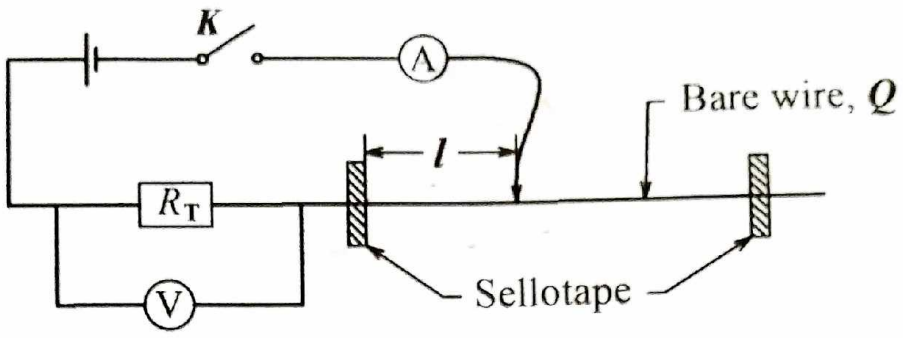

Fig. 3 b

(b) Adjust the length of the bare wire, $l = 0.30$ m.

(c) Close switch ***K***.

(d) Read and record the ammeter reading, I , and the voltmeter reading, V.

(e) Repeat procedure (b) to (d) for $l = 0.40,\ 0.50,\ 0.60,\ 0.70$ and 0.80 m.

(f) Tabulate your results in a suitable table including values of $\left(\frac{E-V}{I}\right)$.

(g) Plot a graph of $\left(\frac{E-V}{I}\right)$ **(along the vertical axis)** against l **(along the horizontal axis)**.

(h) Calculate the slope, μ , of the graph.

(i) Read and record the intercept, γ, on the $\left(\frac{E-V}{I}\right)$ axis.

(j) State the possible source of errors in this experiment.

DISMANTLE THE SET UP.

END