Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 13_Oscillations

Name of the Student:____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable Answer	Additional Guidance	Mark
	Max 4 from 2 out of 3 pairs • The student should let the pendulum swing back and to before starting the stopwatch. (1) • The first swing may be affected by the student pushing the bob as they release it (1) • The student should use a (fiducial) marker at O (1) • Easier to determine when it passes O (1) • Time more oscillations (1) • A longer time reduces (%) uncertainty (in T) (1)	For each pair, the second marking point is dependent on the first marking point MP4: Accept the pendulum travelling fastest when it passes O	4

Q2.

Question Number	Acceptable Answer		Additional Guidance	Mark
(i)	An explanation that makes reference to the following points: • Time *n* oscillations and divide by *n*, where *n* is a large number • Increasing the time (measured) reduces the uncertainty (in *T*) • Repeat timing and calculate a mean • Use a (fiducial) marker to indicate the reference position • Use equilibrium position as reference position • The trolley is moving fastest at this point so the uncertainty in starting/stopping the stopwatch is least	(1) (1) (1) (1) (1) (1)	Where $n \geq 5$ For equilibrium allow centre/undisplaced	6
(ii)	• Use $\omega = 2\pi/T$ (to calculate a value for ω) **Or** use $\omega = 2\pi f$ with $f = 1/T$ • Measure the maximum displacement of the trolley from the equilibrium position (with the metre rule) • Use $v_{max} = \omega A$ (to calculate a value for the maximum velocity of the trolley)	(1) (1) (1)	For equilibrium allow centre/undisplaced [accept initial displacement for maximum displacement]	3

Q3.

Question Number	Answer		Mark
(a)	Use of $F = \frac{G m_1 m_2}{r^2}$ G = 6.6 × 10^{-11} (N m^2 kg^{-2}) [must see 6.6 × 10^{-11} when rounded to 2 sf] <u>Example of calculation</u> $G = \frac{1.5\times10^{-7}\,\text{N}\times(0.23\,\text{m})^2}{160\,\text{kg}\times0.75\,\text{kg}} = 6.61\times10^{-11}\,\text{N}\,\text{m}^2\,\text{kg}^{-2}$	(1) (1)	**2**
(b)(i)	Read (peak) times from graph for at least 3 cycles T = 6.4 min (±0.2 min) [T = (380 ±12) s] [max 1 mark if correct answer shown without working] <u>Example of calculation</u> $T = \frac{(28.0 - 2.5)\,\text{min}}{4} = 6.38\,\text{min}$	(1) (1)	**2**
(b)(ii)	Air resistance acts on the sphere [accept frictional forces **Or** (viscous) drag for air resistance] Energy is removed from the oscillation/system **Or** the oscillation/system is damped [For mp 2 do not credit 'energy is lost' but accept 'energy is dissipated'; answer must indicate idea of transfer of energy]	(1) (1)	**2**
(b)(iii)	Evidence of values of at least 3 consecutive peaks read from graph [accept values of 3 points separated by equal time intervals] Attempt to obtain amplitudes, by subtracting 0.75 Calculation of two values of A_{n+1}/A_n with corresponding conclusion **Or** Calculation of two values of difference of ln A_{n+1} and ln A_n with corresponding conclusion **Or** Use peaks of graph to sketch curve Use curve to determine "half-life" [accept other ratio] Calculation of two values of "half-life" with corresponding conclusion <u>Example of calculation</u> A_0 = 1.45-0.75 = 0.7, A_1 = 0.75-0.25 = 0.5, A_2 = 1.1-0.75 = 0.35, A_4 = 0.75 – 0.5 = 0.25	(1) (1) (1) (1) (1) (1)	**3**

	$\frac{A_1}{A_0} = \frac{0.50}{0.70} = 0.71$ $\frac{A_2}{A_1} = \frac{0.35}{0.50} = 0.70$ $\frac{A_3}{A_2} = \frac{0.25}{0.35} = 0.71$	
	Total for question	**9**