P510/3

PHYSICS

PAPER 3

MOCK 2024

AUGUST

3 HRS:15 MIN

MEBU EXAMINATIONS CONSULT

UGANDA ADVANCED CERTIFICATE OF EDUCATION
MOCK EXAMINATIONS 2024

[redacted]

PHYSICS

PAPER 3

(PRACTICAL)

3 HRS:15 MIN

INSTRUCTIONS TO CANDIDATES

- Answer question **1** and **one** other question.
- Candidates are not allowed to use the apparatus for the first fifteen minutes.
- Graph papers are provided.
- Mathematical tables and non-programmable scientific calculators may be used.
- Write on **one** side of the paper only
- Candidates are expected to record on their scripts all their observations as these observations are made and to plan the presentation of the records so that it is not necessary to make a fair copy of them. The working of the answer 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. Candidates should however record any special precautions they have taken and any particular feature of their method of going about the experiment.
- 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.

PART I

1. In this experiment, you will determine the force constant, **K, of** the spring provided.

(a) Clamp the upper hook of the spring using the two pieces of wood provided, as in figure 1 (a). Make sure that the spring is vertical.

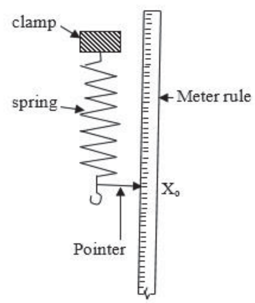

Fig. 1(a)

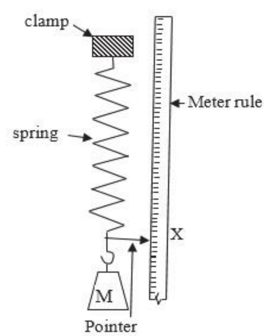

Fig. 1(b)

(b) Attach a pointer to the free end of the spring. Read and record the position, x_o, (in metres) of the pointer on a vertical scale.

(c) Suspend a mass, ***M*** ,of **0.100 kg** from the lower end of the spring.

(d) Read and record the new position, ***x***, (in metres) of the pointer.

(e) Repeat procedures (c) to (d) for values of ***M* = 0.200 , 0.300, 0.400, 0.500** and **0.600 kg.**

(f) Record all your results in a suitable table, including values of $(x - x_o)$.

(g) Plot a graph of $(x - x_o)$ against *M.*

(h) Find the slope, S_1, of the graph.

(i) Determine the force constant, ***K*** of the spring from $K = \frac{g}{S_1}$**,**where **g** is the acceleration due to gravity = **9.81 ms^{-2}**.

PART 2

(a) Set up the circuit as shown in fig.5 below:

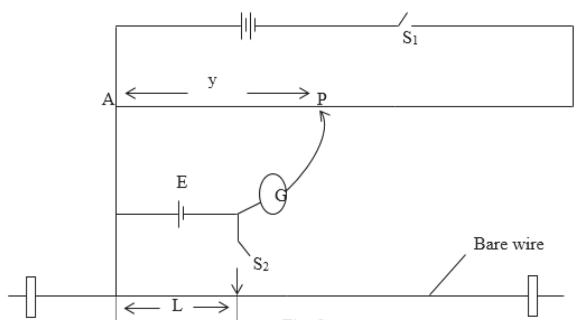

Fig. 5

(b) Starting with L = 0.20m, close the switches S_1 and S_2.

(c) Move the sliding contact, P along the potentiometer slide wire until a point is found for which G shows no deflection.

(d) Measure and record the balance length, y, in metres.

(e) Open switches S_1 and S_2.

(f) Repeat procedures (b) to (e) for values of L = 0.30, 0.40, 0.50, 0.60, and 0.70m.

(g) Tabulate your results including values of 1/ L and 1/ y.

(h) Plot a graph of 1/ y against 1/ L.

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

(j) Read and record the intercept, C on the 1/ y axis.

(k) Calculate the internal resistance, r of cell, E, from r = SK/ C.

END

PART II

In this experiment, you will determine the effective mass, $\boldsymbol{m_o}$, of the spring.

(a) Suspend a mass, **M**, of 0.100kg from the spring as in part 1.

(b) Pull the mass vertically downwards through a small displacement and release it.

(c) Measure the time, ***t***, for 20 oscillations of the mass.

(d) Determine period ***T*** of the oscillations.

(e) Repeat procedures (a) to (c) for M = 0.200, 0.300, 0.400, 0.500 and 0.600 kg.

(f) Record your results in a suitable table, including values $\frac{1}{f^2}$, where $f = \frac{1}{T}$

(g) Plot a graph of $\frac{1}{f^2}$ against M; find the slope $\mathbf{S_2}$ and intercept, **C**, of $\frac{1}{f^2}$ axis.

(h) Calculate the effective mass, $\boldsymbol{m_o}$, of the spring from $\boldsymbol{m_o} = \frac{C}{S_2}$.

