EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate
and General Certificate of Education Ordinary Level

PHYSICS 5054/3

PAPER 3 Practical Test

Friday 31 OCTOBER 2014

Candidates answer on the enclosed Answer Booklet

Additional materials:
As listed in Instructions to Supervisors
Electronic calculator (non-programmable) and /or Mathematical table
Graph Paper

TIME: 2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, center number and candidate number in the spaces provided on **Answer Booklet.**

Answer **all** questions.

Write your answers in the spaces provided in the **Answer Booklet.**

For each of the questions in **Section A**, you will be allowed to work with the apparatus for a maximum of 20 minutes. For the question in **Section B**, you will be allowed to work with the apparatus for a maximum of 1 hour.

You are expected to record all your observations as soon as these observations are made. All of your answers should be written in the Answer Booklet, scrap paper should not be used.

An account of the method of carrying out the experiments is not required.

At the end of the examination, hand in only the **Answer Booklet.**

INFORMATION FOR CANDIDATES

Graph paper is provided.

The sheets of graph paper should be attached securely to the **Answer Booklet.**

Cell phones are not allowed in the examination room.

Section A

Answer **all** questions.

1 In this experiment, you will compare the weight of a 100g mass in air and in water.

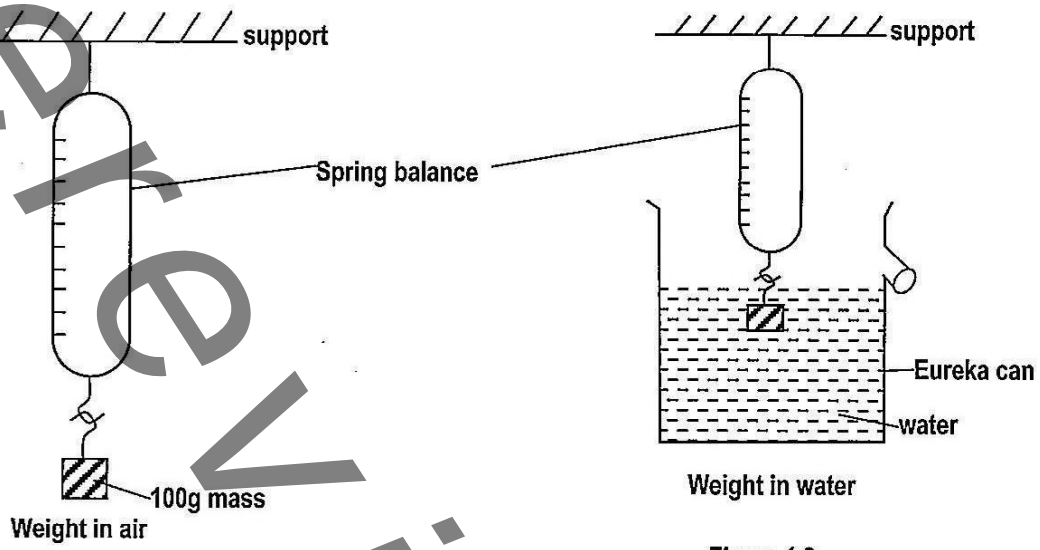

Figure 1.1 *Figure 1.2*

(i) Hang a 100g mass on a spring balance in air as shown in figure 1.1 ,and record its weight in your Answer Booklet as $\mathbf{W_1}$. [1]

(ii) Lower the 100g mass slowly till it is completely immersed in water as shown in figure 1.2, read and record the new weight as $\mathbf{W_2}$. [1]

(iii) How do $\mathbf{W_1}$ and $\mathbf{W_2}$ compare? [2]

(iv) What conclusion can you make from the results? [1]

[Total 5]

