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

C

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 C
[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.*

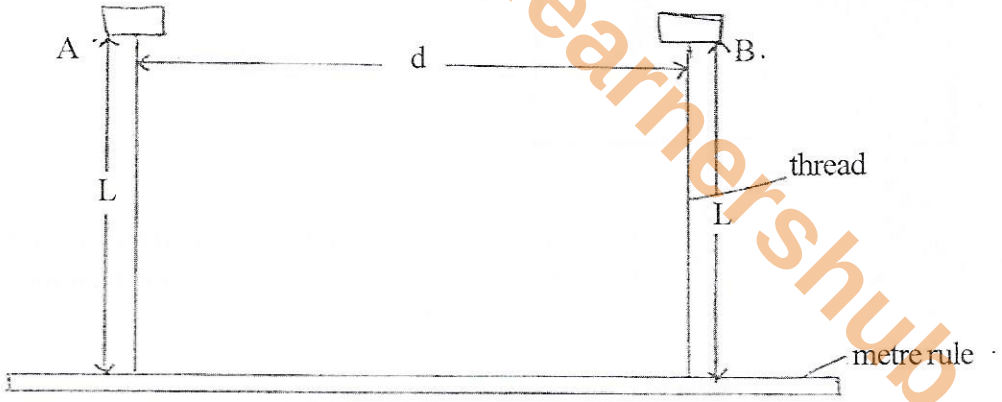
You are required to record your observations as soon as they are made. The observations and any mathematical working and answers to questions should be written in your answer booklet; scrap paper must **not** *be used. Attach your graphs to your answer booklet.*

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*)



You are provided with two retort stands and clamps, two split corks, 2 pieces of thread, a stop watch, two metre rules and other necessary materials.
Use the diagram above as a guide to carry out the experiment.

(i) Tie a loop of thread round the metre rule on the 5 cm mark and another on the 95 cm mark.

(ii) Suspend the metre rule horizontally from two rigid supports, **A** and **B**.

(iii) Adjust the lengths of the suspending threads such that $L = 100$ cm, ensuring that both are vertical and parallel.

(iv) Displace the ends of the rule slightly in opposite directions and release it so that it oscillates in a horizontal plane about a vertical axis through its centre.

(v) Determine the time t for 20 oscillations.

(vi) Evaluate the period T, $\log T$ and $\log L$.

(vii) Repeat the procedure for **four** other values of $L = 90$ cm, 80 cm, 60 cm and 50 cm.
In **each** case, evaluate the period T, $\log T$ and $\log L$.

(viii) Tabulate the results.

(ix) Plot a graph with $\log T$ on the vertical axis and $\log L$ on the horizontal axis.

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

(xi) Given that $T = AL^n$, where A and n are constants, determine A.

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

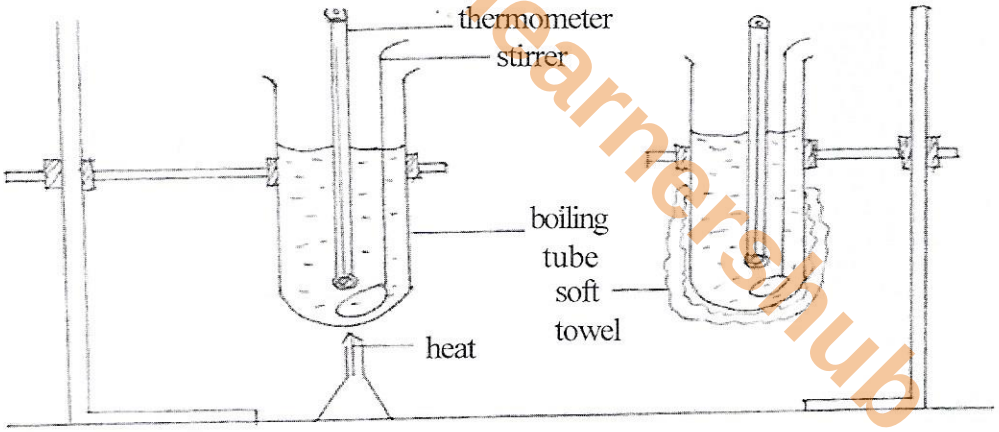
[21 marks]

(*b*) (i) Define the term *couple* as applied to oscillatory systems.

