**Term 2 - 2024**

**PHYSICS (232/3)**

**FORM FOUR (4)**

**Time:** $2\frac{1}{2}$  **Hours**

**Name**: …………………………………………………………. **Adm** **No**: ……………….

**School**: ……………………………………………………….. **Class**: …………………..

**Signature**: …………………………………………………….. **Date**: …………………...

**INSTRUCTIONS:**

* Answer all the questions in this paper
* You are supposed to spend the first 15 minutes of the $2\frac{1}{2}$ hours allowed for this paper reading the whole paper carefully before starting your work.
* Marks are given for clear record of the observations made, their suitability and accuracy and the use made of them.
* Candidates are advised to record observations as soon as they are made
* Mathematical table and electronic calculators may be used.
* **The earth’s gravitational pull,** $g=10Nkg^{-1}$

 **For Examiner’s use only:**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **TOTAL MARKS**  | **CANDIDATE’S SCORE** |
| 1 | **20** |  |
| 2 | **20** |  |
| GRAND TOTAL | **40** |  |

***This paper consists of 7 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.***

**QUESTION ONE**

You are provided with the following apparatus:

* Two new size ‘D’ dry-cells
* switch
* milli-ammeter
* voltmeter (0-3V)
* two enameled copper rods
* rheostat ($0-100$Ω)
* eight connecting wires with at-least 4 fitted with crocodile clips
* Micrometer screw-gauge (to be shared)
* 50 ml beaker (labelled, A)
* 75 ml of distilled water (labelled, B)
* solid X
* Measuring cylinder
* Thermometer
* Glass-rod for stirrer
* Sand-paper

**Proceed as follows:**

1. Measure the temperature of the distilled water in beaker, B

 Temperature, $θ$ = ............................ (1 mark)

1. Place the provided solid X into the beaker labelled, A. measure 50 ml of the distilled water and gently pour it into beaker A and stir gently until all the solid X is dissolved to form solution, C.
2. Measure the diameter, d of one of the copper rods.
3. diameter, d = ............................ m (1 mark)
4. determine the cross-section area, A of the copper rod (2 marks)

A =

1. Using the sand paper, remove the insulating coating at the both ends of each of the copper rods. Now set-up the apparatus as shown in figure 1 below.

support

 **mA**

**V**

Copper rod

Solution, C

Beaker, A

**Figure 1**

1. With the help of the rheostat, set the current value to 30 mA and measure its corresponding voltage, V.

V = ............................ (1 mark)

1. Repeat the above procedure for the values of current indicated in the table, 1 below and note their corresponding voltages. Complete the table. (5 marks)

**Table 1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Current, I (mA)** | **30** | **40** | **50** | **60** | **70** |
| Current, (A) |  |  |  |  |  |
| Voltage, V |  |  |  |  |  |

1. In the grid provided, plot a graph of voltage (y-axis) against current (A) (X-axis) (5 marks)



1. Determine the slope, S of the graph (3 marks)
2. The voltage and current are related by the equation: $V-\frac{bI}{A}=0$

Determine the value of $b.$ (2 marks)

$b=$ .............................................

**QUESTION TWO**

**You are provided with the following apparatus:**

* Complete retort-stand (clamp, boss and stand)
* Half metre-rule
* Metre-rule
* G-clamp
* Office pin
* Four 100g masses (or its equivalent)
* Some celotape
* Vernier calipers (to be shared)
* String/thread (about 30 cm long)
* One 50g mass
* Knife-edge

**PART A**

**Proceed as follows:**

1. Arrange the apparatus as shown in figure 2, below. Ensure the 10 cm mark of the half metre-rule is at the edge of the table and firmly held by the G-clamp while the pin (pointer) is at the 90 cm mark on the scale of the metre-rule. (The clamp should not be removed for the entire duration of carrying-out this experiment)

X

Load

Metre-rule

Half metre-rule

G-clamp

Table-top

clamp

support

Retort stand

**Figure 2**

1. Suspend one 100 g mass at the 49.5 cm mark and record the new pointer reading, $P\_{1}$

$P\_{1}=$............................... (1 mark)

1. Continue adding the load in 100 g steps, each time recording the pointer position. Ensure that the half metre-rule is not overloaded.
2. Determine the amount of sagging, X and complete the table, 2 below. (6 marks)

**Table 2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Mass (g)** | **Load (N)** | **Pointer position (cm)** | **Amount of sagging, X (m)** |
| 100 |  |  |  |
| 200 |  |  |  |
| 300 |  |  |  |
| 400 |  |  |  |

**PART B**

**Procedure**

1. Use the Vernier calipers to determine the width, a and breadth, b of the half metre-rule

 **b**

 **a**

Half metre-rule

**Figure 3**

Width, a = ......................... cm (1 mark)

breadth, b = ........................ cm (1 mark)

1. Using a loop of thread suspend the 50g mass at the 49.5cm mark on the half-metre rule.
2. With the 50g mass fixed at that position adjust the position of the half-metre rule on the knife edge until it balances horizontally as shown in figure 4.

0

 **49.5 cm**

 50

50 g

Half metre-rule

Knife-edge

 Y

X

**Figure 4**

1. At the balance position, read off the length x and y and record in table 3.
2. Using the values of x and y obtained in ‘h’ above, determine the weight, W of the half metre-rule

(3 marks)

W = ................................

1. Move the suspended mass 2cm towards the centre of the rule and repeat parts (g) and (h) to obtain other values of x and y so as to complete table 3. (4 marks)

**Table 3**

|  |  |  |
| --- | --- | --- |
| **Position of the mass of 50g** | **X (cm)** | **Y (cm)** |
| 49.5 cm mark |  |  |
| 47.5 cm mark |  |  |
| 45.5 cm mark |  |  |
| 43.5 cm mark |  |  |
| 41.5 cm mark |  |  |

1. Given that quantity, P is given by: $p=\frac{W}{g \left(5ab×10^{-5}\right)} $; determine the value of P (3 marks)

1. State the significance of the quantity, P (1 mark)

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