

# EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

## Physics

5054/3

### Paper 3 Practical Test

Wednesday

19 JULY 2017

**Additional Material(s):**

Candidates answer on the enclosed Answer Booklet  
As listed in Instructions to Supervisors  
Electronic calculator (non-programmable)  
and /or Mathematical table  
Graph Paper  
Two plain papers

**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.**

Section A

Answer all questions.

- 1 In this experiment you will determine the density of the material of length of wire.

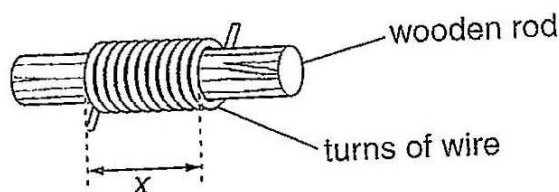


Figure 1.1

- (a) Using two pieces of adhesive tape stick the wire to the bench and ensure that it is straight. Measure the length **L** of the wire. Record it in your Answer Booklet. [1]
- (b) Carefully wind the wire around the wooden rod, ensuring that the turns of wire are as close as possible as shown in **Figure 1.1**. You may use adhesive tape to fix the ends of the wire to prevent the turns unwinding.
- (i) Count the number **N** of turns of wire on the rod and record (**N**) in the Answer Booklet. [1]
- (ii) Measure the length **X** of the coil as shown in **Figure 1.1** and record it in your Answer Booklet. [1]
- (iii) Calculate the diameter **d** of the wire using,  $d = \frac{X}{N}$ . [2]
- (c) Remove the coil of wire from the rod.
- (i) Using the top-pan balance/electronic balance, measure the mass **m** of the coil of wire. Record **m** in the Answer Booklet. [1]
- (ii) Calculate the density  $\rho$ , of the material of the wire using the equation;  $\rho = \frac{4m}{\pi d^2 L}$ . [2]

[Total marks: 8]

- 2 In this experiment you will measure angles of incidence and reflection.

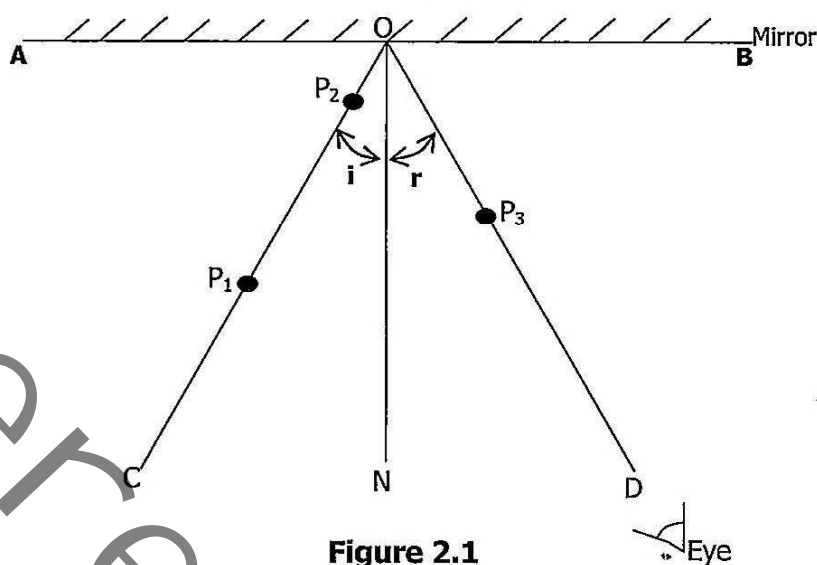
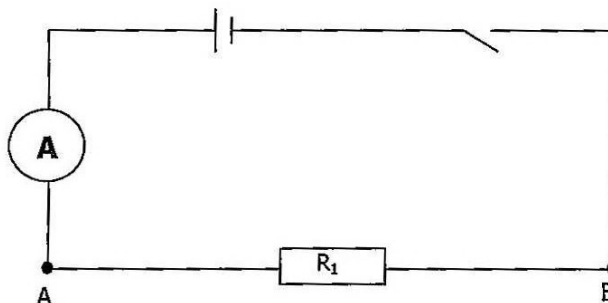


