SC5123/A
WASSCE 2020
PHYSICS 3
Practical
ALTERNATIVE A
2¾ hours

A

Name .....

Index Number .....

THE WEST AFRICAN EXAMINATIONS COUNCIL
West African Senior School Certificate Examination
for School Candidates

SC 2020 PHYSICS 3 2¾ hours

PRACTICAL

ALTERNATIVE A

[50 marks]

Write your **name** *and* **index number** *in the spaces provided above.*

Answer **two** *questions* **only**.

You are allowed an additional 15 minutes *before the start of the examination to read this question paper. During this time, you must* **not** *touch the apparatus.*

You are required to record your observations as soon as they are made. The observations and any mathematical working and answers to questions should be written in your answer booklet; scrap paper must **not** *be used. Attach your graphs to your answer booklet.*

You are **not** *expected to copy out your work again neatly. The record may be kept in pencil provided it can be read clearly. If any piece of the apparatus provided has a label with a letter on it, this letter* **must** *be recorded in your answer booklet in order that the Examiner may identify which set of apparatus you used.*

Neither *a detailed description of the apparatus* **nor** *a full account of the method of carrying out the experiments is required. You should however, note any special precautions you have taken clearly.*

You may use diagrams or otherwise, to express **exactly** *what the readings you have recorded mean and how they were obtained.*

1. (*a*)

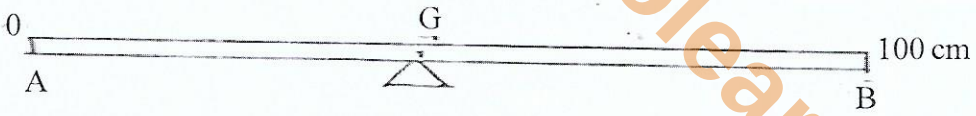


Fig **1** (*a*)

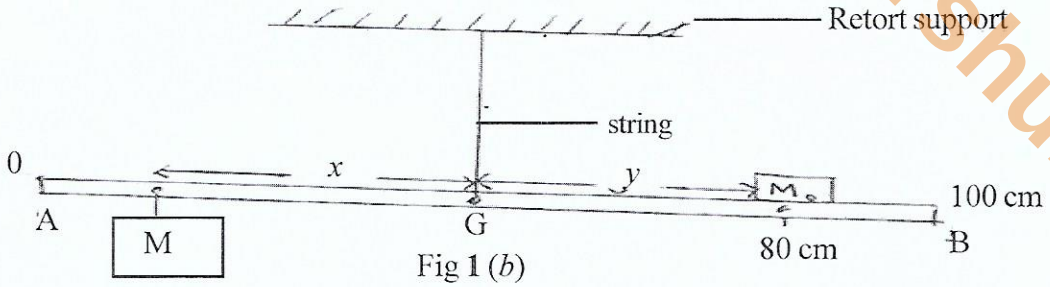


Fig **1** (*b*)

You are provided with a metre rule, knife edge, set of masses, inextensible string, retort support and other necessary apparatus.

(i) Place the metre rule on the knife edge. Read and record the point **G**, where the metre rule balances horizontally as shown in **Fig 1** (*a*).

(ii) Suspend the metre rule at **G** with the aid of the string provided and attach the string to the retort support as shown in **Fig 1** (*b*). Keep the string attached to this point throughout the experiment.

(iii) Attach the mass $\mathbf{M}_o$ at the 80 cm mark of the metre rule. Determine the distance y of $\mathbf{M}_o$ from **G**. Keep $\mathbf{M}_o$ at this position throughout the experiment.

(iv) Suspend a mass m = 40 g on the side **AG** and adjust its position until the metre rule balances horizontally.

(v) Measure and record the distance x of **M** from **G**. Evaluate x^{-1}.

(vi) Repeat the procedure for **four** other values of m = 60 g, 80 g, 100 g and 120 g. Measure and record x and evaluate x^{-1} in **each** case.

(vii) Tabulate the readings.

(viii) Plot a graph of m on the vertical axis and x^{-1} on the horizontal axis, starting **both** axes from the origin (0, 0).

(ix) Determine the slope, s, of the graph.

(x) Given that $s = yM_o$, determine M_o.

(xi) State **two** precautions taken to ensure accurate results.

