SC5123/A
WASSCE 2021
PHYSICS 3
Practical
ALTERNATIVE A
2¾ hours

A

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

SC 2021 — 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.*

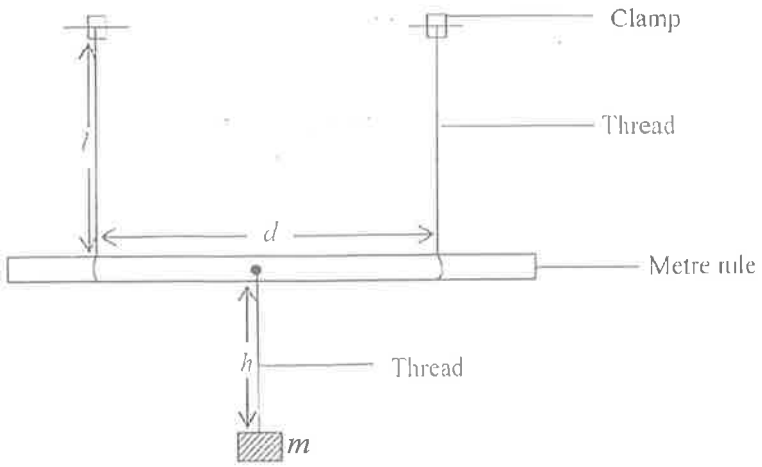
You are required to record your observations as soon as they are made. The observations and any mathematical working and answers to questions should be written in your answer booklet; scrap paper must **not** *be used. Attach your graphs to your answer booklet.*

You are **not** *expected to copy out your work. 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*)



You are provided with a set of masses, two metre rules, a piece of thread, two retort stands and clamps, a stop watch, split corks and a weighing balance.

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

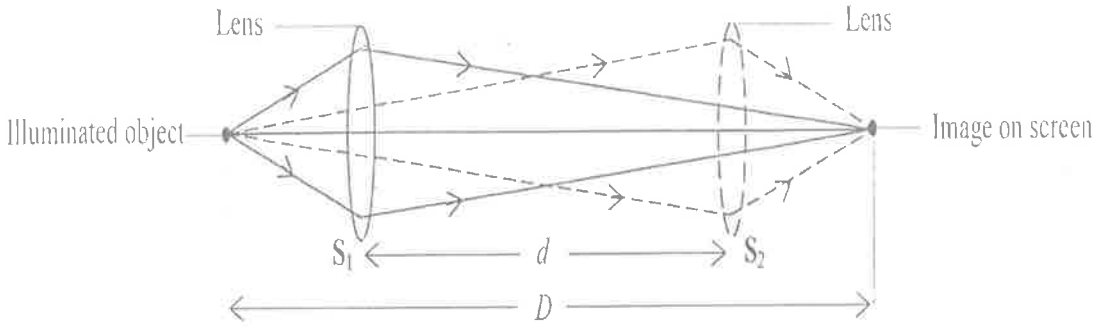
(i) Measure and record the mass, M, of the metre rule.
(ii) Suspend the metre rule, whose mass has been measured, by means of two vertical strings of equal lengths, $l = 70$ cm.
(iii) Make the separation between the threads, $d = 80$ cm.
(iv) Suspend a mass $m = 20$ g from the mid-point of the metre rule by means of a thread such that the distance between the mass and the rule, $h = 15$ cm.
(v) Displace the ends of the metre rule in a horizontal plane in opposite directions. Release the rule to perform horizontal oscillations.
(vi) Determine the time, t for 20 oscillations.
(vii) Evaluate the period T, T^2 and T^{-2}.
(viii) Repeat the procedure for **four** other values of $m = 30$ g, 50 g, 70 g and 100 g keeping the values of h, d and l constant. In **each** case, determine t and evaluate T, T^2 and T^{-2}.
(ix) Tabulate the results.
(x) Plot a graph with T^{-2} on the vertical axis and m on the horizontal axis.
(xi) Determine the slope, s, of the graph.
(xii) State **two** precautions taken to ensure accurate results.

[21 marks]

(*b*) (i) Define *the period* of an oscillatory motion.
(ii) State **two** differences between *mass* and *weight*.

[4 marks]

2. (*a*)



You are provided with an illuminated object, a lens, a screen, a lens holder and a metre rule.

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

(i) Determine the approximate focal length, f, of the lens by focussing a distant object on the screen.

(ii) Place the illuminated object and the screen a distance $D = 100$ cm apart.

(iii) Place the lens at a position $\mathbf{S}_1$ to obtain a sharp image of the object on the screen. Note $\mathbf{S}_1$.

(iv) Move the lens to a position $\mathbf{S}_2$ to obtain another sharp image of the object on the screen. Note $\mathbf{S}_2$.

(v) Measure the distance, d, between $\mathbf{S}_1$ and $\mathbf{S}_2$.

(vi) Evaluate D^{-1}, D^2, d^2 and $\frac{d^2}{D^2}$.

(vii) Repeat the procedure for **four** other values of $D = 90$ cm, 85 cm, 80 cm and 70 cm.
In **each** case, evaluate D^{-1}, D^2, d^2, and $\frac{d^2}{D^2}$.

(viii) Tabulate the results.

(ix) Plot a graph with $\frac{d^2}{D^2}$ on the vertical axis and D^{-1} on the horizontal axis.

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

(xi) Given that $s = 4k$, determine k.

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

[21 marks]

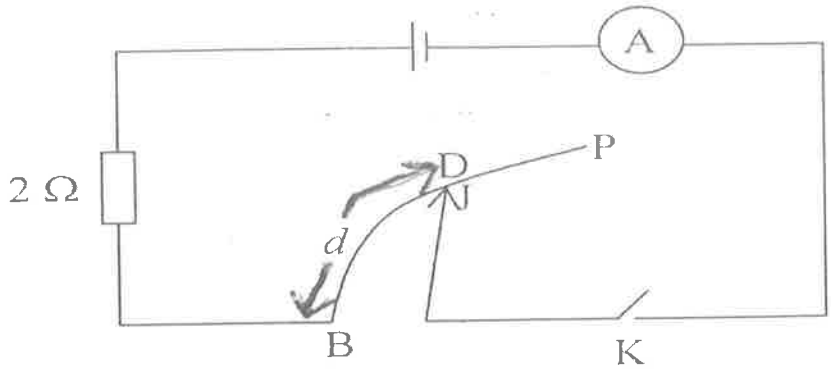
(*b*) (i) Draw and label the ray diagram of a simple microscope.

(ii) State **two** differences between a *real image* and a *virtual image*.

[4 marks]

Turn over

3. (*a*)



You are provided with an accumulator, an ammeter, a 2 Ω resistor, a key, **K**, a resistance wire **BP**, a crocodile clip, **J** and other necessary materials.

(i) Connect the circuit as shown in the diagram above.

(ii) Use the crocodile clip to hold the resistance wire at **D** such that **BD** = d = 80 cm.

(iii) Close the key, read and record the ammeter reading, I. Evaluate I^{-1}.

(iv) Repeat the procedure for **four** other values of d = 70 cm, 50 cm, 40 cm, and 30 cm. In **each** case, record I and evaluate I^{-1}.

(v) Tabulate the results.

(vi) Plot a graph with d on the vertical axis and I^{-1} on the horizontal axis.

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

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

[21 marks]

(*b*) (i) State **two** factors on which the sensitivity of a moving coil galvanometer depends.

(ii) A resistance wire of diameter 0.6 cm has a resistivity of 1.0×10^{-6} Ω m. What length of the wire would be needed to make a 4 Ω resistor?

[4 marks]

END OF PAPER