(b) Close switch K.

(c) Move the jockey along the metre bridge wire AB to locate the point where the galvanometer, G shows no deflection.

(d) Read and record the balance length, y_1 and y_2.

(e) Open switch K.

(f) Calculate the value of R_2 from the expression: $R_2 = \frac{R_s y_1}{y_2}$.

$$R_b = \frac{R_1 + R_2}{2}$$

(g) Calculate R_b of the filament of the torch bulb from the expression;

(h) Replace the torch bulb with a bare wire W of length $l = 50.0$ cm.

(i) Repeat procedure (c).

(j) Reaad and record the balance lengths x_1 = AC and x_2 = CB.

(k) Calculate the constant ρ from the expression;

$$\rho = \frac{\pi d^2 x_1 R_s}{4 l x_2}$$

) What does ρ represent?

a) State any **four** sources of error.

END

(b) Adjust the length y of the bare wire, W such that $y = 0.200$ m.
(c) Close switch K.
(d) Move the jockey along the metre bridge wire AB to locate the point, C where the galvanometer, G shows no deflection.
(e) Read and record the balance length, l_1 and l_2.
(f) Open switch K.
(g) Repeat procedures (b) to (f) for values of $y = 0.300, 0.400, 0.500, 0.600$ and 0.700 m.
(h) Record your results in a suitable table including values of $\frac{l_2}{l_1}$ and $\frac{1}{y}$.
(i) Plot a graph of $\frac{l_2}{l_1}$ against $\frac{1}{y}$.
(j) Determine the slope, S of the graph.
(k) Read and record the intercept, C on the $\frac{l_2}{l_1}$ – axis .
(l) Calculate the value R_1 from the expression $R_1 = \frac{R_S}{C}$.
(m) Measure and record the diameter, d of the bare wire W.
(n) Calculate the value of the constant ρ of the bare wire from the expression;

$$\rho = \frac{\pi d^2 R_S}{4SC}$$

METHOD II

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

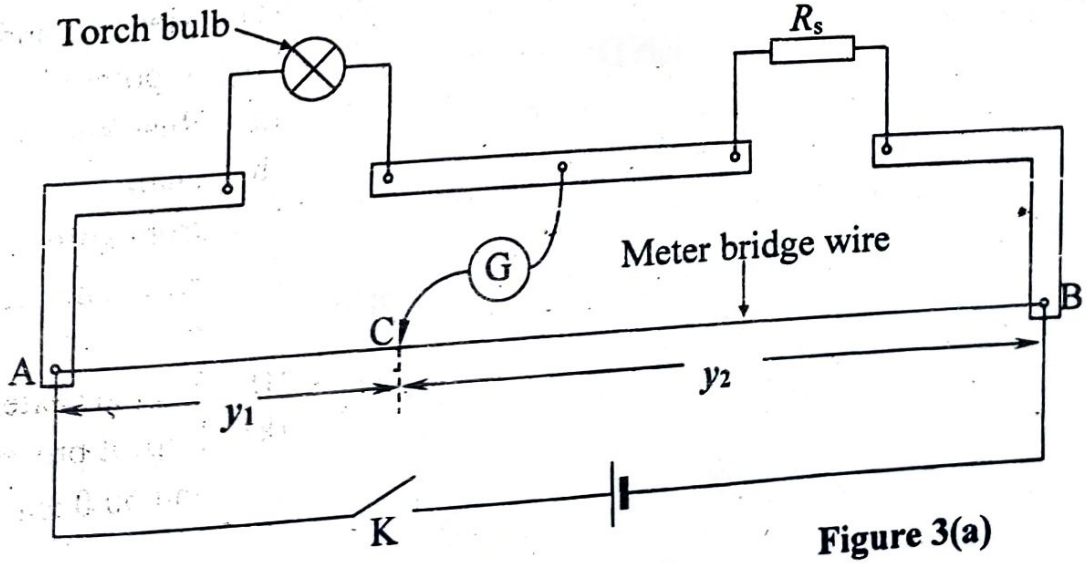

Figure 3(a)

(g) Replace the glass block on its outline.
(h) Fix two pins P_1 and P_2 vertically along line AO.
(i) While looking through the glass block from side SR, fix pins P_3 and P_4 so that they appear to be line with the images of pins P_1 and P_2.
(j) Remove the glass block and the pins.
(k) Draw a line through points P_3 and P_4 so that it meets SR at point B.
(l) Join B to O.
(m) Measure and record the lateral displacement, *d*. distance, l = OB and angles i and r.
(n) Calculate the constant λ_2 from the expression $\lambda_2 = \dfrac{d \cos r}{\sin (i - r)}$
(o) Calculate the constant from the expression $\lambda_3 = l \cos r$.
(p) Find from the expression $3\lambda = \lambda_1 + \lambda_2 + \lambda_3$.
(q) What does λ represent?
(r) State any **four** sources of errors.

