535/3
PHYSICS
PRACTICAL
Paper 3
Oct./Nov. 2022
2¼ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

PHYSICS
(PRACTICAL)

Paper 3

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.

1. In this experiment, you will determine the constant, K, using a pendulum bob. *(30 marks)*

(a) Suspend the pendulum bob from a retort stand as shown in Figure 1.

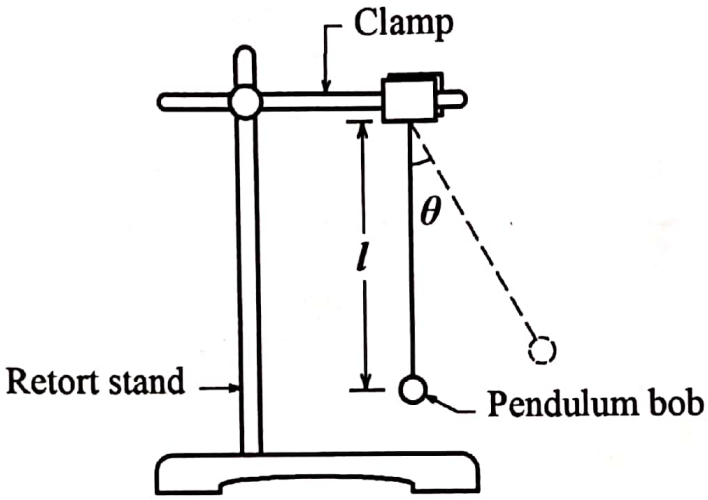

Fig. 1

(b) Adjust the length, l, of the thread to 0.900 m.

(c) Displace the pendulum bob through a small angle, θ, and release it to oscillate.

(d) Measure and record the time, t, for 20 complete oscillations.

(e) Repeat procedure (b) to (d) for $l = 0.800$ m, 0.700 m, 0.600 m, 0.500 m and 0.400 m.

(f) Record your results in a suitable table including values of $f = \frac{20}{t}$, f^2 and $\frac{1}{l}$.

(g) Plot a graph of f^2 **(along the vertical axis)** against $\frac{1}{l}$ **(along the horizontal axis)**.

(h) Find the slope, S, of your graph.

(i) Calculate the constant, K, from the expression;

$$K = 4\pi^2 S.$$

(j) State one possible source of error in the experiment.

2. In this experiment, you will determine the relationship between the angle of incidence, α, and the glancing angle, β. *(30 marks)*

(a) Fix a white sheet of paper on a soft board using drawing pins.

(b) Draw a straight line XY in the middle of the white sheet of paper.

(c) Mark point, O, in the middle of XY.

(d) Draw a normal MO to XY.

(e) Draw a line AO such that angle, $\alpha = 10^{\circ}$.

(f) Place the plane mirror such that the longer edge of the reflecting surface lies along line XY and is perpendicular to the sheet of paper.

(g) Fix pins, P_1 and P_2 vertically along AO.

(h) While looking from the opposite side, fix pins P_3 and P_4 such that they appear to be in line with the images of P_1 and P_2 in the mirror as shown in Figure 2.

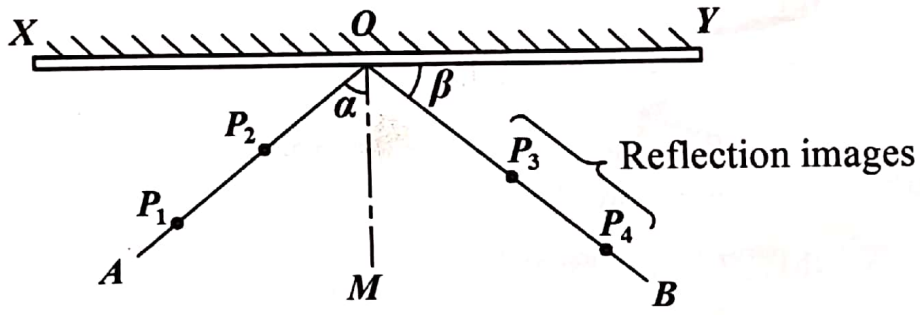

Fig. 2

(i) Remove the mirror and all the pins.

(j) Draw a line BO through P_3 and P_4.

(k) Measure angle $YOB = \beta$.

(l) Repeat procedure (e) to (k) for values of $\alpha = 20^{\circ}$, 30°, 40°, 50°, and 60°.

(m) Record your results in a suitable table including values of $(90 - \beta)$, $\sin \alpha$ and $\sin (90 - \beta)$.

(n) Plot a graph of $\sin \alpha$ **(along the vertical axis)** against $\sin (90 - \beta)$ **(along the horizontal axis)**.

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

(p) What is the relationship between α and $(90 - \beta)$?

HAND IN THE TRACING TOGETHER WITH YOUR SCRIPT.

3. In this experiment, you will determine the constant, α, of the cells provided.

(*30 marks*)

(a) Fix the bare wire, W, provided on the bench using sellotape.

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

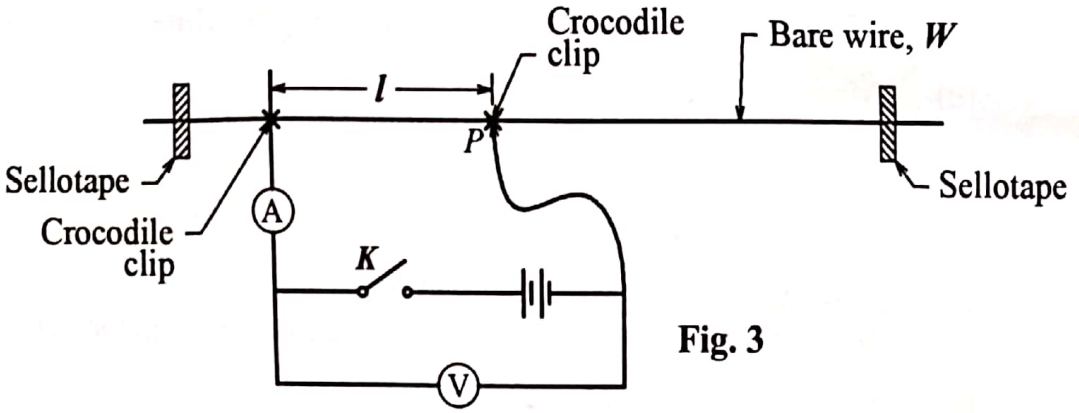

Fig. 3

(c) Disconnect the crocodile clip at point P.

(d) Close the switch, ***K***.

(e) Read and record the voltmeter reading, E.

(f) Open the switch, ***K***.

(g) Reconnect the crocodile clip at point P, such that the length of the bare wire, W is $l = 20$ cm.

(h) Close the switch, ***K***.

(i) Read and record the ammeter reading, I.

(j) Read and record the voltmeter reading, V.

(k) Open the switch, ***K***.

(l) Repeat procedure (g) to (k) for values of $l = 30,\ 40,\ 50,\ 60$ and 70 cm.

(m) Record your results in a suitable table including values of $\frac{V}{I}$, $(E-V)$ and $\frac{E}{(E-V)}$.

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

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

(p) Calculate the constant, α, from the expression $\alpha = \frac{1}{S}$.

(q) State **one** possible source of errors in the experiment.

END