



MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education
PRE-MOCK EXAMINATIONS 2022

232/3

PHYSICS

Paper 3

June 2022 – 2½ Hours

Name: Marking Scheme Adm No:

Class: Candidate's Signature: Date: 30/6/2022.

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided
- Answer ALL the questions in the spaces provided in the question paper
- You are supposed to spend the first 15 minutes of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.
- Marks are given for a clear record of the observations actually made.
- Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

FOR EXAMINERS USE ONLY

QUESTION 1

	c	d	e	f	c	e	f	g	i	j	k	TOTAL
Maximum Score	2	2	2	2	1	1	2	2	2	2	2	20
Candidate's Score												

QUESTION 2

	b	c	d	e	f	g	h	TOTAL
Maximum score	6	5	3	1	2	2	1	20
Candidate's score								

TOTAL SCORE

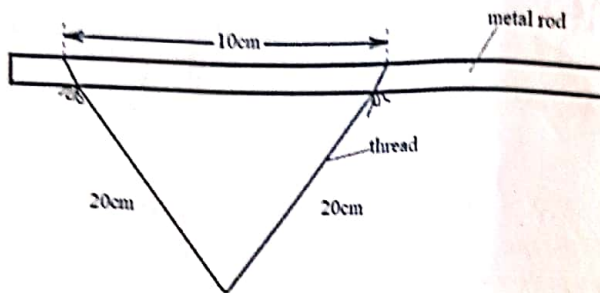
QUESTION 1**PART A**

You are provided with the following apparatus

- A metre rule.
- Two complete stands.
- A stop watch
- Two pieces of thread (50 cm and 50 cm)
- Steel rod of diameter 5 mm and length 60 cm

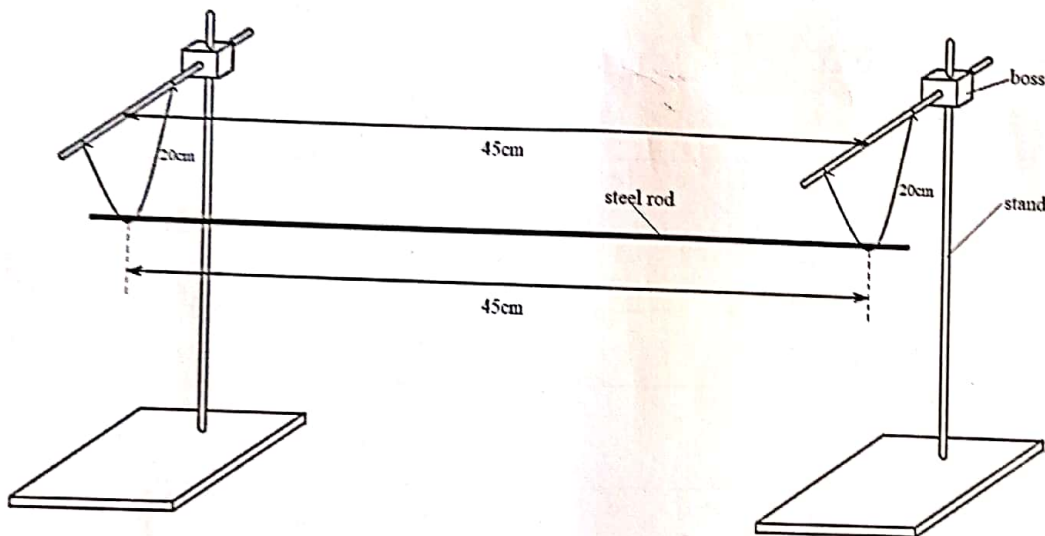
Proceed as follows

- a) Use the threads to make two loops, suspend the threads on the metal rod as shown in the figure below.



Each side of the loop on the rod should be approximately 20 cm long.

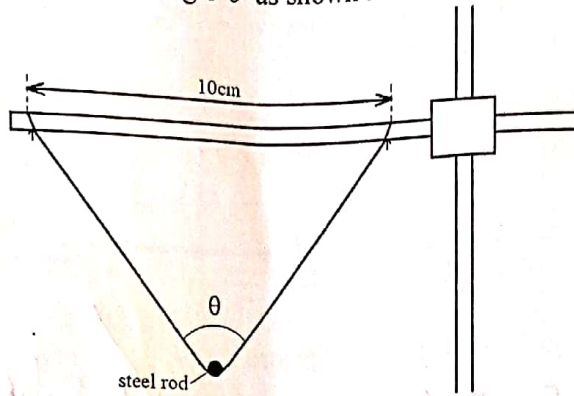
- b) Set up the apparatus as shown below.