D IN YOUR TRACING PAPER TOGETHER WITH YOUR SCRIPT.

In this experiment, you will determine the resistance, R_b of the filament of the torch bulb and the constant ρ of the bare wire labelled, *W*.

METHOD I

(a) Connect the circuit with a standard resistor, $R_s = 5\ \Omega$ in the right gap of the meter bridge, wire W and the torch bulb in the left gap of the meter bridge as shown in Figure 3(a).

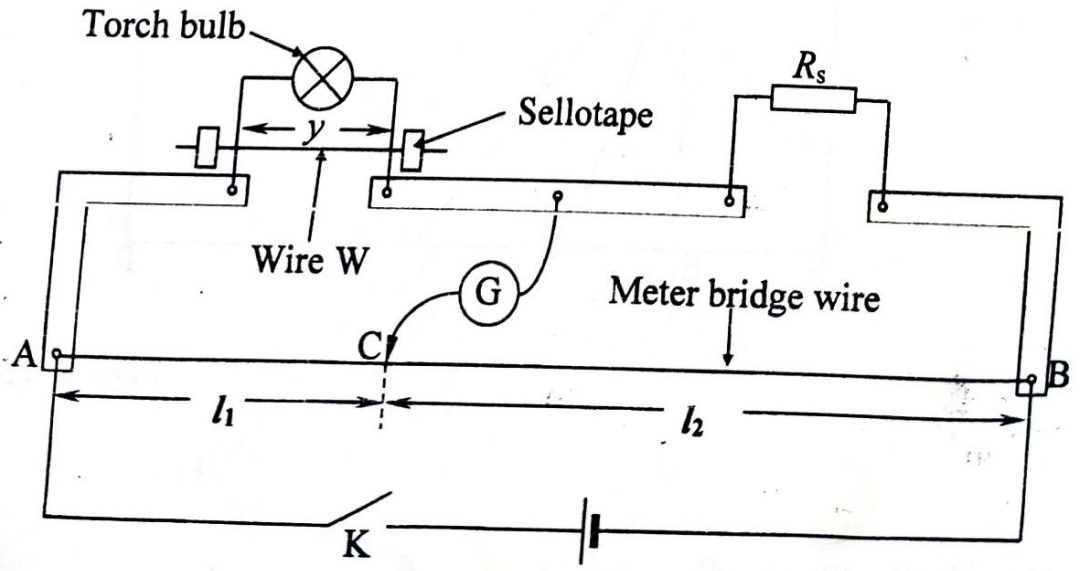

Figure 3(a)

(n) Measure and record the angle α and the length, d.

(o) Repeat procedures (h) to (n) for values of $\theta = 30^\circ, 40^\circ, 50^\circ, 60^\circ$, and 70°.

(p) Record your results in a suitable table including values of $\frac{1}{\tan \alpha}$ and $\frac{1}{d}$

(q) Plot a graph of $\frac{1}{\tan \alpha}$ against $\frac{1}{d}$

(r) Find the slope λ of your graph.

METHOD II

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

(b) Place the glass block centrally on the sheet of paper with its largest face uppermost.

(c) Trace the outline of the glass block.

(d) Remove the glass block and label the outline PQRS as shown in Figure 2(b).

