P510/3
PHYSICS
(PRACTICAL)
Paper 3
July/August 2017
$3^{1}/_{4}$ hours

WAKISSHA JOINT MOCK EXAMINATIONS

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.

Turn Over

QUESTION 1

In this experiment, you will determine the relative density, **R.D** of liquid **L** provided, using two methods.

Part I

(a) Clamp a metre rule vertically and suspend the spring with the pointer attached beside the ruler.

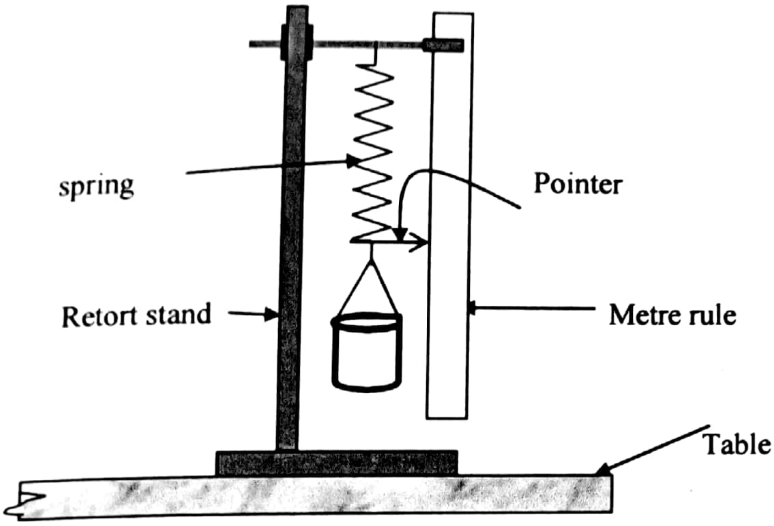

Fig 1.

(b) Suspend a beaker with a knitting thread as shown in Figure 1.

(c) Record the initial position of the pointer on the metre rule.

(d) Pour $100cm^3$ of water into the beaker and record the new position of the pointer.

(e) Find the extension, y in metres, produced.

(f) Remove the beaker, empty, dry and suspend it.

(g) Repeat procedures (d) and (e) using liquid, **L**. Call the extension produced, x.

(h) Calculate the relative density from the expression,

$$\mathbf{R.D} = \frac{x}{y}$$

Part II

(a) Record the mass M_b and M_r of the rubber bung and the metre rule provided, respectively.

(b) Suspend the metre rule provided on a retort stand using a piece of thread and adjust the loop until the metre rule balances horizontally with its graduated face upwards.

(c) Note the position of the balancing point, **G**.

(d) Suspend the rubber bung **P** at a distance l = 5.0 cm from the zero end of the metre rule as shown in Figure 2.

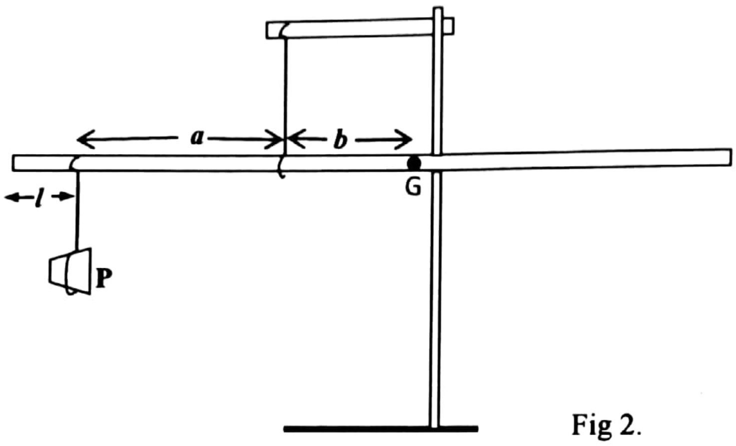

Fig 2.

(e) Wholly submerge the rubber bung in water, provided in a beaker.

(f) Adjust the position of the loop until the metre rule balances horizontally.

(g) Measure and record the distances a and b of the rubber bung and point **G,** from the loop of thread, respectively.

(h) Repeat procedures (d) to (g) for l = 10.0, 15.0, 20.0, 25.0 and 30.0 cm.

(i) Tabulate your results including the values of $x = (aM_b - bM_r)$ and $\frac{x}{a}$.

(j) Repeat procedures (d) to (f) and (h) with the rubber bung wholly immersed in liquid, L, provided.

(k) Measure and record the distances c and d of the rubber bung and point **G,** from the loop of thread, respectively.