The two boss rods should be parallel, equal in heights above the bench and 45 cm apart. The two strings supporting the steel rod should be 45 cm apart.

c)

(i) Measure and record the angle θ as shown in the figure below



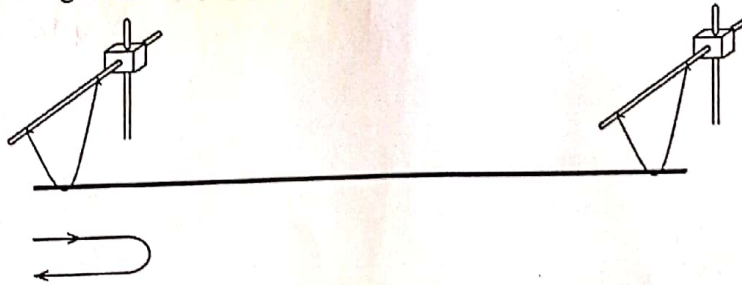
$\theta = 45^\circ \pm 5$ (1 mark)

(ii) Calculate the value of $\cos\left(\frac{\theta}{2}\right)$

$\cos\left(\frac{\theta}{2}\right) = \cos 22.5^\circ \cdot \frac{1}{\sqrt{2}}$ Students Value (4.s.f.) (1 mark)
 $0.9239 \cdot \frac{1}{\sqrt{2}}$

d)

(i) Move the steel rod to the left. Release it and watch the movement. The rod will move to the right and then to the left again, completing an oscillation as shown below.



(ii) Time two complete oscillations and the time taken t_1

$t_1 = 1.70 \pm 0.10$ s 2 d.p. a must (1 mark)

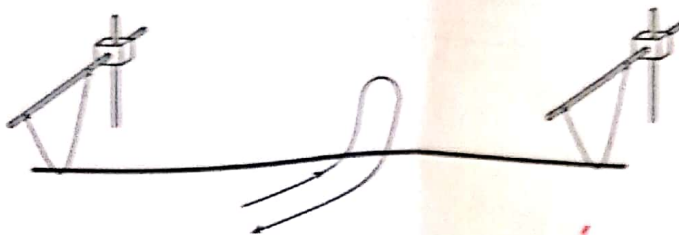
Determine the periodic time T_1

$T_1 = \frac{1.70}{2} \cdot \frac{1}{\sqrt{2}}$ Students value (1 mark)
 $0.65 \text{ s} \cdot \frac{1}{\sqrt{2}}$ 4.s.f

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Calvince Achiang / Elvis Owino

e)

- (i) Move the centre of the steel rod towards you through a small distance. Release it and watch the movement. The rod will move away from you and then back towards you completing a cycle as shown below



- (ii) Time two complete oscillations and record it as t_2

$t_2 = 1.65 \pm 0.10$ s (1 mark) ✓ 2d.p. correct

Determine the periodic time T_2

$T_2 = \frac{t_2}{2} = \frac{1.65}{2} = 0.825$ s (1 mark) ✓ Student value 4 sf

- f) The relationship between T_1 , T_2 and θ is given by the equation $\frac{T_1}{T_2} = k \cos\left(\frac{\theta}{2}\right)$ where k is a constant. Using your data, calculate the value of k . (2 marks)

$\frac{0.65}{0.825} = k (0.9239)$ (1 mark) ✓ Substitution

0.8528 (1 mark) ✓ Accuracy Student value 4 sf

PART B

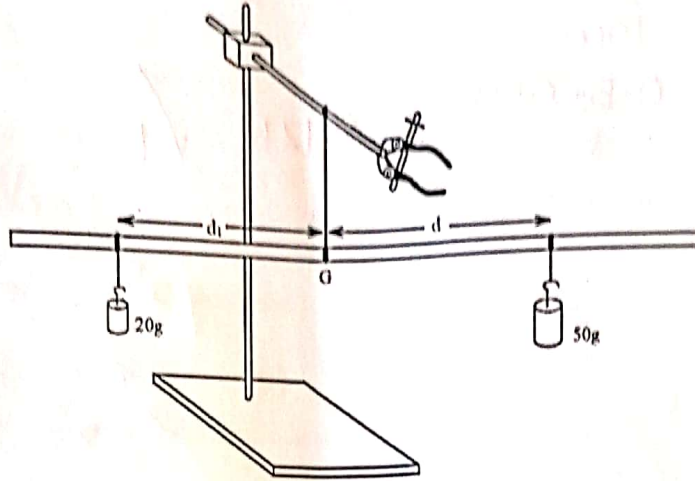
You are provided with the following apparatus:

- Metre rule
- Thread
- A complete retort stand
- Two masses, a 50g and 20g mass
- Water in a beaker
- Liquid X in a beaker

- a) Suspend the metre rule so that it balances at its centre of gravity G. Read and record the value of G.