Figure 2.1

- (a) (i) Draw a line **AB** near the top of the sheet of plain paper provided. At the centre of **AB** mark the point **O**.  
(ii) Draw a line **ON** at right angles to **AB**. [1]  
(iii) Draw a line **OC**, at an angle of  $30^\circ$  from **ON**. [1]
- (b) (i) Place the mirror along the line **AB**.  
(ii) Stick two pins, **P<sub>1</sub>** and **P<sub>2</sub>**, vertically into the paper along the line **OC**.
- (c) (i) Place your eye as shown in **Figure 2.1** so that you can see the images of **P<sub>1</sub>** and **P<sub>2</sub>** in the mirror. Stick pin **P<sub>3</sub>** into the paper such that **P<sub>3</sub>** and images of **P<sub>1</sub>** and **P<sub>2</sub>** appear to be one behind the other. Mark the position **P<sub>3</sub>**.  
(ii) Remove the mirror and the pins and draw the line **OD**.  
(iii) Measure and record **i**, the angle between **OC** and **ON**. [1]  
(iv) Measure and record **r**, the angle between **OD** and **ON**. [1]
- (d) On a new sheet of paper, repeat the experiment with the angle between **OC** and **ON** equal to  $52^\circ$ . [1]  
Comment on the values of angles of **i** and **r** for each set. [3]
- (e) Attach your two trace papers behind the page of the Answer Booklet.

[Total marks: 8]

- 3 In this experiment you will determine the power dissipated in an arrangement of resistors. You have been provided with a circuit consisting of a switch, an ammeter, a cell, connecting leads and a resistor labelled  $R_1$ . Set up the circuit as shown in **Figure 3.1**.



**Figure 3.1**

You are also provided with a voltmeter, a resistor labelled  $R_2$  and four connecting leads.

- (a) Using two of the connecting leads, connect the voltmeter between points **A** and **B** in the circuit. Close the switch and measure;
  - (i) the potential difference  $V_1$  across resistor  $R_1$ . [1]
  - (ii) the current  $I_1$  in the circuit. Open the switch. [1]
- (b) Calculate the power  $P_1$  dissipated in  $R_1$ , using  $P_1 = I_1 V_1$ . [2]
- (c) Using two more connecting leads connect  $R_2$  between **A** and **B** so that it is in parallel with  $R_1$ . Close the switch and measure;
  - (i) the potential difference  $V_2$  across the resistor combination. Record it in your Answer Booklet. [1]
  - (ii) the current  $I_2$  in the circuit. Open the switch. Record it in your Answer Booklet. Open the switch. [1]
- (d)
  - (i) Calculate the power  $P_2$  dissipated in the resistor combination. [1]
  - (ii) The resistances of  $R_1$  and  $R_2$  are similar. Explain why  $P_2$  is greater than  $P_1$ . [1]

**[Total marks: 8]**

## Section B

- 4 In this experiment you will determine a value for the power loss from a beaker of water at a particular time.

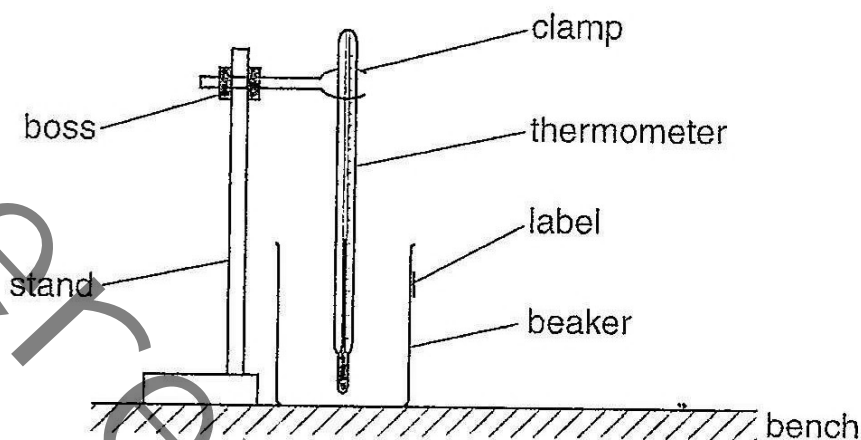


Figure 4.1

- (a) Set up the apparatus as shown in **Figure 4.1** with the bulb of the thermometer just above the base of the beaker.
- (b) Draw a table of time and temperature for at least six sets in the Answer Booklet. [2]
- (c) (i) The mass **m** of the beaker is written on the label. Record **m**. [1]
- (ii) Pour hot water in the beaker until the water is level with the top of the label. The temperature on the thermometer initially rises but as soon as it starts to fall, start the stopwatch. Continue to measure the temperature at a convenient interval until you have six sets in seven minutes. Record this information in the table you drew in the Answer Booklet. [4]
- (d) Using the graph paper provided, plot a graph of temperature on the y-axis against time on the x-axis. Draw the smooth curve of best fit through your points. [4]
- (e) Draw a tangent to the curve at a time of 180s (3 minutes) and determine the gradient **G** of the tangent at this point. This gives the power loss at a time of 180s. [3]
- (f) Carefully remove the thermometer from the beaker without removing any water.
- (i) Measure accurately the volume **V**, of water used in your experiment. [1]
- (ii) The mass of  $1.0\text{cm}^3$  of water is 1.0g. State the mass **M** of water used. [1]

[Total marks: 16]