P510/3

Physics Practical

July - August,

2023

UGANDA MUSLIM TEACHERS' ASSOCIATION

UMTA JOINT MOCK EXAMINATIONS 2023

UGANDA ADVANCED CERTIFICATE OF EDUCATION

Physics
Paper 3
3 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

Answer **question 1** *and* **one** *other question.*

- *For each question, candidates will be required to select suitable apparatus from the equipment provided.*
- *Any additional question answered will not be marked.*
- *Candidates are not allowed to use the apparatus for the first fifteen minutes.*
- *Squared paper is provided.*
- *Mathematical tables and non-programmable scientific electronic calculator may be used.*
- *Candidates are expected to record on their scripts in blue or black ink all their observations as these observations are made and to plan for 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. Any pencil work will not be marked.*
- *Details on the question paper should not be repeated in the answer, nor is the theory of the experiment required unless specifically asked for. However, candidates should record any special precautions they have taken and any particular feature of the method of going about the experiment.*
- *Marks are given mainly for a clear record of observations actually made, for their suitability, and for the use made of them.*
- *Acceleration due to gravity* $g = 9.81ms^{-1}$

In this experiment, you will determine the constant, β of the metre rule provided and the acceleration, g due to gravity.

PART I

a) Balance the metre rule on a knife edge and locate the point, C at which it balances.

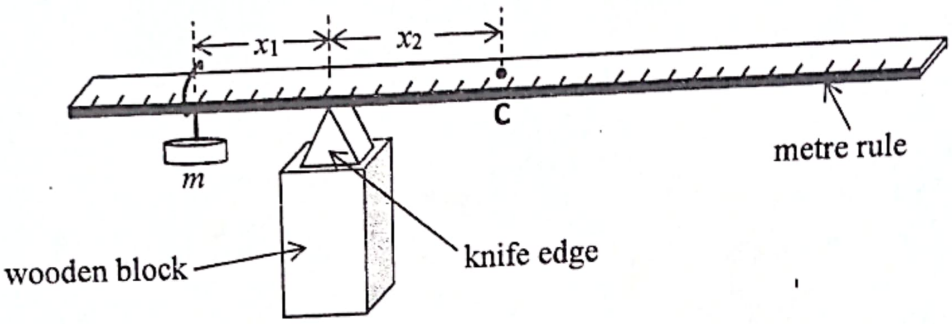

Fig. 1.1

b) Suspend a mass $m = 0.100$ kg from the 10.0 cm mark of the metre rule.

c) Balance the metre rule on a knife edge as shown in the figure 1.1.

d) Measure and record the distances x_1 and x_2.

e) Calculate the value of β from the expression:

$$\beta = \frac{mx_1}{x_2}$$

f) Measure and record the breadth, b and the length, l of the metre rule.

g) Calculate the value of k from the expression:

$$k = (l^2 + b^2)$$

PART 2

a) Suspend the metre rule with its graduated face upwards from a clamped half-metre rule as shown in the figure 1.2.

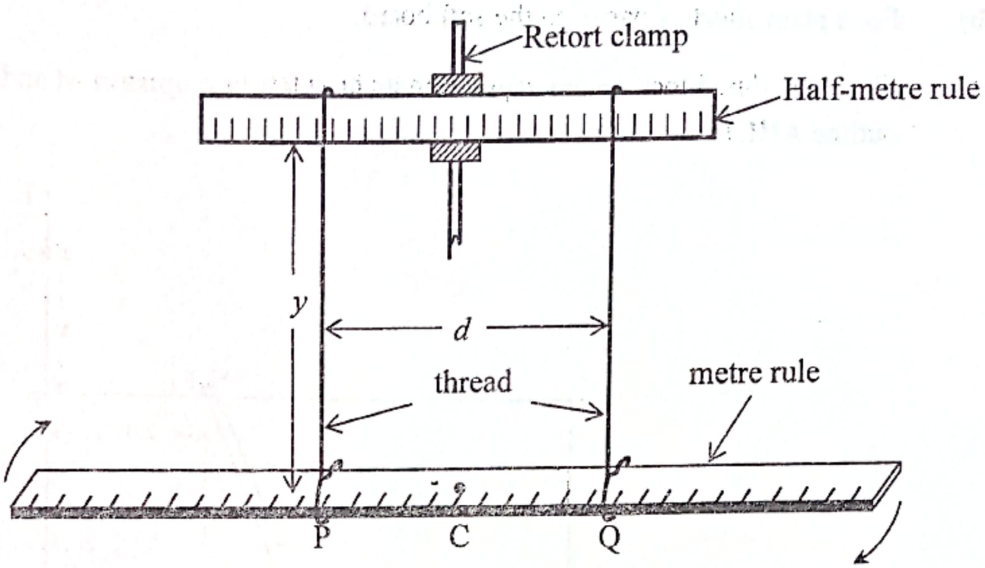

Fig. 1.2

b) Adjust the length, y of the threads to 0.500 m.

c) Start with a separation, $d = 0.200$ m of the threads such that the points P and Q are equidistant from point C of the metre rule.

d) Set the metre rule to oscillate in a horizontal plane by turning it through a small angle about point C and releasing it.