$G = 50.0 \text{ cm} \pm 1.0 \text{ cm}$ (No mark)

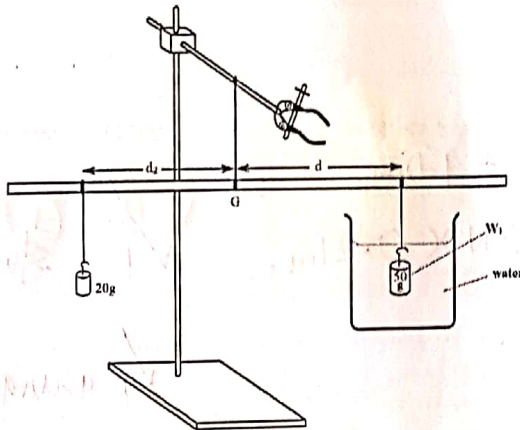
- b) Suspend the 50g mass at a distance $d = 10\text{ cm}$, then suspend the 20g mass and adjust its position such that the metre rule is balanced as shown in the figure below



- c) Record the distance distance d_1

$d_1 = 24.5 \pm 1.0$ cm (1 mark) *1 d.p. must*

- d) While maintaining the distance d , immerse the the 50g mass completely in water, as shown in the figure below.



- e) Adjust the position of the 20g mass to balance the metre rule again. Record the new distance

$d_2 = 19.0 \pm 1.0$ cm (1 mark) *1 d.p. must*

- f) Using the results obtained above, calculate the value of W_1 , weight of the 50g mass in water.

$$W_1 d = W_2 d_2$$

$$W_1 \times 10\text{ cm} = 0.2\text{ N} \times 19.0\text{ cm}$$

$$W_1 = 0.38\text{ N}$$

✓ 1 correct evaluation
✓ 1 accuracy 4.s.f

(2 marks)
(student's value)

James Anyango⁶

g) Determine the upthrust U_1 on the 50g mass in water. (2 marks)

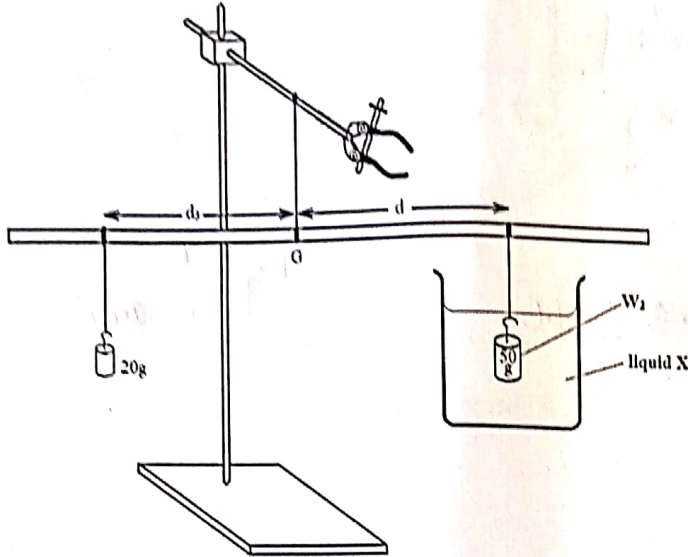
$$U_1 = \frac{50 \times 10}{1000} - 0.38 \quad \checkmark$$

student values

$$0.5 - 0.38 \quad U = 0.12 \text{ N} \quad \checkmark$$

accuracy 4 sf.

h) Repeat steps (d), (e) and (f) but now the 50g is totally immersed in liquid X as shown in the figure below



i) Using the results obtained above, calculate the value of W_2 , weight of the 50g mass in liquid X. (2 marks)

$$d_1 = 21.0 \text{ cm} \pm 1.0 \text{ cm}$$

X.

$$W_2 \times 0.1 \text{ m} = 0.2 \text{ N} \times 0.21 \text{ m} \quad \checkmark$$

(2 marks)

student's value.

