535/4
PHYSICS
PRACTICAL
Paper 4
Oct./Nov. 2023
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 observation 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, except graphs 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 scientific calculators may be used.

Turn Over

1. In this experiment, you will determine the constant, β, of the pendulum bob provided.

(30 marks)

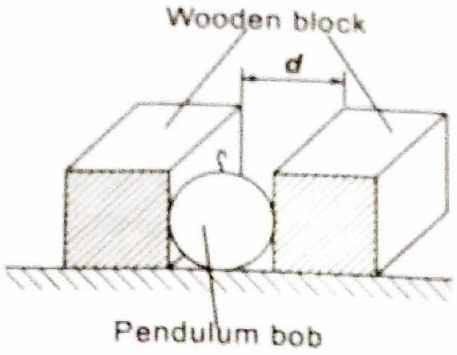

Fig. 1.1

(a) Place the pendulum bob on the table and place the wooden blocks on either side of the bob such that they are parallel and pressing against the bob as shown in Figure **1.1**.

(b) Measure and record the separation, d, between the wooden blocks.

(c) Dismantle the arrangement in Figure **1.1**.

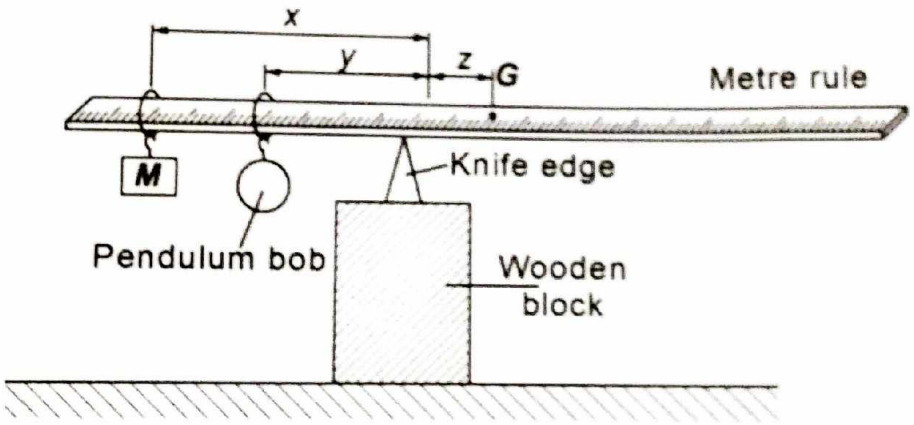

Fig. 1.2

(d) Balance the metre rule on a knife edge.

(e) Read and record the position, G, where the metre rule balances.

(f) Suspend a mass, $M = 20$ g at the 2 cm mark of the metre rule.

(g) Suspend the pendulum bob and adjust the position of the knife edge to a distance, $x = 36.0$ cm from the mass M.

(h) Adjust the position of the pendulum bob so that the metre rule balances horizontally as shown in Figure **1.2**.

(i) Measure and record the distances y and z.

(j) Repeat procedure (g) to (i) for $x = 35.5,\ 35.0,\ 34.5,\ 34.0,$ and 33.5 cm.

(k) Record your results in a suitable table including values of $\frac{x}{z}$ and $\frac{y}{z}$.

(l) Plot a graph of $\frac{x}{z}$ **(along the vertical axis)** against $\frac{y}{z}$ **(along the horizontal axis)**.

(m) Find the slope, S, of the graph.

(n) Calculate M_1 from the expression:

$$M_1 = -SM.$$

(o) Calculate M_2 from the expression:

$$M_2 = \frac{D\pi d^3}{6}, \qquad \text{where } D = 8.73 \text{ gcm}^{-3}.$$

(p) Calculate the constant, β, of the pendulum from the expression:

