EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Physics   5054/3

Paper 3 Practical Test

Wednesday   **3 AUGUST 2016**

Candidates answer on the enclosed Answer Booklet

Additional materials:
*   Graph paper
*   Electronic calculators (non-programmable)/Mathematical tables
*   Answer Booklet

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 compare the densities of two wires.

(a)   Using the micrometer screw gauge, measure the diameter, d_A of wire **A**.

(b)   Calculate the radius r_A of wire **A** using the expression; $r_A = \dfrac{dA}{2}$ [1]

(c)   Repeat the procedure in (a) and (b) to obtain the diameter d_B of wire **B** and its radius r_B.   [1]

(d)   Measure the lengths, L_A of wire **A** and L_B of wire **B**.

(e)   Calculate the volume V_A of wire **A** using the expression,
$$V = \pi r^2 h. \ (h = L_A)$$ [1]

(f)   Determine the density D_A of wire **A** using the expression, $density = \dfrac{M_A}{V_A}$ [1]

(g)   Repeat procedure (e) and (f) to determine the volume V_B, of wire **B** and it's density, D_B

(h)   Comment on the two values in (f) and (g). Justify your answer.   [1]

Total [5]

2   In this experiment you will investigate which block will cause more friction with the inclined plane, the wooden or the glass block.
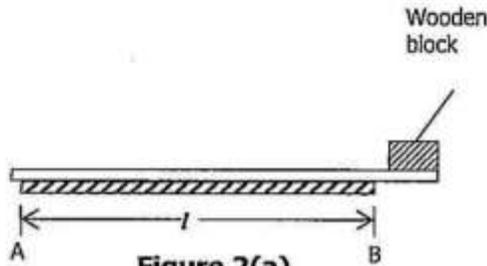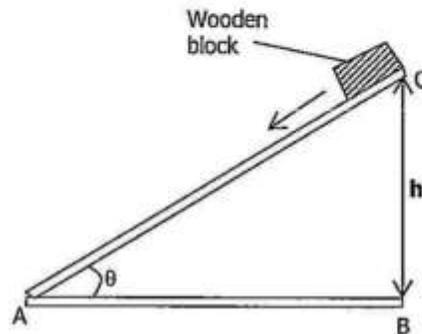

Figure 2(a)   Figure 2(b)

The apparatus has been set up as shown in **figure 2 (a).** ·

(a)   Record the length **AB** as *l*.   [1]

(b)   Using a wooden block gradually tilt the plane up until the block just starts to slide down as shown in figure **2(b)**. Be careful to tilt the plane slowly and smoothly so as to get a precise value of **h** at which the block starts to slide down. Record this height as **h₁**.

(c)   Repeat the procedure in **(b)** in order to obtain two (2) more values of **h**. Record these values as **h₂** and **h₃**. Find the average of **h₁, h₂** and **h₃** and record it as **h$_{av1}$**. Calculate the angle θ using the following expression,

$$tan\theta = \frac{h\ av_1}{L}$$ [1]

(d)   Instead of a wooden block now repeat the procedure in part **(b)** and **(c)** using a glass block. Record the average of **h₁, h₂** and **h₃** as **h$_{av2}$**.   [1]

(e)   Calculate angle θ using the formula, $tan\theta = \frac{h\ av_2}{l}$ [1]

(f)   What conclusion can you make from these two experiments?   [1]

Total [5]

3   In this experiment, you will investigate the relationship between the resistance and the cross-sectional area for two resistance wires.

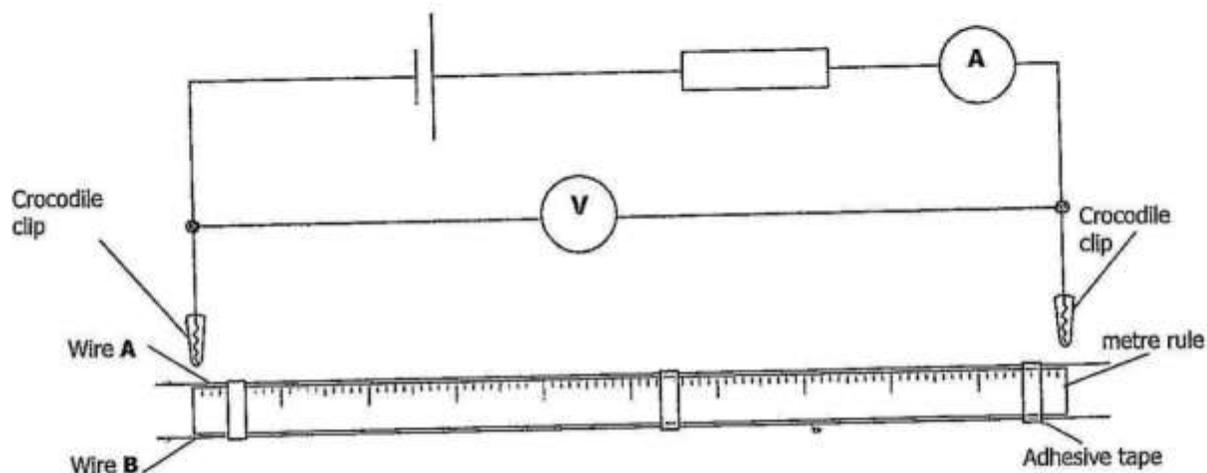The circuit has been arranged for you as shown in the diagram below.

