

FORM FOUR CLUSTER KCSE MODEL 2

PHYSICS PAPER 3 ANSWERS

QUESTION ONE (10 Marks)

PART A

1. _____

- A metre rule • A mass labelled M
- Two pieces of wood • A wire P
- A complete set of retort stand
- A stop watch • A micrometer screw gauge
- A 100ml measuring cylinder
- A piece of thread

a) Using a weighing balance, measure and record the mass of the mass

$$M = 0.100 \text{ (} 0.098 \rightarrow 0.102 \text{) kg (1 d.p.)}$$

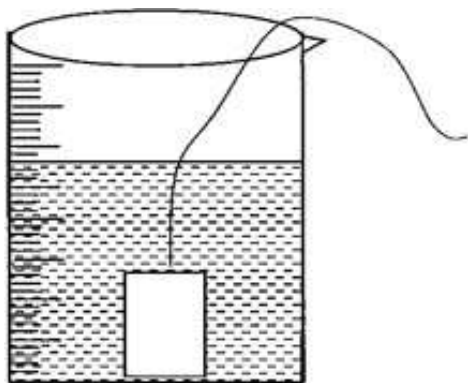
b) i) Pour water in a 100ml measuring cylinder to half way and record the volume as V1

V1 60.00. = cm³

ii) Using the thread, lower the mass M into the measuring cylinder provided until it's fully submerged as shown.

Record the final volume V2

V2 73.0 cm³ students value.



iii) Determine the volume V of the solid M in m^3

$$V = 0.000013m^3 \quad (0.000010 - 0.000015)$$

Determine the value of R given that $V = \frac{M}{R}$ giving the unit (1mark)

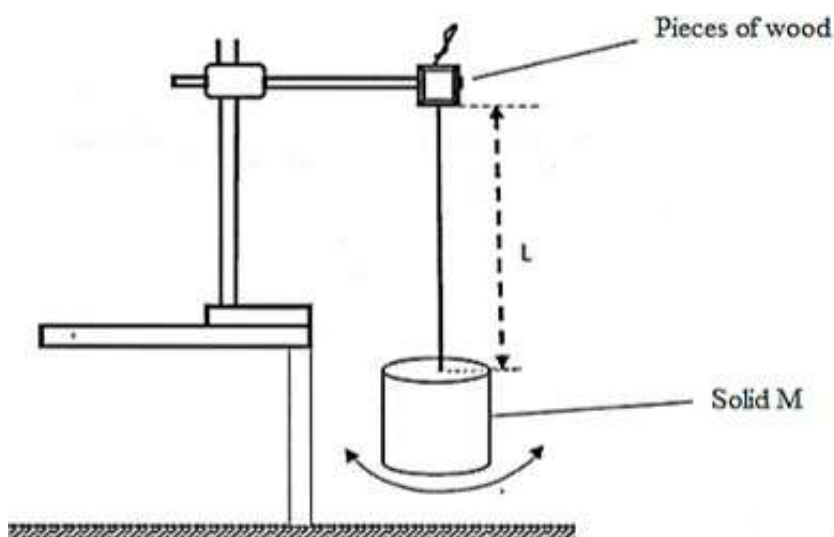
$$R = \frac{M}{V} = \frac{0.100}{0.000013} = 7,692.31kg/m^3$$

range(6500 – 9000)

QUESTION TWO (20 Marks)

PART B

2. c) Set up the apparatus as shown below. Ensure that the wire is free of kinks and the end tied to the hook is very firm and the hook does not move about.