$$\beta = \frac{M_1 + M_2}{2}.$$

2. In this experiment, you will determine the constant, P, of the convex lens provided. *(30 marks)*

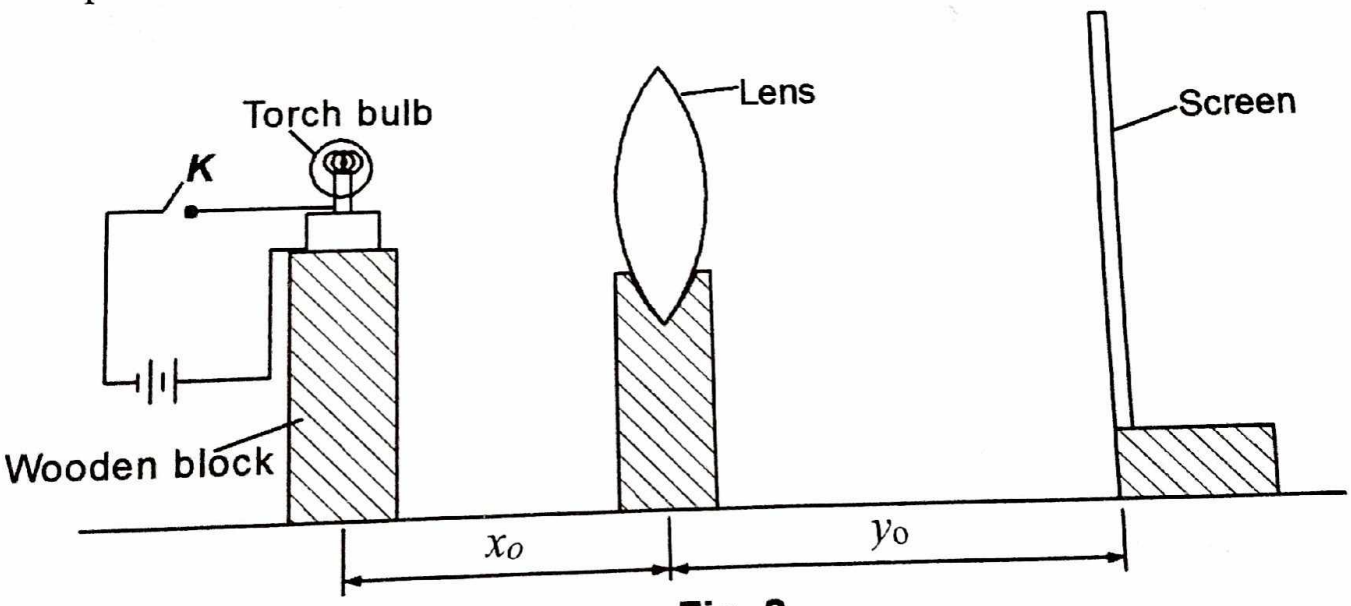

Fig. 2

(a) Arrange the apparatus provided as shown in Figure **2** such that $x_o = y_o = 30$ cm, from the lens.

(b) Close switch K.

(c) Move the torch bulb to a distance $x = 35.0$ cm.

(d) Adjust the screen until a focused image of the filament is formed on it.

Turn Over

(e) Measure and record distance, y, of the screen from the lens.

(f) Open switch K.

(g) Repeat procedure (b) to (e) for values of $x = 40.0,\ 45.0,\ 50.0,\ 55.0$ and 60.0 cm.

(h) Record your results in a suitable table including values of $\left(\frac{x}{y}+1\right)$.

(i) Plot the graph of $\left(\frac{x}{y}+1\right)$ **(along the vertical axis)** against x **(along the horizontal axis)**.

(j) Determine the slope, S, of your graph.

(k) Calculate the constant, P, from the expression:

$$P = 10^2\left(\sqrt{\frac{2S}{x_o}}\right).$$

3. In this experiment, you will determine the constant, β, of the bare wire labelled, **Q**. *(30 marks)*

(a) Fix the bare wire, **Q**, provided on the table using pieces of sellotape.

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

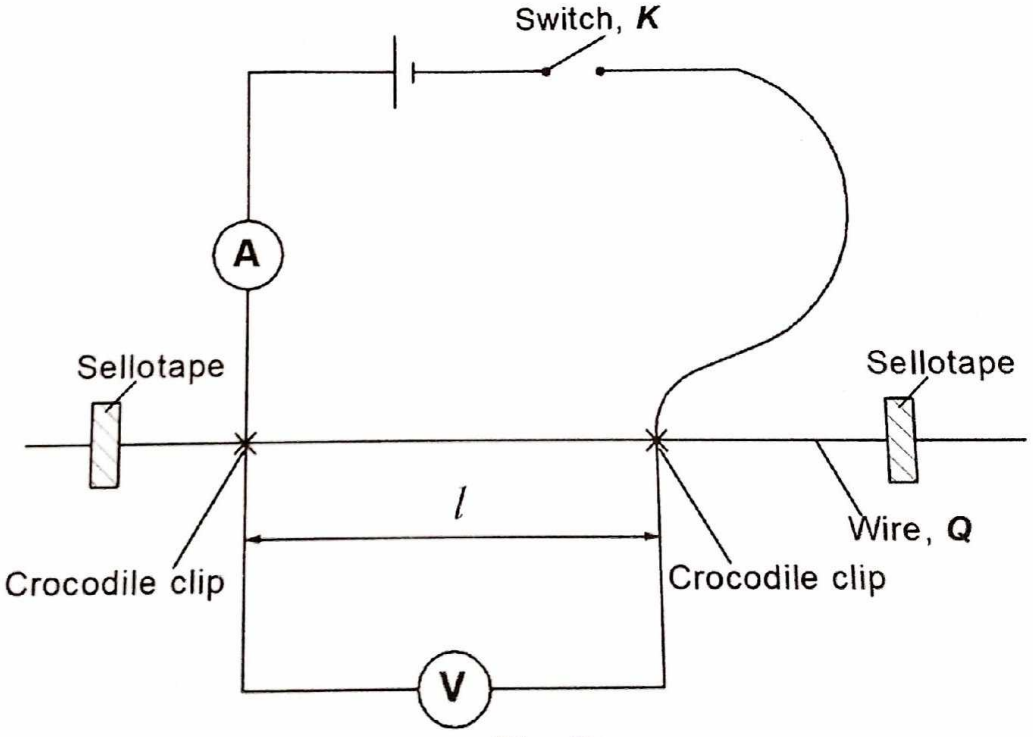

Fig. 3

(c) Starting with a length, $l = 0.200$ m, close the switch **K**.

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

(e) Repeat procedure (c) to (d) for values of $l = 0.300,\ 0.400,\ 0.500,\ 0.600$ and 0.700 m.

(f) Record your results in a suitable table including values of $\frac{1}{I}$ and $\frac{l}{V}$.

(g) Plot a graph of $\frac{1}{I}$ **(along the vertical axis)** against $\frac{l}{V}$ **(along the horizontal axis)**.

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

END