P510/3
PHYSICS
(PRACTICAL)
Paper 3
$3^1/_4$ hours

WAKISSHA

Uganda Advanced Certificate of Education

PHYSICS PRACTICAL

(PRINCIPAL SUBJECT)

Paper 3

3 hours 15 minutes

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 electronic 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 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. 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.

Question One

1. In this experiment, you will determine the constant, I, of the metre rule labelled A by two methods.

Method I

(a) Measure and record the width, t of the metre rule labelled A.

(b) Balance the metre rule on a knife edge with its calibrated face upwards.

(c) Determine the position C at which the metre rule balances.

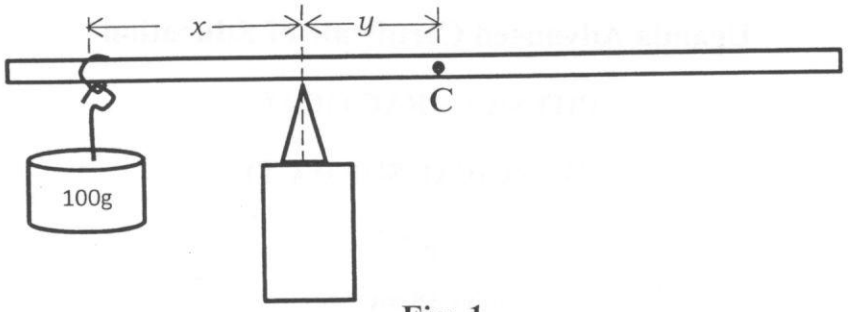

Fig. 1

(d) suspend a 0.100kg mass at 5.0cm mark of the metre rule and adjust the position of the knife edge until the ruler balances again as shown in figure 1.

(e) Measure and record the length x and y .

(f) Calculate the mass M of the metre rule from the expression

$$M = \frac{0.100x}{y}.$$

(g) Calculate the value of the constant, I, from the expression,

$$I_1 = \frac{M(t^3 + 1)}{12}$$

Method II

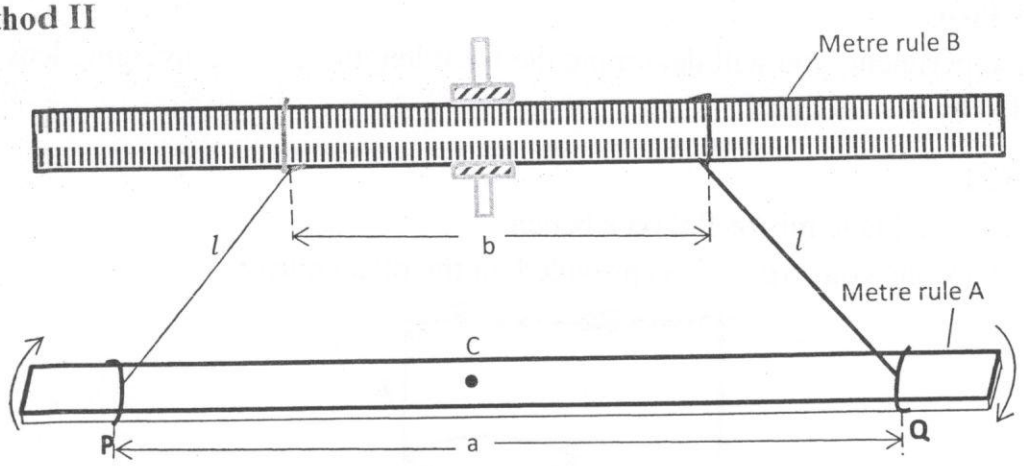

Fig.2

(a) Tie the long pieces of thread at points P and Q, equidistant from the point C of the metre rule labeled A such that a =0.900m.

(b) Suspend the metre rule labeled A from a clamped metre rule labeled B as shown in figure 2 above.

(c) Adjust the length of the threads l = 0.700m and the separation of the threads on metre rule B to b = 0.200m.

(d) Turn the metre rule A horizontally through a small angle about its centre and release it to oscillate.

(e) Record the time for 20 oscillations.

(f) Determine the period, T, of the oscillations.

(g) Repeat procedures (c) to (f) for values of b = 0.300, 0.400, 0.500, 0.600 and 0.700m.

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

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

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

(k) Calculate the value, I_2, from the expression, $I_2 = \frac{0.030MgS}{\pi}$, where g = 9.81ms^{-2} and M; the value of **method I** (f).

(l) Calculate the value of I from the expression,

$$I = \frac{I_1 + I_2}{2}.$$

Turn Over

Question Two

2. In this experiment, you will determine the focal length, f, of a converging lens L, provided by two methods.

Method I

(a) Place a plane mirror flat on a bench.