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

f) Find the periodic time, T.

g) Repeat procedures (c) to (f) for values of $d = 0.240, 0.280, 0.320, 0.360$ and 0.400 m.

h) Tabulate your results including values of T^2 and $\frac{1}{d^2}$.

i) Plot a graph of T^2 against $\frac{1}{d^2}$.

j) Find the slope, S of the graph.

k) Calculate the value of g from the expression:

$$g = \frac{4\pi^2 yk}{3S}$$

l) State a special precaution you took to minimize errors in the experiment.

2. **In this experiment, you will determine the average breadth, *b* of the glass block provided.**

a) Measure and record the breadth, b_1 of the glass block.

b) Fix a plain sheet of paper on the soft board.

c) Place the glass block on the paper with its broadest face uppermost and trace its outline **ABCD**.

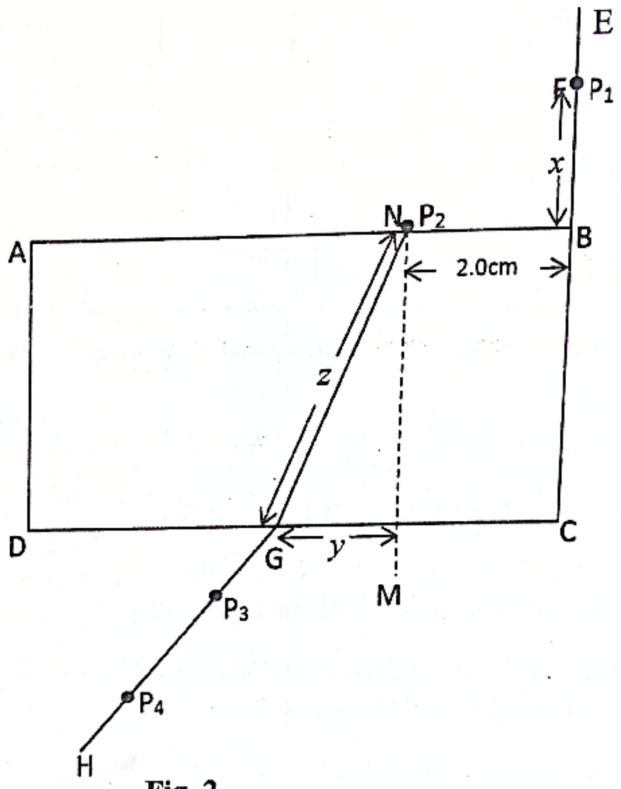

Fig. 2

d) Remove the glass block and draw a perpendicular line **NM** to side **AB** such that NB = 2.0 cm.

e) Extend **BC** to a point **E** such that **BE** = 6.0 cm.

f) Replace the glass block onto its outline and fix pin, $\mathbf{P_1}$ vertically at point **F**, a distance of $x = 0.8$ cm from **B** as shown in the Figure 2.

g) Fix pin, $\mathbf{P_2}$ vertically and close to side **AB** at point **N**.

h) While looking through the side **DC** of the glass block, fix pins P_3 and P_4 such that they appear to be in line with the images of P_1 and P_2.

i) Remove the glass block and the pins.

j) Draw a line **HG** through the positions of P_3 and P_4 to meet side **DC** at **G**.

k) Join **G** to **N**.

l) Measure and record the distances y and z.

m) Repeat procedures **(f)** to **(l)** for values of x =1.2, 1.6, 2.5, 3.5 and 5.5 cm.

n) Tabulate your results including values of $(z + y)$and $\frac{1}{(z-y)}$.

o) Plot a graph of $(z + y)$ against$\frac{1}{(z-y)}$.

p) Find the slope, S of the graph.

q) Calculate the average breadth, b of the glass block from the expression:

$$b = \frac{b_1+\sqrt{S}}{2}$$

r) State one source of error in the experiment.

HAND IN THE TRACING PAPER YOU HAVE USED.