2. In this experiment you will determine the constant, **S**, of the glass block provided using two methods.

Method 1

(a) Measure and record the length, **L**, of the glass block.

(b) Draw a line on the plain sheet of paper.

(c) Place the glass block with the smallest area over the line.

(d) Hold a pin horizontally so that its pointed end is adjacent to the glass block as shown in figure 2 below.

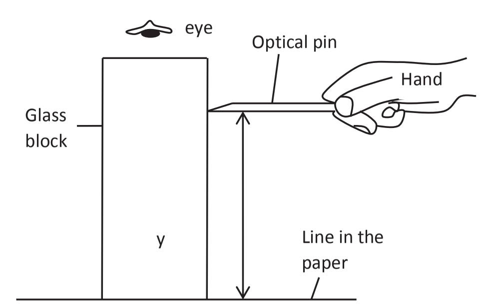

Figure 2

(e) Adjust the position of the optical pin until it appears to coincide with the image of the line as seen through the glass block.

(f) Measure and record the height, **y**, of the pin from the line on the sheet of paper

(g) Calculate the constant, **S** of the glass block, S= L/(L-y).

Method II

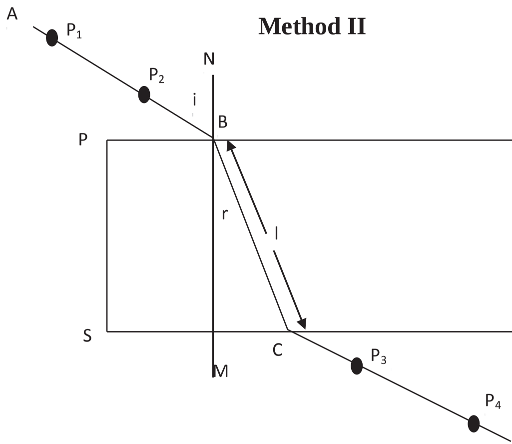

Figure 3

(a) Place a glass block on a sheet of white paper.

(b) Trace the outline of the block.

(c) Remove the glass block and label its outline as PQRS.

(d) Draw a normal NM at B about 3.0 cm from P.

(e) Draw a line AB such that angle $i = 10^0$ as shown in the figure 3.

(f) Put back the glass block in its outline.

(g) Fix pins vertically at P_1 and P_2 along AB.

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

(i) Remove the glass block and the pins.

(j) Draw a line through P_3 and P_4 to meet SR at C.

(k) Join B to C.

(l) Measure and record angle, r and the distance, l.

(m) Repeat procedures (e) to (l) for values of $i = 20^0, 30^0, 40^0, 50^0$, and 60^0.

(n) Tabulates your results including values of: sin i, sin r, $\sin^2 i$ and $\mathbf{l^{-2}}$.

(o) Plot a graph of $\mathbf{l^{-2}}$ against $\sin^2 i$.

(p) Find the slope, S_1 of the graph.

(q) Find the intercept, C on the l^{-2} – axis.

(r) Calculate the width, w of the glass block from the expression:

$$\mathbf{w = \sqrt{(1/C)}}.$$

(s) Determine the refractive index, n , of the glass block from the expression: $\mathbf{n = \sqrt{(C/-S_1)}}$

(t) Plot a graph of sin i against sin r.

(u) Find the slope, S_2 of the graph.

(v) Determine the ratio of $\mathbf{n/S_2}$.

3. In this experiment, you will determine the resistance per metre, **k**, of the bare wire **Q** and the internal resistance, **r**, of the cell provided.

PART 1

(a) Fix the bare wire Q provided on the table using cello tape.
(b) Connect the circuit as shown in fig. 4 below:

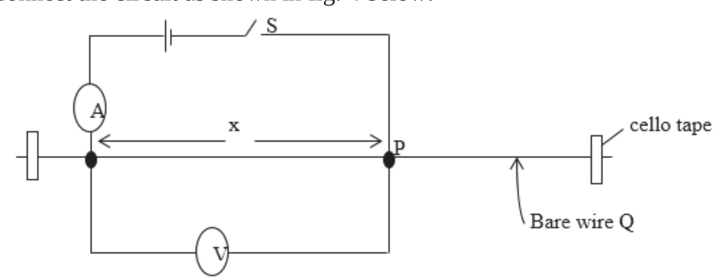

Fig. 4

(c) Adjust the position of P such that x = 0.50m.

(d) Record the voltmeter reading V_1 and the ammeter reading I_1.

(e) Adjust the position of P such that x = 0.75m.

(f) Record the voltmeter reading V_2 and the ammeter reading I_2.

(g) Calculate the resistance per metre, K from the expression:

$$2K = 2R_1 + 4R_2, \text{ where } V_1 = I_1R_1 \text{ and } V_2 = I_2R_2.$$