(b) Place the converging lens provided on the plane mirror

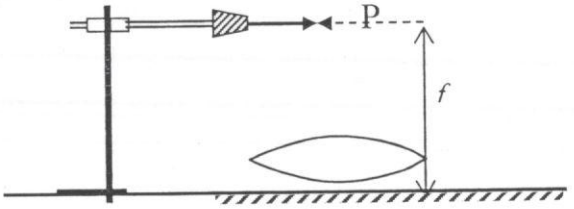

Fig.2

(c) Clamp an optical pin P in a retort stand such that its pointed end lies along the axis of the lens as shown above.

(d) Adjust the height of the pin P to locate the position at which it coincides with its image.

(e) Measure and record the distance, f, of the pin from the plane mirror.

Method II

(a) Connect the bulb, the key and the dry cells in series.

(b) Mount the bulb just behind the wire gauze as shown below.

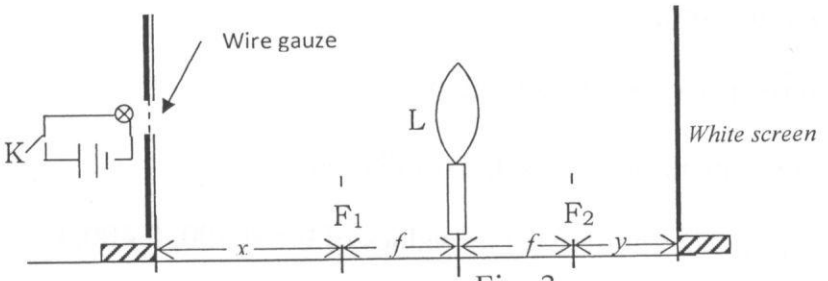

Fig. 3

(c) Adjust the position of the wire gauze so that it is a distance x = 2.5 cm from the principal focus F_1 of L and close switch K.

(d) Adjust the position of the screen until a sharp image of the gauze is obtained on the screen.

(e) Measure and record the distance y of the screen from the principal focus F_2 of L.

(f) Repeat the procedures (c) to (e) for values of $\boldsymbol{x}$ = 5.0, 7.5, 10.0, 12.5 and 15.0cm.

(g) Tabulate your results including values of $\frac{\mathbf{1}}{\boldsymbol{x}}$

(h) Plot a graph of y against $\frac{\mathbf{1}}{\boldsymbol{x}}$.

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

(j) Calculate the focal length of the lens from $f = \sqrt{S}$.

Question Three

3. In this experiment, you will check the calibration of an ammeter using a slide wire potentiometer.

(a) Connect the voltmeter across the terminals of the cell marked E.

(b) Read and record the voltmeter reading E_0.

(c) Connect the circuit shown below.

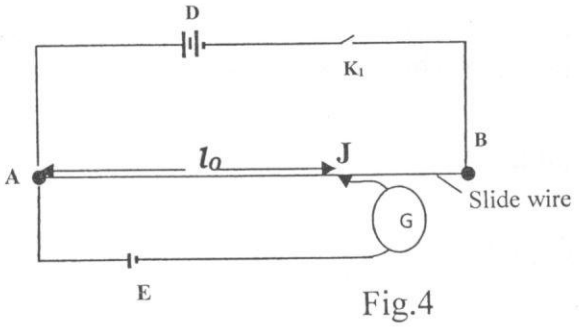

Fig.4

(d) Close switch K_1 and move the sliding contact J along the wire AB to locate a point on it for which G shows no deflection.

(e) Measure and record the balance length l_0, and open switch K_1.

(f) Calculate the value of ***k*** from the expression.

$$k = \frac{E_0}{l_0 x R_s} \quad \text{where } R_s = 1\ \Omega$$

(g) Connect the circuit as shown below.

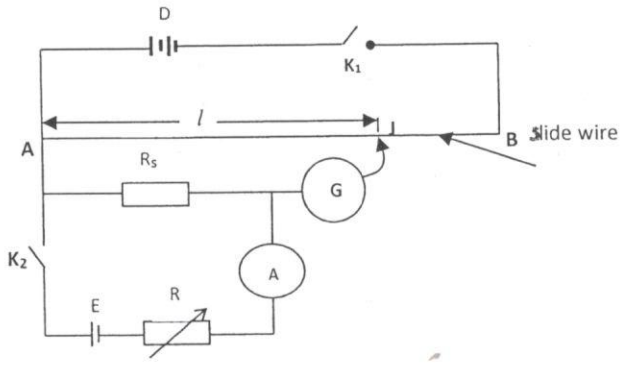

Fig. 5

(h) Close switch K_2 and adjust the rheostat R until the ammeter A reads $I_r = 0.15$ A.

(i) Close switch K_1 and move the sliding contact J along the slide wire to locate a point on it.

Turn Over

(j) for which G shows no deflection.

(k) Measure and record the balance length l.

(l) Open switch K_1.

(m) Repeat procedure (h) to (k) for ammeter readings $I_r = 0.20, 0.25, 0.30, 0.35$ and 0.40A.

(n) Tabulate your results including the values of $I_a = kl$.

(o) Plot a graph of I_a against I_r.

(p) Find the slope S of the graph.

(q) Comment on the value of the slope.

END