Term 2 - 2022
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 ($0 - 100\Omega$)
- 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:

a) Measure the temperature of the distilled water in beaker, B

Temperature, θ = ... (1 mark)

b) 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.

c) Measure the diameter, d of one of the copper rods.

i. diameter, d = ... m (1 mark)

ii. determine the cross-section area, A of the copper rod (2 marks)
A =

d) 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.

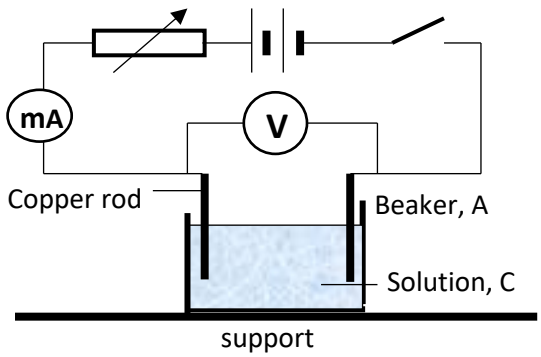


Figure 1

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

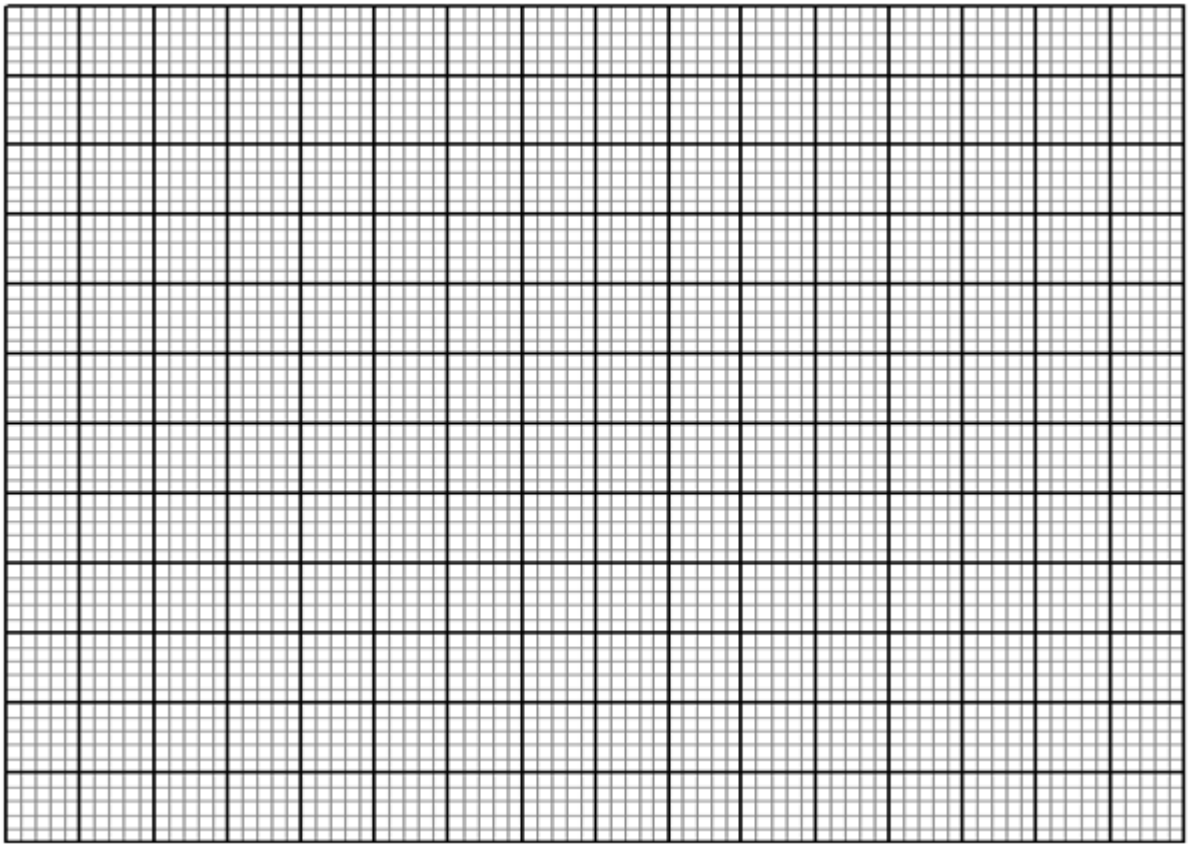
V = ... (1 mark)

f) 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					

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



h) Determine the slope, S of the graph (3 marks)

i) 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:

a) 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)

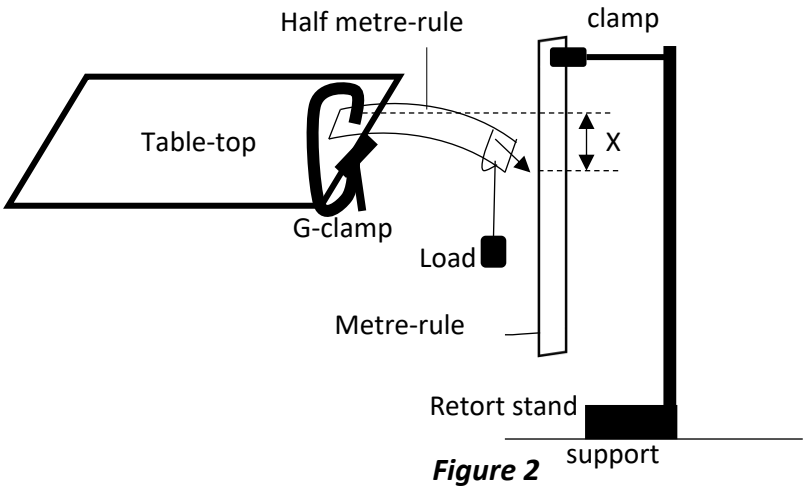


Figure 2

b) Suspend one 100 g mass at the 49.5 cm mark and record the new pointer reading, P_1

P_1 =..... (1 mark)

c) Continue adding the load in 100 g steps, each time recording the pointer position. Ensure that the half metre-rule is not overloaded.

d) 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

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

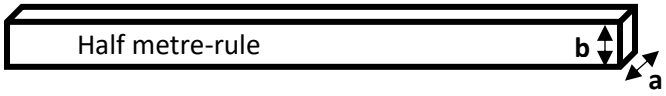


Figure 3

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

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

f) Using a loop of thread suspend the 50g mass at the 49.5cm mark on the half-metre rule.

g) 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.

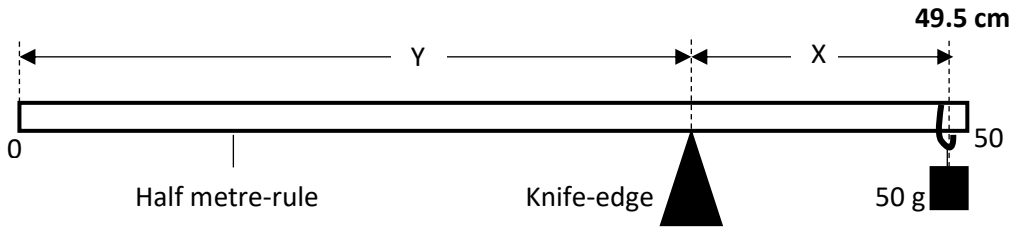


Figure 4

h) At the balance position, read off the length x and y and record in table 3.

i) Using the values of x and y obtained in 'h' above, determine the weight, W of the half metre-rule (3 marks)

W = ...

j) 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		

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

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

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