2 In this experiment you will determine the mass of sugarcane using the principle of moments.

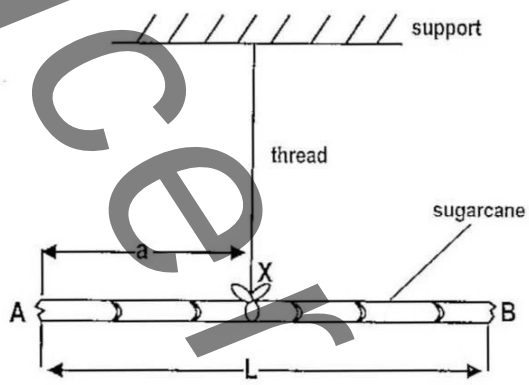

Figure 2.1

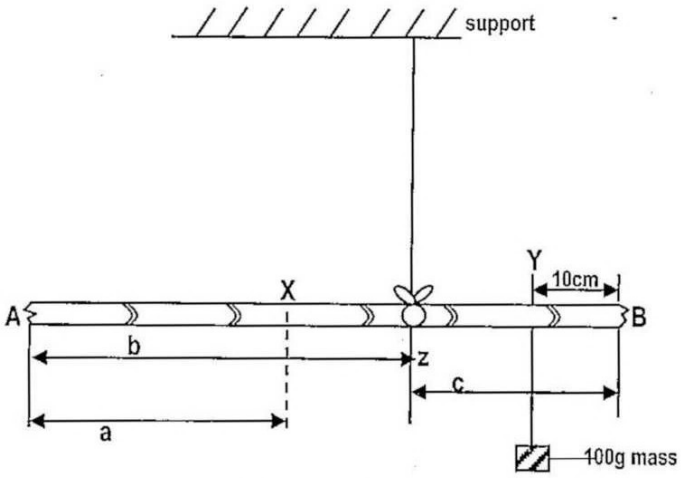

Figure 2.2

(i) Measure the length of a sugarcane **AB** and record it as 'L' in your Answer Booklet. Suspend the sugarcane by means of a thread as shown in ***Figure 2.1*** until it balances. [1]

(ii) Mark the position **X** at which the sugarcane balances, measure the distance **AX** and record it as '**a**' in your Answer Booklet. [1]

(iii) Tie a 100g mass at point **Y**, 10cm from end **B**. Mark this position and do NOT adjust this position throughout your experiment.

(iv) Adjust the position of the thread until the sugarcane balances again as shown in ***Figure 2.2.***

(v) Mark the position of the thread where the sugarcane balances as **Z**, using a marker.

(vi) Measure the distances **AZ** and **BZ. Record AZ and BZ as 'b' and 'c' respectively** as shown in ***Figure 2.2.*** [2]

(vii) Calculate the mass of the sugarcane M using the formula; $M = \frac{100c - 1000}{b - a}$. [1]

[Total 5]

3 In this experiment, you will make measurements on a wooden block floating in water.

You have been provided with a wooden block whose upper surface has been labelled 'top', a glass beaker containing water and a half-metre rule.

(a) Take measurements to determine the thickness **d** as shown in ***Figure 3.1***. Record the thickness **d** on page 3 of your Answer Booklet. [1]

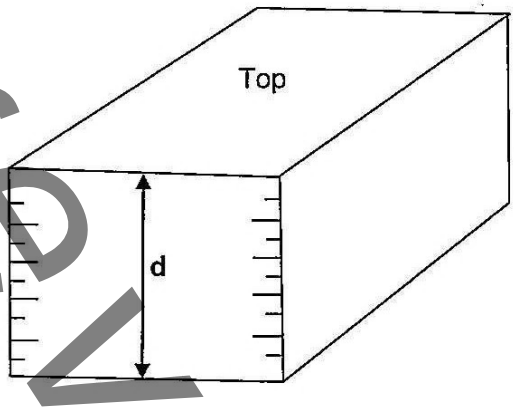

Figure 3.1

(b) Place the wooden block in the beaker of water with the top face uppermost. Draw a diagram to show what you observe when the block is resting at equilibrium in the water. [1]

(c) There are scales with 5mm divisions on each corner of the block. Use these scales to determine the average depth **ds** to which the wooden block sinks into the water. You should aim for as much precision as possible when taking your measurements. Explain how you made sure that your value for **ds** was as accurate as possible. [2]

(d) Calculate $\frac{\mathbf{ds}}{\mathbf{d}}$ [1]

[Total 5]

Section B

4 In this experiment, you will investigate the output voltage from a potential divider circuit when different resistors are used in the potential divider.

You have been provided with an electrical circuit containing a resistor **X** whose value has been obscured. There is a gap in the circuit between points **A** and **B**. You have three extra resistors and some extra connecting leads.

(a) In the space on page 4 of your Answer Booklet, draw a circuit diagram of the circuit that has been set up for you. [2]

(b) Connect points **A** and **B** together. Close the switch and measure the potential difference $\mathbf{V_o}$ across **X**.
Record $\mathbf{V_o}$ on page 4 of your Answer Booklet.
Open the switch and separate points **A** and **B**. [1]

(c) With the voltmeter still connected across **X**, connect one of the extra resistors between points **A** and **B**. Close the switch. Record the resistance **R** of the extra resistor and the voltmeter reading **V**. Open the switch and disconnect the extra resistor. [2]

(d) Repeat part **(c)** with:

(i) the other two extra resistors used on their own,

(ii) all possible series combinations of the extra resistors.

Tabulate all your values of **R** and **V** on page 4 of your Answer Booklet. Include your results from **(c)**. Include units for **R** and **V** in your table. [3]

(e) Using a graph paper, plot a graph of **V/V** on the y-axis against **R/KΩ** on the x-axis. [4]

(f) **(i)** Use your graph to determine the value of **R** that gives a value for **V** of 0.5 $\mathbf{V_o}$. [1]

(ii) State the resistance of **X** and give a reason for your answer. [2]

[Total 15]