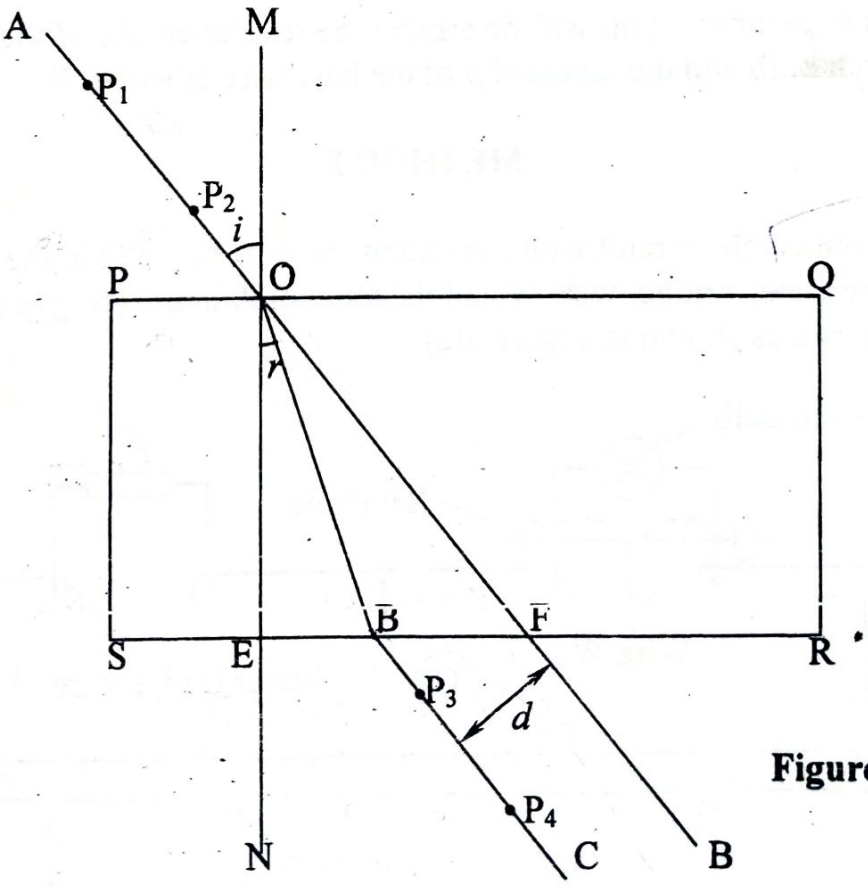

Figure 2(b)

(e) Draw a normal MN at point O.

(f) Draw a line AB through point O and F; give that distance EF = 4.0 cm.

In this experiment, you will determine the parameter λ of the glass block provided.

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

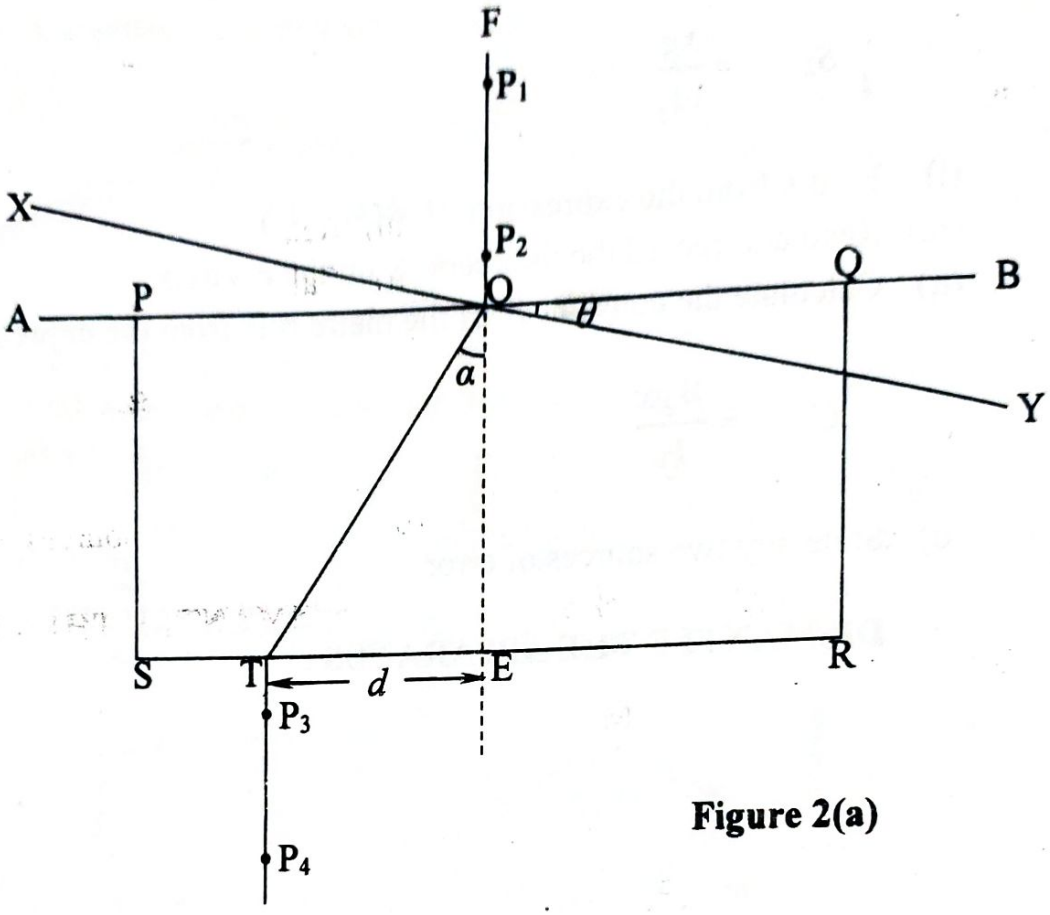

Figure 2(a)

(b) Draw a line AB along the middle of the paper.