(ii) Give **two** practical applications of a couple.

[4 marks]

2. (*a*)



You are provided with a retort stand and clamp, stop watch, boiling tube, measuring cylinder, stirrer, thermometer, face towel or handkerchief, string, source of heat and other necessary apparatus.

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

(i) Measure 80 cm^3 of water and pour it into the boiling tube.

(ii) Insert a stirrer and thermometer into the boiling tube.

(iii) Suspend the boiling tube by the means of a retort stand and clamp as shown in the diagram above.

(iv) Heat the water in the boiling tube. Stir at short intervals until the thermometer reads about 85 °C.

(v) Remove the source of heat and allow the temperature to drop to 70 °C.

(vi) Read and record the temperature θ **every** 1 minute for 5 minutes.

(vii) Heat the boiling tube again until the thermometer reads about 85 °C.

(viii) Wrap the towel around the boiling tube using the string and allow the temperature to drop to 70 °C.

(ix) Read and record the temperature θ' **every** 1 minute for 5 minutes.

(x) Evaluate $Q = (\theta' - \theta)$ in **each** case.

(xi) Tabulate the readings.

(xii) Plot a graph with Q on the vertical axis and time t on the horizontal axis.

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

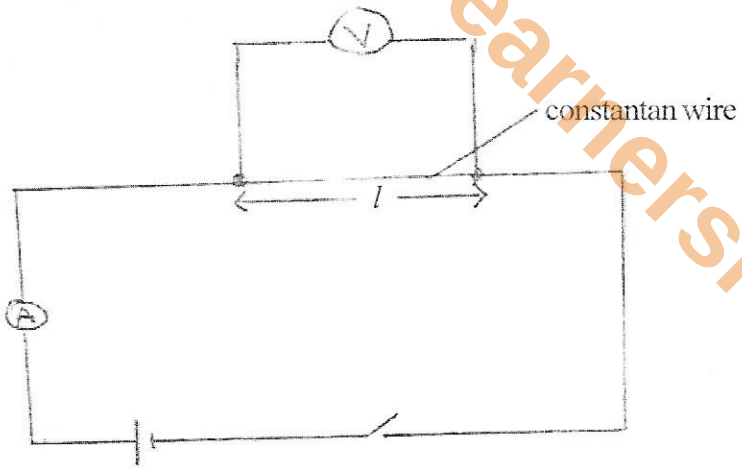
(xiv) State **two** precautions taken to ensure accurate results.

[21 marks]

(*b*) (i) State **two** modes of heat loss by the boiling tube in the experiment above.

(ii) Why is it necessary to stir the water while heat is being supplied to the boiling tube. [4 marks]

3. (*a*)



You are provided with an ammeter, a voltmeter, a key, a battery, crocodile clips, constantan wire and other necesssary materials.

(i) Set up the circuit as shown in the diagram above.

(ii) Measure the length l = 10 cm of the constantan wire and close the key.

(iii) Read and record the current I and voltage V.

(iv) Evaluate $P = \frac{V}{I}$.

(v) Repeat the procedure for **four** other values of $l = 20$ cm, 30 cm, 40 cm, and 50 cm.

(vi) Read and record the current I and voltage V and evaluate $P = \frac{V}{I}$ in **each** case.

(vii) Tabulate the results.

(viii) Plot a graph with P on the vertical axis and l on the horizontal axis.

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

(x) Evaluate X, given that $s = \frac{X}{A}$, where A is the cross sectional area of the constantan wire of value 1.0×10^{-7} cm^2.

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

[21 marks]

(*b*) (i) (α) Express the resistivity of a material in terms of the conductivity σ of the material.

(β) State the SI unit of σ.

(ii) A 10 cm length of a wire of cross sectional area 1.0×10^{-7} cm^2 has a resistance 6 Ω. Calculate the resistivity of the wire.

[4 marks]

END OF PAPER