(l) Tabulate your results in a separate table including the values of $y = (cM_b - dM_r)$ and $\frac{y}{c}$.

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

(n) Find the slope **R.D** of your graph.

Turn Over

QUESTION 2

In this experiment, you will determine the relationship between the:

i) angle of rotation of the mirror and the angle of rotation of the reflected ray for a fixed point of incidence.

ii) angle of rotation of the mirror and the supplement of the angle of deviation of incident ray.

Procedure

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

(b) Draw a horizontal line AB 10.0cm long about 6.0cm from the bottom of the white sheet of paper.

(c) Draw a line AB_1, making an angle $\alpha = 10^0$ with AB.

(d) Draw lines AB_2, AB_3, AB_4, AB_5 and AB_6 such that $\alpha = 20^0, 30^0, 40^0, 50^0$ and 60^0 respectively.

(e) Mark off point O on AB such that AO = 4.0cm.

(f) Draw a line DOF such that angle $D\hat{O}B$ is 100^0 as shown in Figure 3.

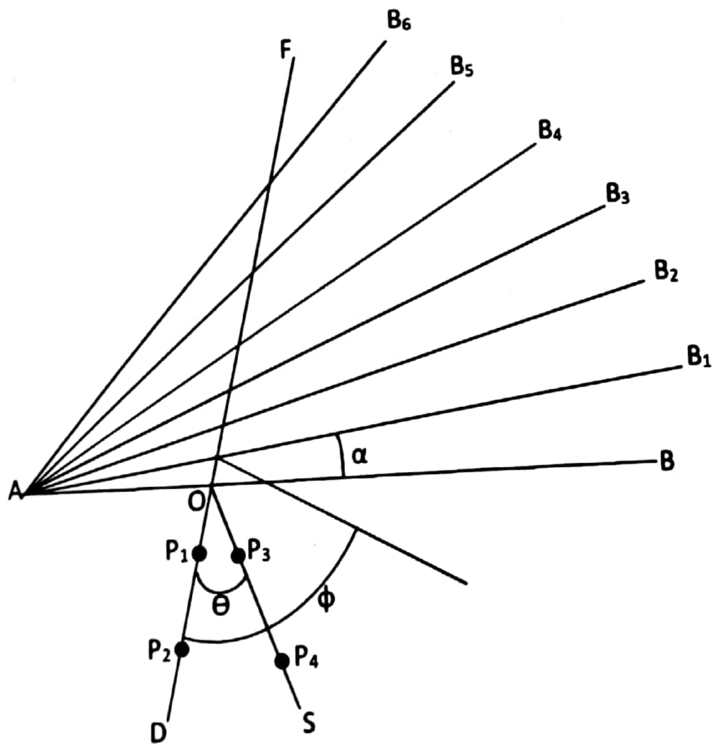

Fig 3.

(g) Place the plane mirror provided along AB with its reflecting surface towards D, and fix it in place using plasticine.

(h) Fix pins P_1 and P_2 vertically on the line DO.

(i) Looking into the mirror from position S, fix pins P_3 and P_4 such that they appear to be in line with the images of P_1 and P_2.

(j) Remove the mirror and pins P_3, P_4.

(k) Draw a line OS through P_3 and P_4.

(l) Measure and record angle Θ.

(m) Keeping P_1 and P_2 fixed in their positions, place the mirror along AB_1.

(n) Looking into the mirror from the same side as S, fix pins P_3 and P_4 such that they appear to be in line with the images of P_1 and P_2.

(o) Remove pins P_3, P_4 and draw a line through P_3, P_4 to meet the line DF.

(p) Measure and record the angle ϕ.

(q) Repeat procedures (m) to (p) with the mirror placed along AB_2, AB_3, AB_4, AB_5 and AB_6, respectively.

(r) Tabulate your results including the values of $\phi - \theta$

(s) Plot a graph of $\phi - \theta$ against α.

(t) Determine the slope s of the graph.

(u) Plot a graph of ϕ against α.

(v) Find the angle between the incident ray and the reflected ray if the mirror is rotated through 45^0.

NB: Hand in the white paper used in the experiment together with your results.

Turn Over

QUESTION 3.

In this experiment, you will determine the internal resistance **r** of the dry cell, **C** provided using two methods.

Part I

(a) Connect the circuit as shown in figure 4 below.