(c) Place the glass block on the paper with the broadest face topmost and one of its longest side PQ along AB.

(d) Trace the outline of the glass block.

(e) Remove the glass block and label the outline PQRS as shown in Figure 2(a).

(f) Draw a line EF normal to PQ at O and intersecting SR at E.

(g) Fix pins P_1 and P_2 vertically along FO.

(h) Draw a line XY through O at an angle $\theta = 20^\circ$ to line AB.

(i) Place the glass block with its longest edge along XY.

(j) While looking through the glass block from side SR, fix pins P_3 and P_4 so that they appear to be line with the images of pins P_1 and P_2.

(k) Remove the glass block and P_3 and P_4.

(l) Draw a line through points P_3 and P_4 so that it meets SR at T.

(m) Join O to T.

(h) Tabulate your results in a suitable table.
(i) Plot a graph of e against M.
(j) Find the slope S_2 of the graph
(k) Calculate k_2 from the expression.

$$S_2 = \frac{xg}{yk_2}$$

(l) Find k from the expression $2k = (k_1 + k_2)$
(m) Read and record the intercept, C on the e – axis.
(n) Calculate the constant W of the metre rule from the expression;

$$C = \frac{Wgx}{ky}$$

(o) State any two sources of error.

DISMANTLE THE APPARATUS

(l) Tabulate your results and include values of $\frac{x}{y}$

(m) Plot a graph of d against $\frac{x}{y}$.

(n) Find the slope S_1 of the graph.

(o) Calculate k_1, from the expression.

$$S_1 = \frac{Mg}{k_1} \text{ where } g = 9.81 \text{ms}^{-2}.$$

PART II

(a) Set up the apparatus as shown in Figure 1(b) with pieces of the thread tied at a distance of 10.0 cm from the ends of each of the metre rules A and B.

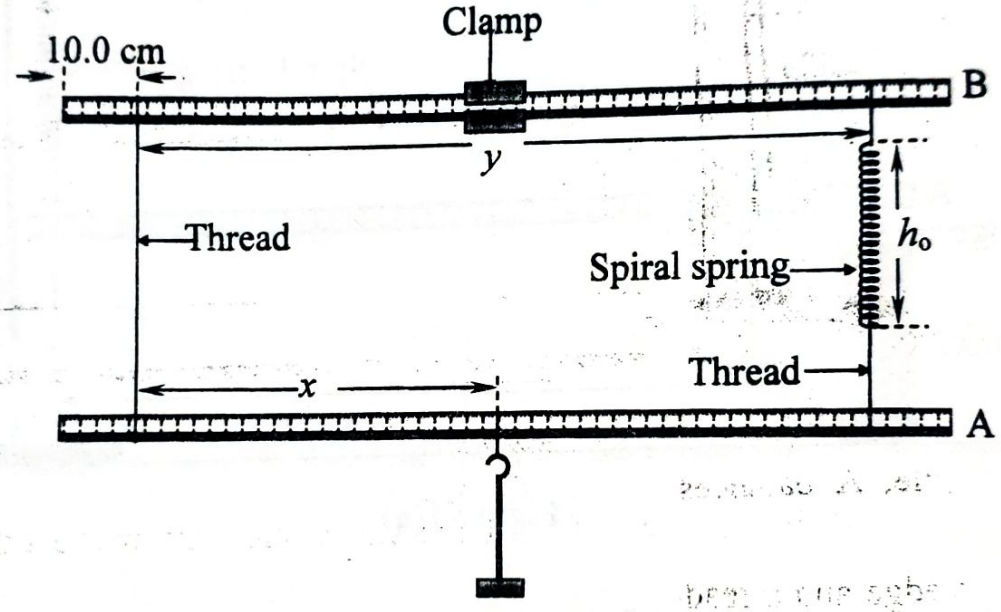

Figure 1(b)

(b) Adjust the length of the pieces of thread such that the metre rule A is horizontal and parallel to metre rule B.

(c) Measure and record separation, y, of the threads and the vertical height, h_o of the spring.

(d) Suspend a mass, $M = 100$ g on metre rule A at a distance $x = 0.400$ m.

(e) Read and record the vertical height, h of the spring.

(f) Find the extension, $e = (h - h_o)$ of the spring.

(g) Repeat procedures (d) and (f) for values of $M = 200, 250, 300, 350$ and 400 kg.