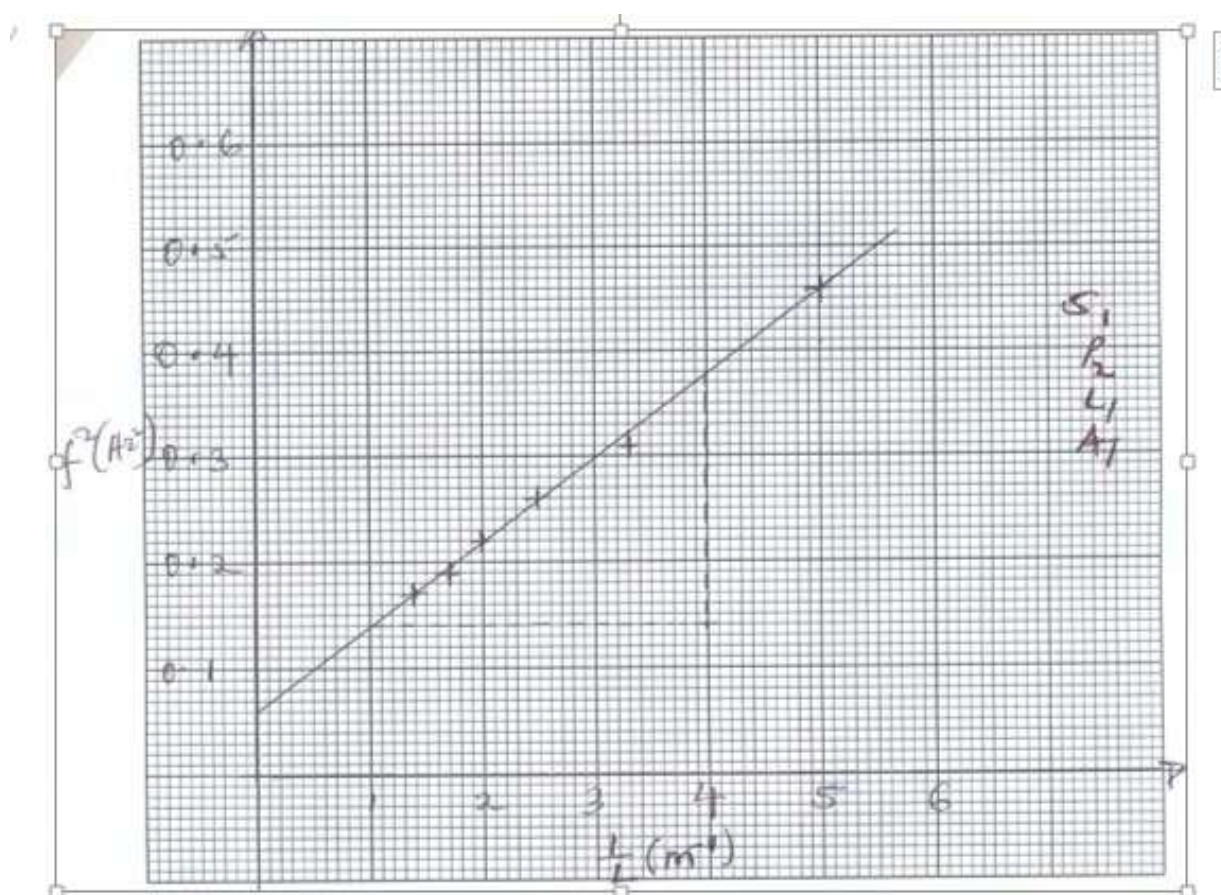


d) Adjust the length L of the wire so that $L = 70cm$. Give the solid M a slight twist in a horizontal plane of 180° so that when released it oscillates about as shown. Measure the time t for twenty oscillations and record in the table below.

e) Repeat the procedure above for other values of L as shown and complete the table.

Length L(cm)	70	60	50	40	30	20
Length L(m)	0.70	0.60	0.50	0.40	0.30	$0.20\sqrt{\frac{1}{2}}$
$\frac{1}{L} (m^{-1})$	1.429	1.667	2.000	2.500	3.333	$5.000\sqrt{\frac{1}{2}}$
Time for 10 oscillations t(s)	24.20 $\sqrt{\frac{1}{2}}$	22.75 $\sqrt{\frac{1}{2}}$	21.04 $\sqrt{\frac{1}{2}}$	19.80 $\sqrt{\frac{1}{2}}$	17.91 $\sqrt{\frac{1}{2}}$	14.73 $\sqrt{\frac{1}{2}}$ 3
Period T (s)	2.420	2.275	2.104	1.980	1.791	$1.473\sqrt{\frac{1}{2}}$
Frequency , f (Hz)	0.4132	0.4396	0.4754	0.5051	0.5583	$0.6789\sqrt{\frac{1}{2}}$
f ² (Hz ²)	0.1707	0.1932	0.2259	0.2551	0.3117	$0.4609\sqrt{\frac{1}{2}}$

On the grid provided plot a graph of f² against $\frac{1}{L}$



g) Determine the slope of the graph.

(2mks)

$$\begin{aligned} \text{Slope} &= \frac{0.38 - 0.14}{4 - 1} = \frac{0.24}{3} \text{ Hz}^2 \text{ m} \\ &= 0.08 \text{ Hz}^2 \text{ m} \quad \checkmark \frac{1}{2} \text{ accuracy} \quad \checkmark \frac{1}{2} \text{ units} \end{aligned}$$

h) Using the micrometer screw gauge measure the diameter of the wire d

$$d = 0.00027 \text{ (0.00023-0.00032) m}$$

(1mk)

i) Given that $f^2 = \frac{39\pi^2}{GdL}$ determine the value of the constant G.

(2mks)

$$\frac{39\pi^2}{Gd} = \text{slope}$$

$$\frac{39\pi^2}{Gd} = 0.08$$

$$\begin{aligned} G &= \frac{39\pi^2}{0.08d} = \frac{39\pi^2}{0.08 \times 0.00027} \\ &= 1.7820 \times 10^7 \text{ m}^{-1} \text{ Hz}^{-2} \text{ units} \end{aligned}$$