$$W_2 = 0.42 \text{ N}.$$

accuracy

j) Determine the upthrust U_2 on the 50g mass in liquid X. (2 marks)

$$U_2 = \frac{50 \times 10}{1000} - 0.42 \text{ N} \quad \checkmark$$

students.

$$0.08 \text{ N} \quad \checkmark$$

accuracy.

k) Given that $\rho_L = \frac{U_2}{U_1} \times \rho_w$ where $\rho_w = 1000 \text{ kg m}^{-3}$. Calculate ρ_L (2 marks)

$$\rho_L = \frac{0.08 \text{ N}}{0.12 \text{ N}} \times 1000 \quad \checkmark$$

$$\rho_L = 666.67 \text{ kg m}^{-3} \quad \checkmark$$

1/2 mark if no units

student's value with units

Jesse Opiyo

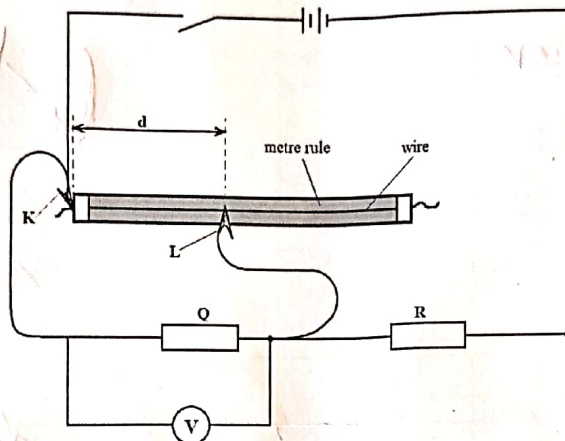
QUESTION 2

You are provided with the following:

- 2 new size D dry cells
- A cell holder
- A switch
- 8 connecting wires
- Resistor box labelled $R = 18\Omega, 22\Omega, 27\Omega, 33\Omega$ and 39Ω
- Resistor labelled $Q = 10\Omega$
- Nichrome wire mounted on a mm scale
- A micrometer screw gauge (to be shared)
- A Voltmeter

Proceed as follows

(a) Set up the circuit as shown in the figure below.



Place L at a length $d = 20\text{ cm}$, keep the length constant through throughout the experiment. The distance between K and L is d as shown above. Close the switch and record the voltmeter reading V .

$V = \dots\dots\dots 0.8 \pm 0.2 \dots\dots\dots (0.6 - 1.0) \dots\dots\dots V$ (1 mark) 1dp

(b) Open the switch. Repeat the steps above for other values of resistor to measure voltage across each of the resistors

$R = 18\Omega, 22\Omega, 27\Omega, 33\Omega$ and 39Ω to measure the v

Read and record corresponding voltmeter reading in table 1 below. (6 marks)

Resistor R (Ω)	18	22	27	33	39
Voltage V (V)	0.2 V	2.0 V	1.2 V	1.7 V	2.0 V
$\frac{V}{R} (A) \times 10^{-2}$	1.111	9.091	4.444	5.152	5.128