1. In this experiment you will determine the constant k of the spring and constant, W of the metre rule.

PART I

(a) Attach a pointer to the spring provided.
(b) Clamp the spring and metre rule, B.
(c) Place the metre rule on a knife edge at a point 0.10 cm from end A.
(d) Using a piece of thread, suspend the metre rule from the spring tied at a distance of 10.0 cm from the other end

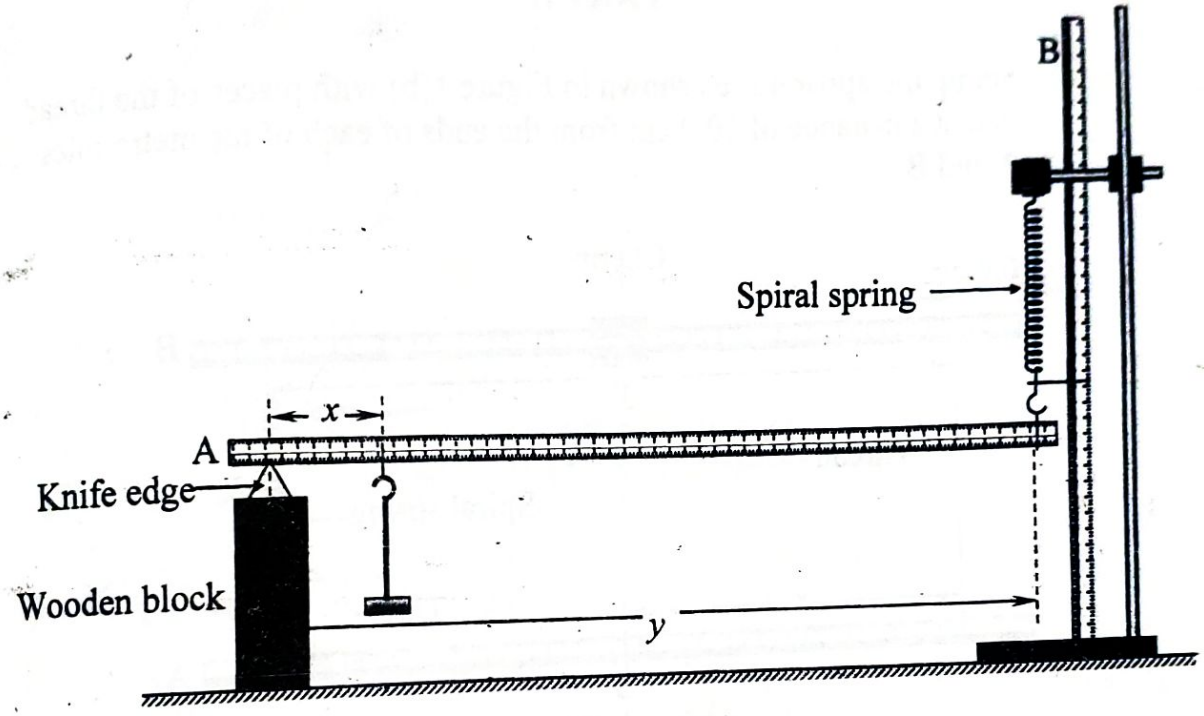

Figure 1(a)

(e) Adjust the position of the clamp until the metre rule, A balances horizontally.
(f) Measure and record the distance y between the knife edge and thread at point of suspension of the spring. 39.9
(g) Read and record the position P_o of the pointer on the vertical metre rule. 39.0
(h) Hang a mass $M = 0.200$ kg on the metre rule at a distance $x = 10.0$ cm from knife edge as shown in Figure 1(a).
(i) Read and record the new position of the pointer on the vertical metre rule. 37.5 36.5 35.5 34.5 33.5 32.5
(j) Find the extension, d of the spring.
(k) Repeat procedures (h) and (j) for values of $x = 20.0, 30.0, 40.0, 50.0,$ and 60.0 cm.

P510/3
PHYSICS
Paper 3
July/Aug. 2024
3¼ hours

MASAKA DIOCESE EXAMINATION BOARD

UACE Joint Mock Examinations 2024

PHYSICS PRACTICAL

Paper 3

3 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

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

Any additional question(s) answered will **not** *be marked.*

Candidates are not allowed to use the apparatus for the **first fifteen minutes.**

Graph papers are provided.

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

Candidates are expected to record all their observations as they are made and plan the presentation of 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. However, candidates should record any special precautions they have taken and any particular feature of their methods of going about the experiment.*

Marks are given mainly for a clear record of the observations actually made, for their suitability, accuracy and the use made of them.

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

Turn Over