Name of the Student:_____

Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
	B as equal to total momentum before = 1×2−0.5×2	1.0	1
	A is the answer if each trolley had the same momentum C is the momentum of the second trolley only D is the answer if the two trolleys were travelling in the same direction		

Q2.

Question Number	Acceptable Answer	Additional Guidance	Mark
	• Use of $P = VI$ (1) • Calculation of gradient (1) • Gradient $= \frac{\Delta m}{\Delta t}$ (1) • Use of $\Delta E = mL$ and $P = \frac{\Delta E}{\Delta t}$ (1) • $L = 2.30 \times 10^6$ (J kg^{-1}) (1) • Comparison of calculated value for L with values in table and appropriate conclusion. (1)	For MP2 and MP3 credit Δm read from graph and used with corresponding Δt value For MP3 and MP4, credit $L = \frac{VI}{\text{gradient}}$ Answers in the range $(2.26 - 2.34) \times 10^6$ J kg^{-1}	
	• But not all of the energy supplied to the liquid will be used to boil the liquid **Or** thermal energy will be transferred to surroundings	Example of calculation: grad$= \frac{(211\text{-}155)\times10^{-3}\text{ kg}}{(0\text{-}600)\text{ s}} = 9.33\times10^{-5}\text{ kg s}^{-1}$ $\therefore \frac{\Delta m}{\Delta t} = 9.33\times10^{-5}\text{ kg s}^{-1}$ $P = 20.5\text{ V} \times 10.5\text{ A} = 215\text{ W}$ $\therefore L = \frac{215\text{ W}}{9.33\times10^{-5}\text{kg s}^{-1}} = 2.30\times10^6\text{ J kg}^{-1}$	7

Q3.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	• Ignoring mass of holder / spring when determining the oscillating mass (1)		1
(ii)	• Using a data logger (and light gate) would eliminate reaction time (1) • So the uncertainty in the measurement (of the time) would be reduced (1) • Not easy to measure timings for multiple swings/oscillations with a data logger (1)		3
(iii)	• Identify gradient as $\frac{4\pi^2}{k}$ (1) • Determine gradient of graph (1) • $k = 17.8\ \text{N m}^{-1}$ [17.5 → 18.5] (1)	Example of calculation Gradient = $2.21\ \text{s}^2\ \text{kg}^{-1}$ $k = \frac{4\pi^2}{2.21\ \text{s}^2\ \text{kg}^{-1}}$ $= 17.8\ \text{N m}^{-1}$	3

Q4.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following points: • Measure the distance between the two 1st/2nd order maxima (1) **Or** measure the distance from the 2nd order to the central maximum (1) **Or** increase the distance from the grating to the screen • This increases the distance measured on the screen (and reduce the % uncertainty) MP2 dependent upon MP1		2