3. **In this experiment, you will determine the resistance per unit length, k of the bare wire labelled P provided.**

METHOD I

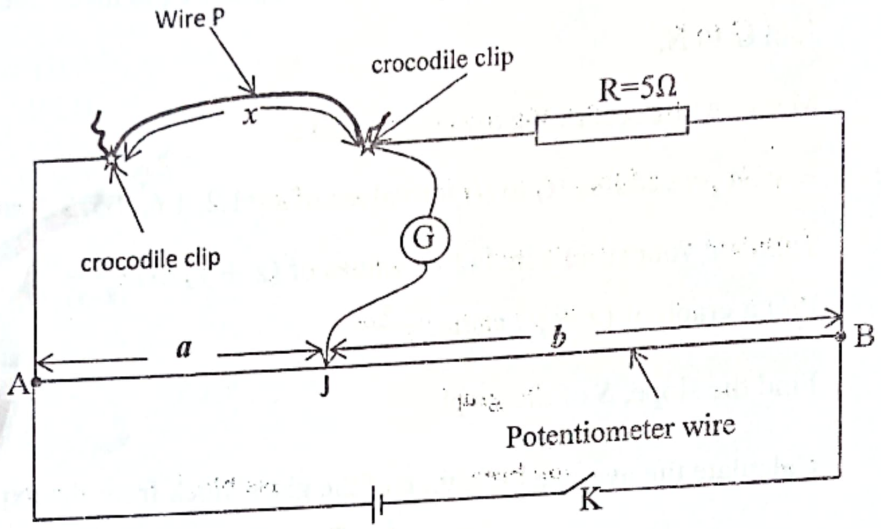

Fig. 3.1

a) Connect the circuit as shown in figure 3.1 with a length, $x = 0.100$ m of the wire **P**.

b) Close switch **K**.

c) Move the sliding contact along the potentiometer wire **AB** and locate a point **J**, for which the galvanometer shows no deflection.

d) Measure and record the balance lengths a and b, in metres.

e) Open switch **K**.

f) Repeat procedures (a) to (e) for values of $x = 0.150$, 0.200, 0.250. 0.300, and 0.400 m.

g) Tabulate your results including values of $\frac{1}{x}$ and $\frac{b}{a}$.

h) Plot a graph of $\frac{b}{a}$ against $\frac{1}{x}$.

i) Find the slope **S**, of the graph.

j) Calculate the value of k_1 from the expression:

$$k_1 = \frac{R}{S}$$

METHOD II

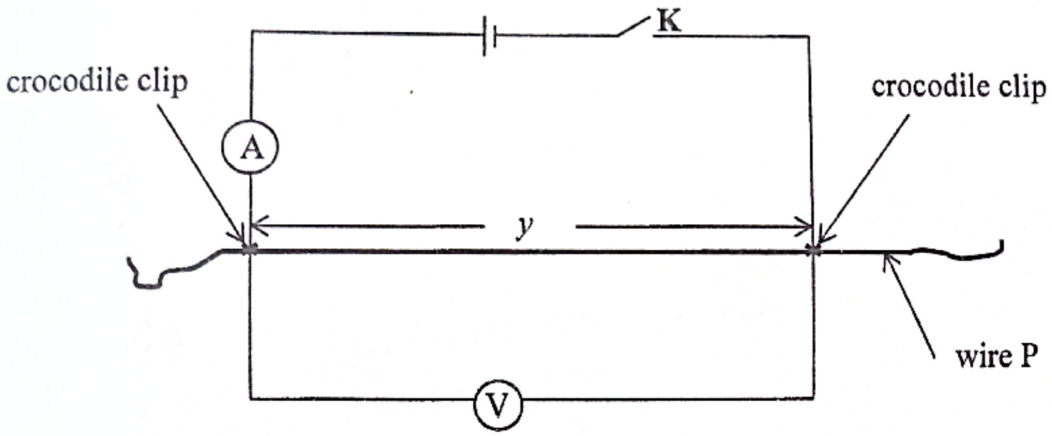

Fig. 3.2

a) Set up the circuit shown in figure 3.2.

b) Starting with a with length $y_1 = 0.200$ m, close switch **K.**

c) Read and record the ammeter reading, I_1 and the voltmeter reading, V_1.

d) Open switch **K.**

e) Adjust the length of the wire **P** to $y_2 = 0.400$ m and close switch **K.**

f) Read and record the new ammeter reading, I_2 and the voltmeter reading, V_2.

g) Calculate the value of k_2 from the expression:

$$k_2 = \frac{V_2 - V_1}{I_2 y_2 - I_1 y_1}$$

h) Calculate the resistance per unit length k, of the wire P from the expression:

$$k = \frac{1}{2}(k_1 + k_2)$$

i) Give one precaution you took to improve on accuracy of your results.

END.