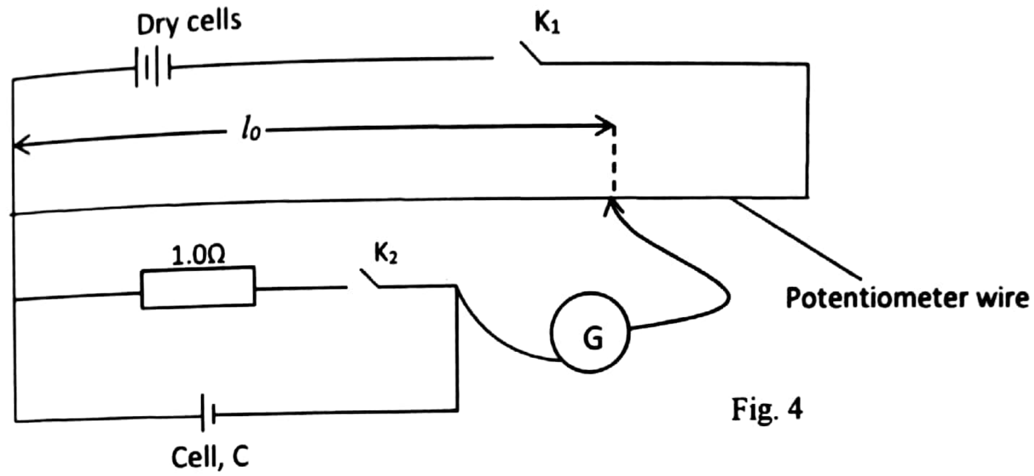

Fig. 4

(b) Close switch K_1.

(c) Move the sliding contact along the potentiometer wire until a point is found where the galvanometer G shows no deflection.

(d) Read and record the balance length, l_o in metres.

(e) Close switch K_2.

(f) Move the sliding contact along the potentiometer wire until a point is found where the galvanometer G shows no deflection.

(g) Read and record the balance length l in metres.

(h) Calculate the internal resistance $\mathbf{r_1}$ of the cell, C from the expression

$$r_1 = \frac{l_0 - l}{l}$$

Part II

(a) Connect the circuit as shown in figures below.

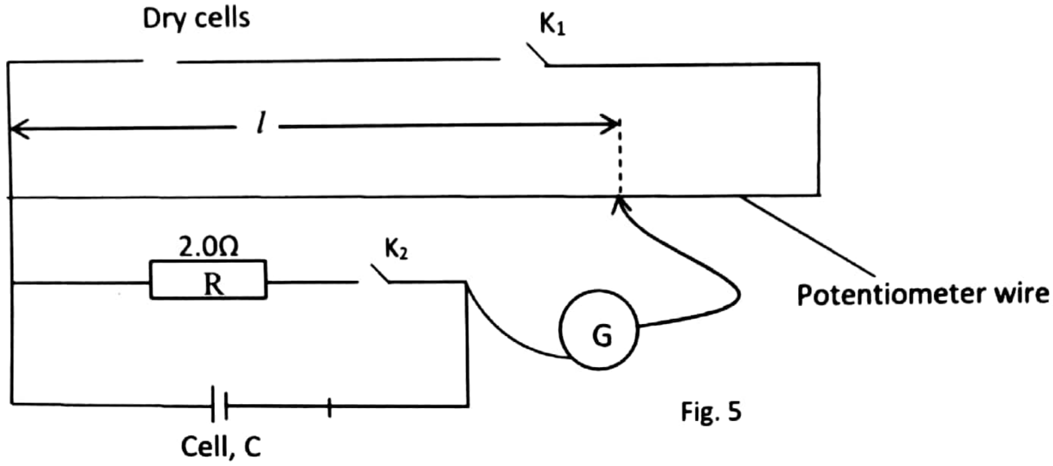

Fig. 5

(b) Starting with $R = 2.0\ \Omega$, close both switches K_1 and K_2.

(c) Move the jockey along the potentiometer wire until a point where the galvanometer G, shows no deflection is found.

(d) Read and record the balance lengths l, in metres.

(e) Repeat procedures (b) to (d) for values of R = 3.0, 4.0, 5.0, 7.0 and 10.0 Ω.

(f) Tabulate your results including the values of $\frac{1}{R}$ and $\frac{1}{l}$.

(g) Plot a graph of $\frac{1}{l}$ against $\frac{1}{R}$.

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

(i) Calculate the internal resistance r_2 from the expression $r_2 = Sl_0$

(j) Calculate the internal resistance of the cell, C from $\mathbf{r} = \frac{r_1+r_2}{2}$

END