1dp →

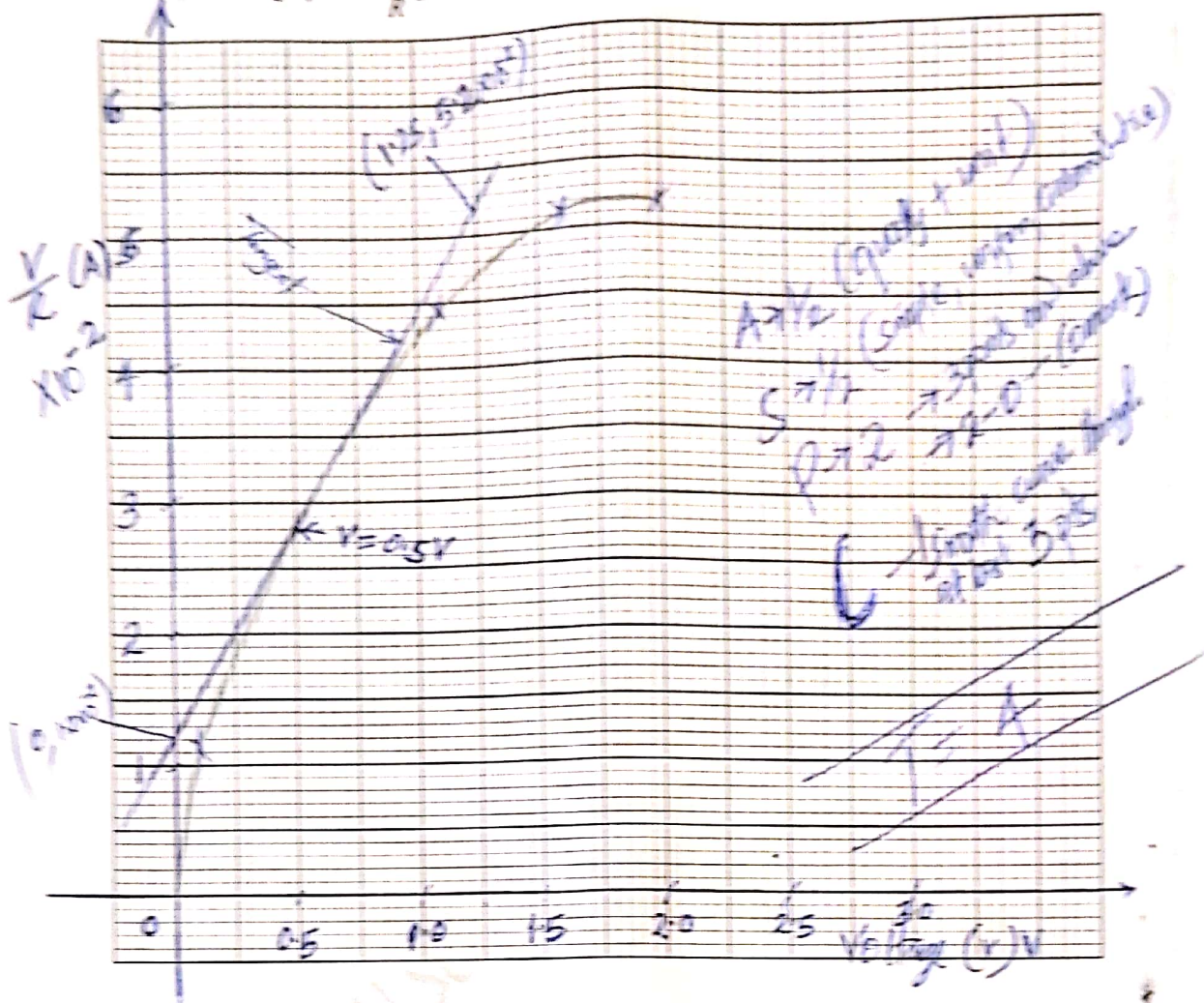
Each point 1mk

→ 4sf unless exact → (All correct 1mk)

Rev Peter Okoth⁸

(c) Plot a graph of $\frac{V}{R}$ (y-axis) against V on the x-axis

(4 marks)



(d) Determine the slope S at $V = 0.5V$

(3 marks)

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{(5.2 - 1.2) \times 10^{-2}}{(1.25 - 0)} = \frac{4 \times 10^{-2}}{1.25} \frac{A}{V}$$

$$= 0.032 \frac{1}{\Omega}$$

or

$$0.032 \Omega^{-1}$$

✓ - correct substitution (read off)

✓ - correct evaluation

✓ - correct answer to 4 sig figs unless exact with correct unit.

Wrong unit penalize fully
Missing unit deny 1/2 mark

1/3 Penalize - A/V

7

Liah Nygale

(a) Measure the diameter D of the nichrome wire.

$D = 0.30 \pm 0.05$ (0.30 - 0.40) mm (2/2) $\sqrt{1/2}$ (1 mark)

$D = \frac{0.30}{1000} = 3.0 \times 10^{-4}$ m Show your working $\sqrt{1/2}$ (1 mark)

(b) Determine the cross-section area A of the nichrome wire.

$A = \frac{\pi D^2}{4} = \frac{\pi (3.0 \times 10^{-4})^2}{4}$ $\sqrt{1}$ correct substitution $\sqrt{1}$ correct evaluation $\sqrt{1}$ m² fully unabbrev. (2 marks)

$A = 7.069 \times 10^{-8}$

(c) Given that $X = \frac{d}{R^2}$, find the value of X where $d = 20$ cm (2 marks)

$X = \frac{20}{(7.069 \times 10^{-8})^2}$ $\sqrt{1}$ correct substitution $\sqrt{1}$ correct evaluation

$X = 1.1045 \times 10^{15}$ cm $\sqrt{1}$ correct answer to 4 sig figs $\sqrt{1}$ units correct

$X = 1.105 \times 10^{15}$ cm

(d) What physical quantity does X represent? (1 mark)

Resistivity of the nichrome wire

Wrong unit - plenty but
Missing unit - only 1/2