EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

Physics 5054/3

Paper 3 Practical Test

Wednesday **29 NOVEMBER 2017**

Candidates answer on the enclosed Answer Booklet

Additional Information:

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, centre number and candidate number in the spaces provided on the 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 should 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 and the card.

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.

This question paper consists of 5 printed pages.

Section A

Answer all questions.

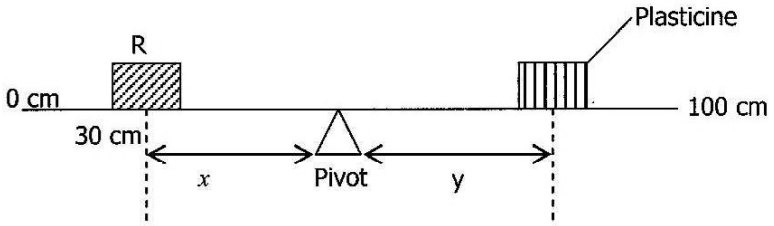
1 In this experiment you are to find the density of a sample of plasticine.

(a) Measure the length **(l)** height **(h)** and width **(w)** of the block of pasticine supplied. [1]

(b) **(i)** Calculate the volume of the block of plasticine [1]

(ii) Measure the mass of the stone **(R)** provided. [1]

(c) Place the metre rule on the pivot so that the 50cm mark is directly over the pivot as shown in the figure below;
Place **R** on the meter rule as shown below. [1]



(i) Record **x**, the distance from the 30cm mark to the pivot

(ii) Place the plasticine on the metre rule and move it until the rule balances (do not change the position of **R**).

Measure and record y, the distance between the pivot and the centre of mass of plasticine. [1]

(d) Calculate the mass of plasticine, **m**, using the equation $m = \frac{Rx}{y}$ [1]

(e) Repeat steps **c** and **d** using different values of **x** to obtain a total of three sets of results.

(f) Calculate and record the average value for m. [1]

(g) Calculate the density of the plasticine. [1]

[Total: 8 marks]

2 In this experiment, you are going to determine a quantity called refractive index of the material of a transparent glass block.

Carry out the following instruction using a ray trace sheet on the pin board supplied and referring to the figure below:

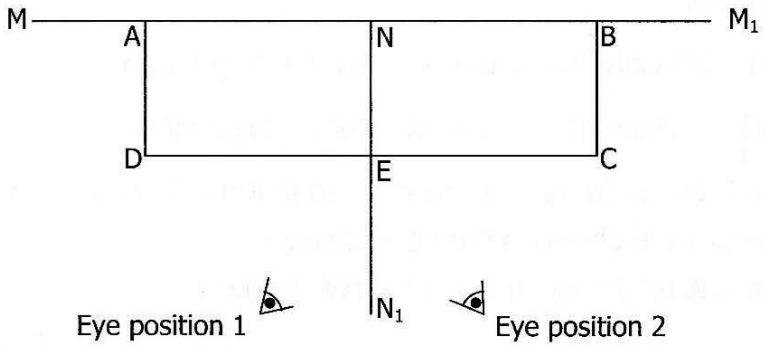


Figure 2.1

(a) Place the transparent block flat on the ray trace sheet along the line **MM_1** so that the vertical line on the block is at point **N**.

(b) Draw the outline of the block **A B C D.**

(c) Label, with a letter **E,** the point where **NN,** cuts the line **CD.**

(d) With your eye at position 1, shown in the diagram look through the block so that you can see the vertical line.

(e) Push a pin **P1,** into the pin board, or close to the line DC. Place a second pin **P_2** between your eye and the vertical line, so that it hides the pin **P_1** Label the positions of the pins **P_1** and **P_2.**

(f) Remove the block and the pins.

(g) Draw a line through **P_1** and **P_2** and continue the line until it meets **NN_1.** Label the position **F** where the line meets **NN_1** [1]

(h) Measure and record the distance EF. [1]

(i) Measure and record the distance EN [1]

(j) Calculate the refractive index of the material of the glass block using the equation $n = \frac{EN}{EF}$. [2]

(k) With your eye at position 2, look through the block so that you can see the image of the vertical line.

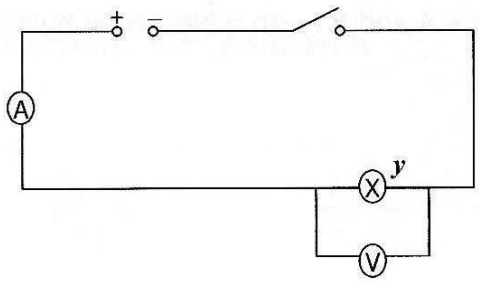
(l) Repeat the procedure in **e** to **f.** [2]

(m) Calculate the average value of the refractive index from the two values, that you have obtained. [1]

NB: Submit the trace diagram – tie the trace diagram to the Answer booklet.

[Total: 8]

3 In this experiment, you are going to determine the power dissipated in lamps. The following circuit has been set up for you using a single lamp *y*.



(a) Switch on. Measure and record the current **I** and the voltage **V** across the lamp. Switch off. [1]

(b) Calculate the power **P** of the lamp. [1]

(c) Replace lamp **y** with lamp **z**. Repeat the procedure in **(a)** and **(b)** recording the corresponding values of **I, V** and **P**. [1]

(d) Set up a circuit such that lamps ***y*** and ***z*** are in series. In your circuit, include a voltmeter to measure the voltage between lamps ***y*** and ***z*** collectively.

(e) Switch on and record the current **I** and the P.d, **V**, across the lamps. Switch off. [1]

(f) Calculate the power. [1]

(g) Draw a circuit diagram showing:

- the two lamps connected in parallel
- the voltmeter connected to measure the P.d across the two lamps.
- the ammeter to measure the total current passing through the two lamps. [1]

(h) Set up the circuit described in **(g)** above.

(i) Switch on. Measure and record the P.d and current.

(j) Calculate the power of the two lamps. [1]

(k) If the power source for each of the circuits were left on until the cells completely ran down; which circuit would stop working first; the series or parallel circuit? Justify your answer by reference to your results. [1]

[Total: 8]

Section B

4 In this experiment you will investigate the effect on a thermometer of blackening the bulb. Two thermometers **A** and **B** (with a blackened bulb) will have to be set up for you.

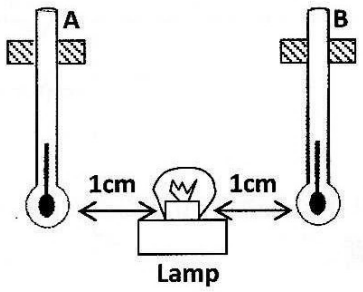


Figure 4.1

(a) Measure room temperature with each of the thermometers and record the readings before the lamp is switched on (at 0 second) [2]

(b) Switch on the lamp. Record the temperature shown on each of the thermometers after 30 seconds. [2]

(c) Continue recording the temperature readings every 30 seconds for a total of 180 seconds. [2]

(d) Suggest a conclusion for this experiment. Justify your answer by reference to your readings. [2]

(e) Using the readings for thermometer **B** only, plot a graph of temperature (y – axis) against time (x- axis). [6]

(f) What precaution did you take in order to obtain good results? [2]

[Total: 16]

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