

QUESTION 1			
Code	Points to score	Marks	
A_1	Position of G recorded to 1 decimal place in cm and is 49.0 – 51.0 cm	1/2	
A_2	Time for 20 oscillations recorded to 2 decimal places and is $40.00 - 43.00$ s	1	
A_3	$\frac{1}{2} + \frac{1}{2}$	1	
A_4	T_1 correctly calculated to 3 decimal places $\frac{1}{2} + \frac{1}{2}$	1	
A5	σ_1 correctly calculated to 1 dp if the substitution is correct $\frac{1}{2} + \frac{1}{2}$	1	
A_6	Time for 20 oscillations recorded to 2 decimal places and is 19.00 – 22.00 s	1	
A ₇	1/2 + 1/2	1	
A_8	T ₂ correctly calculated to 3 decimal places $\frac{1}{2} + \frac{1}{2}$	1	
	σ_2 correctly calculated to 1 dp if the substitution is correct $\frac{1}{2} + \frac{1}{2}$		
	σ correctly calculated to 1 dp $\frac{1}{2} + \frac{1}{2}$		
		71/2	
\mathbf{B}_1	Time for 20 oscillations recorded to 2 decimal places and is $8.50 - 10.00 \text{ s}$	1	
\mathbf{B}_2	$\frac{1}{2} + \frac{1}{2}$	1	
B 3	T correctly calculated to 3 decimal places $\frac{1}{2} + \frac{1}{2}$	1	
\mathbf{B}_4	k correctly calculated to 1 dp if the substitution is correct $\frac{1}{2} + \frac{1}{2}$	1	
B 5	Time for 20 oscillations recorded to 2 decimal places and is 12.00 – 13.00 s	1	
\mathbf{B}_6	$\frac{1}{2} + \frac{1}{2}$	1	
\mathbf{B}_7	T correctly calculated to 3 decimal places $\frac{1}{2} + \frac{1}{2}$	1	
	k correctly calculated to 1 dp if the substitution is correct $\frac{1}{2} + \frac{1}{2}$		
	Average value of k correctly calculated to 1 dp $\frac{1}{2} + \frac{1}{2}$	-	
C	Initial maritian of the mainten recorded to 1 dm in am	7	
C ₁ C ₂	Initial position of the pointer recorded to 1 dp in cm	1/2	
C2		1 1	
	Columnar table of minery position of pointer a time for 20 oscil. T and T^2		
C_2	Columnar table of: m, new position of pointer, e, time for 20 oscil, T and T^2	1	
C ₃	- all (at least $4 \rightarrow \frac{1}{2}$)	1	
C ₃ C ₄	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow$		
C ₄	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$)	3	
C ₄ C ₅	- all (at least 4 → ½) Correct units for columns: kg, cm, m, s, s and s² - all → 1 (at least 4 → ½) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference		
C ₄	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$)	3	
C ₄ C ₅ C ₆	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m $(0.030 - 0.050)$ m	3 1 3	
C ₄ C ₅	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m	3	
C ₄ C ₅ C ₆	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m $(0.030 - 0.050)$ m	3 1 3 1	
C ₄ C ₅ C ₆	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0-5.0)$ cm or $(0.030-0.050)$ m $(0.030-0.050)$ m $(0.030-0.050)$ Time for 20 oscillations increasing $(7.50-22.00)$ s & recorded to 2 dp, diff between consecutive values $(7.50-22.00)$ s & $(0.030-0.050)$ m	3 1 3 1	
C ₄ C ₅ C ₆	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m $(0.030 - 0.050)$ m $(0.030 - 0.050)$ Time for 20 oscillations increasing $(7.50 - 22.00)$ s & recorded to 2 dp, diff	3 1 3 1	
C ₄ C ₅ C ₆	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m $(0.030 - 0.050)$ m $(0.030 - 0.050)$ m $(0.030 - 0.050)$ Time for 20 oscillations increasing $(7.50 - 22.00)$ s & recorded to 2 dp, diff between consecutive values $1.00 - 3.00$ s $(0.030 - 0.050)$ T correctly calculated to 3 dp $(0.030 - 0.050)$ and $(0.030 - 0.050)$ m $(0.030 - 0.05$	3 1 3 1	
C ₄ C ₅ C ₆	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m $@\frac{1}{2}$ e correctly calculated to 3 dp - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) Time for 20 oscillations increasing $(7.50 - 22.00)$ s & recorded to 2 dp, diff between consecutive values $1.00 - 3.00$ s $@\frac{1}{2}$ T correctly calculated to 3 dp - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) T ² correctly calculated to 2 or 3 dp consistently - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$)	3 1 3 1	
C ₄ C ₅ C ₆	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m $(0.0$	3 1 3 1 1	
C4 C5 C6 C7	- all (at least 4 → ½) Correct units for columns: kg, cm, m, s, s and s² - all → 1 (at least 4 → ½) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m @½ e correctly calculated to 3 dp - all → 1 (at least 4 → ½) Time for 20 oscillations increasing $(7.50 - 22.00)$ s & recorded to 2 dp, diff between consecutive values $1.00 - 3.00$ s @½ T correctly calculated to 3 dp - all → 1 (at least 4 → ½) T² correctly calculated to 2 or 3 dp consistently - all → 1 (at least 4 → ½) Title of the graph: A graph of T^2 against e Axes: Each drawn with an arrow in the increasing direction, each labeled	3 1 3 1 1	
C4 C5 C6 C7	- all (at least $4 \rightarrow \frac{1}{2}$) Correct units for columns: kg, cm, m, s, s and s ² - all \rightarrow 1 (at least $4 \rightarrow \frac{1}{2}$) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m $(0.0$	3 1 3 1 1	
C4 C5 C6 C7	- all (at least 4 → ½) Correct units for columns: kg, cm, m, s, s and s² - all → 1 (at least 4 → ½) New position of pointer recorded to 1 dp in cm (or 3 dp in m), difference between consecutive value $(3.0 - 5.0)$ cm or $(0.030 - 0.050)$ m @½ e correctly calculated to 3 dp - all → 1 (at least 4 → ½) Time for 20 oscillations increasing $(7.50 - 22.00)$ s & recorded to 2 dp, diff between consecutive values $1.00 - 3.00$ s @½ T correctly calculated to 3 dp - all → 1 (at least 4 → ½) T² correctly calculated to 2 or 3 dp consistently - all → 1 (at least 4 → ½) Title of the graph: A graph of T^2 against e Axes: Each drawn with an arrow in the increasing direction, each labeled	3 1 3 1 1	

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	Scales: Uniform, each spanning at least ½ pg, demarcations marked, starting	1	
	values		
D_4	indicated $\frac{1}{2} + \frac{1}{2}$	3	
D_5		1/2	
D_6	Points correctly plotted: no shading@½	1/2	
D ₇	Best fit: awarded if at least 4 points were correctly plotted		
	Indication of triangle or equivalent for calculating s ₁ , covering all points	11/2	
	s correctly calculated if the coordinates were correctly read and		
D_8	$3.9 \le s \le 4.2 \text{ s}^2 \text{ m}^{-1}$ recorded to 1 or 2 decimal places $1 + \frac{1}{2}$		
	-	1	
	σ correctly calculated if correct substitution is available and $9.5 \le \sigma \le 10.1$		
	m s ⁻² -1, recorded to 0 or 1 decimal place $\frac{1}{2} + \frac{1}{2}$		
	•	9	
<i>Total</i> = 35			