Figure 3.1

(a) Connect the crocodile clips between two points that are 1.00m apart on wire A. Measure the current I in the circuit and the potential difference (P.d) V across the 1.00m length of wire A. Immediately disconnect the crocodile clips from the wire.   [1]

(b) Calculate the resistance R_A of wire A, using the relationship $R_A = \dfrac{V}{I}$ [1]

(c) Connect the crocodile clips between points that are 1.00m apart on wire B. Determine the resistance R_B of wire B, using the method described in (a) and (b). Record it as R_B.   [1]

(d) The ratio $\dfrac{\text{cross section area of wire A}}{\text{cross section area of wire B}}$, is given on the card supplied by the supervisor. Theory states that, $\dfrac{R_B}{R_A} = \dfrac{\text{cross section area of wire A}}{\text{cross section area of wire B}}$.

Suggest whether your results support this theory.   [2]

Total [5]

Section B

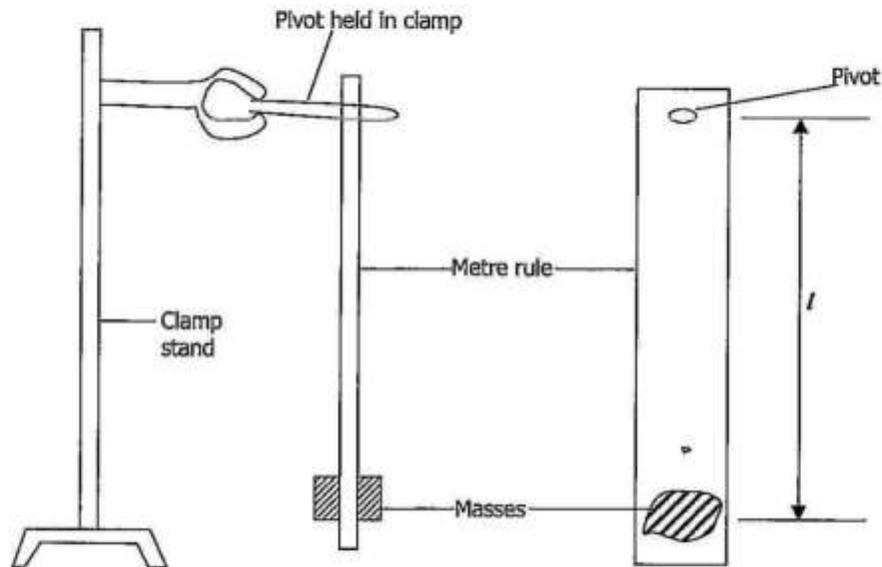4   In this experiment, you will investigate

Figure 4.0

(a)   Attach two (2) 10g masses to the rule at 98.0cm mark on one side. The masses should be attached firmly using rubber bands or adhesive tape and you should start putting them at 2.0cm mark from one end.   [1]

(b)   Record the distance *l* from the pivot to the centre of gravity of the masses.   [1]

(c)   Place the rule on the pivot held on the clamp stand. The rule should be pivoted at the 2.0cm mark throughout the experiment.

(d)   Set the rule swinging at the same time start the stop watch. Record the time taken *t* for the rule to make 20 complete swings. Calculate the period *T*, the time taken to make one swing.   [1]

(e)   Move the masses to a new position and repeat the experiment to obtain five sets of *l*, *t* and *T* values using values of *l* between 90cm and 30cm.   [4]

(f)   Plot a graph of *T* against *l*.   [4]

(g)   Remove the masses from the rule, set it swinging on the pivot and record the time t_0 for 20 complete swings. Calculate and record T_0, the time for one complete swing.   [1]

(h)   From the graph find L_0, the value of L_0 corresponding to T_0. Show clearly on the graph how you obtained this value.   [2]

(i)   State one precaution which you took when doing this experiment.   [1]

Total [15]

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