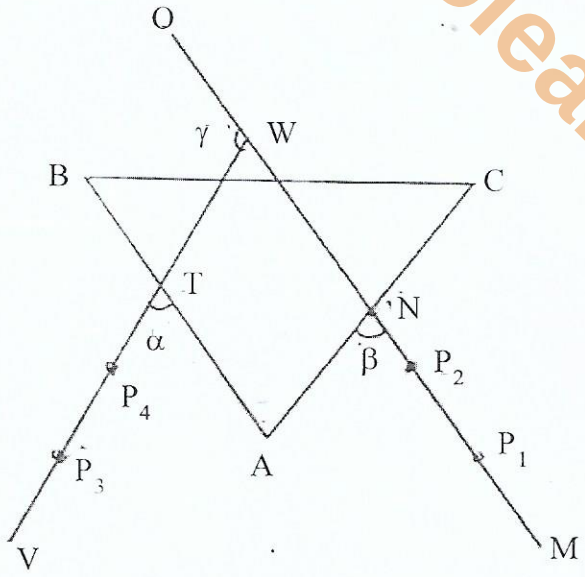
[21 marks]

(*b*) (i) Define *the moment of a force about a point.*

(ii) A uniform metre rule is suspended by an inextensible string at its centre of gravity. If a mass of 60 g is placed at the 25 cm mark, what mass should be placed at 80 cm mark of the metre rule to balance it horizontally?

[4 marks]

2. (*a*)



You are provided with a drawing board, drawing sheets, four optical pins, a triangular glass prism and other necessary materials.

Use the diagram above as a guide to perform the experiment.

(i) Pin the drawing paper onto the drawing board.

(ii) Trace the outline **ABC** of the triangular prism on the drawing paper.

(iii) Remove the prism from its trace. Measure and record the refracting angle *A*.

(iv) Select a point **N** on the side **AC** of the outline. Draw a straight line **MO** through **N** and making a glancing angle $\beta = 60°$ with the side **AC**.

(v) Fix two pins at $\mathbf{P_1}$ and $\mathbf{P_2}$ on the line **MN**. Replace the prism on its outline.

(vi) Look through the side **AB** of the prism and fix two other pins at $\mathbf{P_3}$ and $\mathbf{P_4}$ such that they appear to be in a straight line with the images of the pins at $\mathbf{P_1}$ and $\mathbf{P_2}$.

(vii) Remove the prism and the pins. Join $\mathbf{P_3}$ and $\mathbf{P_4}$ with a straight line **VT** and extend to meet **MO** at **W**.

(viii) Measure and record angles α and γ.

(ix) Evaluate $\theta = (90 - \beta)$, $\phi = (90 - \alpha)$, $U = (\theta - \phi)$

(x) Repeat the procedure for **four** other values of $\beta = 65°, 70°, 75°$ and $80°$. In **each** case measure α, γ and evaluate θ, ϕ and U.

(xi) Tabulate the results.

(xii) Plot a graph with γ on the vertical axis and U on the horizontal axis, starting both axes from the origin(0, 0).

(xiii) Determine the slope, *s*, of the graph.

(xiv) Determine the intercept, *c*, on the vertical axis.

(xv) State **two** precautions taken to ensure accurate results.

[Attach your traces to the answer booklet]

[21 marks]

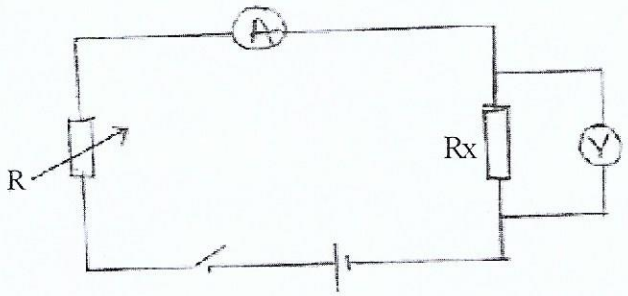
(*b*) (i) Draw a ray diagram to show how a prism is used to invert a beam of light.

(ii) A ray of light travelling from glass to air is refracted along the surface of the glass. Calculate the critical angle of the glass.

[Refractive index of glass = 1.5]

[4 marks]

3. (*a*)



You are provided with a resistance box **R**, voltmeter, key, cell of e.m.f. E, standard resistor, $\mathbf{R}_x$, an ammeter and other necessary apparatus.

(i) Measure and record the e.m.f. E of the cell provided.
(ii) Set up a circuit as shown in the diagram above.
(iii) Set R to 1 Ω. Close the key, read and record the current I and the corresponding voltage V.
(iv) Repeat the procedure for **four** other values of R = 2 Ω, 4 Ω, 6 Ω and 8 Ω.
(v) In each case, read and record I and V.
(vi) Tabulate the results.
(vii) Plot a graph with V on the vertical axis and I on the horizontal axis.
(viii) Determine the slope, s, of the graph.
(ix) State **two** precautions taken to ensure accurate results.

[21 marks]

(*b*) (i) State **two** advantages of connecting identical cells in parallel.
(ii) State **two** factors to consider in choosing the material for the design of a resistor. [4 marks]

END OF PAPER