

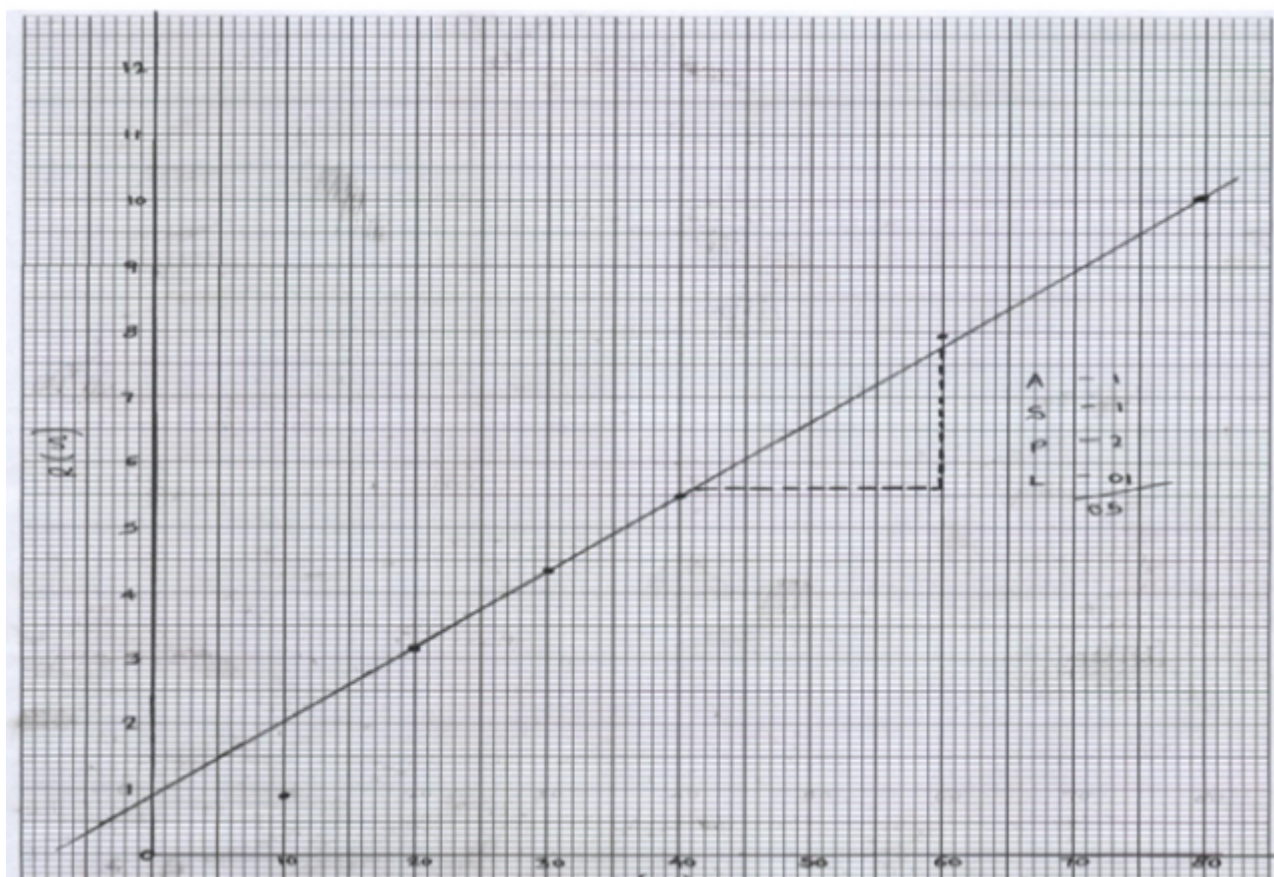
1.

- a) i) $1.2 \times 10^{-3} \text{ m} \checkmark 2$
 ii) $1.13 \times 10^{-6} \checkmark 1$
 iii)

Length L (cm)	80	60	40	30	20	10
V(v)	1.21	1.18	1.10	1.00	0.95	$0.71 \checkmark 3$
I (A)	0.12	0.15	0.20	0.23	0.30	$0.38 \checkmark 3$
$R = \frac{V}{I} (\Omega)$	10.08	7.87	5.50	4.35	3.17	$1.87 \checkmark 2$

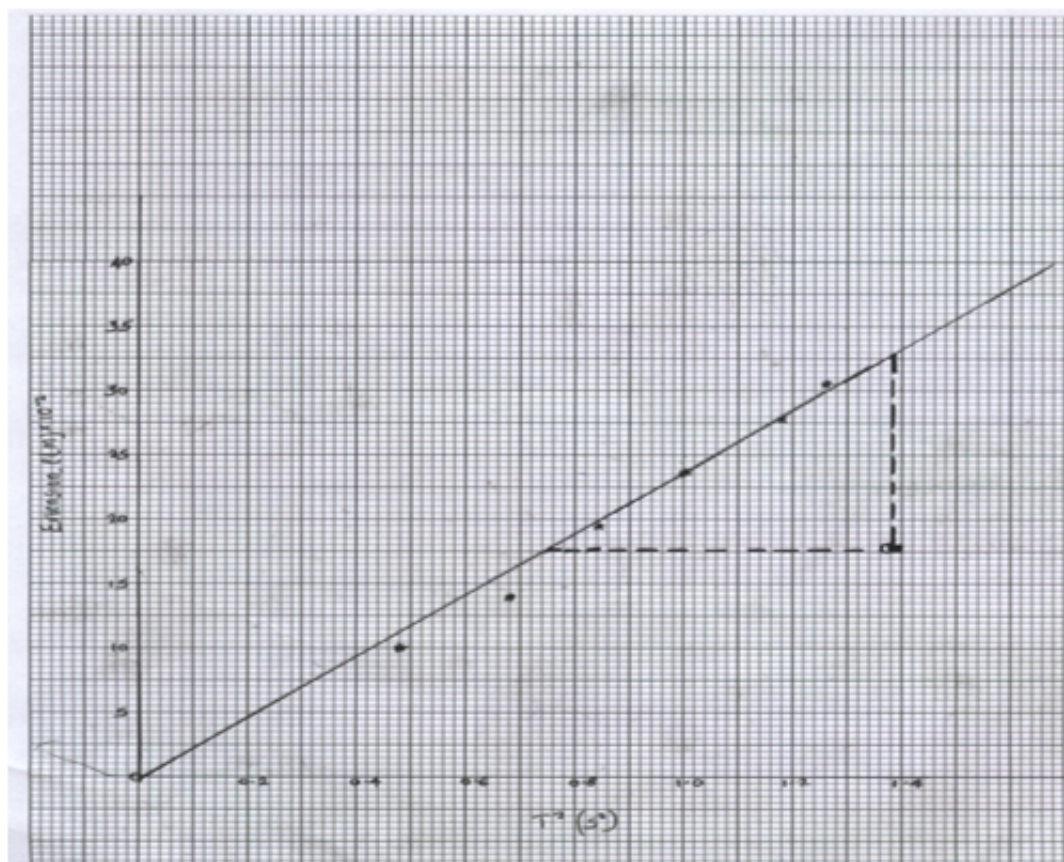
- b) ii) $\text{Gradient} = \frac{\Delta R}{\Delta L} = \frac{7.8 - 5.6}{0.6 - 0.41} \checkmark 1$ OR $0.115789 \Omega \text{m}^{-1}$
 $= 11.5789 \Omega \text{cm}^{-1}$

c) i) $R = \frac{\rho L}{A}$
 $\rho = \frac{RA}{L}$ where $\frac{R}{L} = m \checkmark 1$
 $m A$
 $= 11.5789 \times 1.13 \times 10^{-6}$
 $= 1.31536 \times 10^{-5} \Omega \text{m} \checkmark 1$



2. i)

Mass (g)	Extension e (m)	Time for 50 complete oscillation	Periodic time T(s)	$T^2(s^2)$
50	0.106	34.55	0.6910	0.4775
70	0.146	41.12	0.8224	0.6763
90	0.194	46.00	0.9200	0.8484
110	0.237	50.34	1.0068	1.0136
130	0.282	54.45	1.0890	1.1859
150	0.305	56.15	1.1230	1.2611



$$\text{II Gradient} = \frac{(32.5 - 17.5) \times 10^{-2} \text{ m}}{(1.38 - 0.74) \text{ s}^2}$$

$$= 0.234375 \text{ ms}^{-2} \pm 0.05$$

$$\text{III } \frac{Q}{e} = \left(\frac{2\pi}{T} \right)^2$$

$$\frac{e}{Q} = \frac{T^2}{4\pi^2}$$

$$e = \frac{Q}{4\pi^2} T^2$$

$$y = mx + c$$

$$\Rightarrow \frac{Q}{4\pi^2} = \text{gradient}$$

$$\therefore Q = 4\pi^2 \times 0.234375$$

$$9.253 \text{ ms}^{-2}$$

IV Q represents the acceleration due to the force of gravity.

