Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	• Use of $p = mv$ (1) • $p = 5.4$ (kg m s^{-1}) (1)	Example of calculation $p = 0.012$ kg × 450 m s^{-1} = 5.4 kg m s^{-1}	2
(ii)	• Use of principle of conservation of linear momentum (1) • Use of ½ $mv^2 = mgh$ (1) • $h = 0.24$ m (ecf from (a)(i)) (1)	Example of calculation 5.4 kg m s^{-1} = (2.5 kg + 0.012 kg) × v $v = 2.1$ m s^{-1} ½ $mv^2 = mgh$ ½ (2.1 m s^{-1})^2 = 9.81 m s^{-2} × h $h = 0.24$ m	3

Q2.

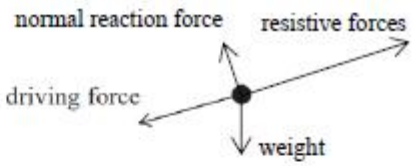
Question Number	Acceptable answers	Additional guidance	Mark
	An explanation that makes reference to the following points: • The final momentum/velocity of the bullet is negative **Or** The final momentum/velocity of the bullet is in the opposite direction (1) • The change in momentum of the bullet is greater (1) • The (change in) momentum of the steel block is greater (because momentum is conserved) (1) • So steel block has greater initial velocity **Or** steel block has greater initial E_K (1) • So gains greater E_P (and moves through a greater maximum vertical height) [Dependent upon MP4] (1)		5

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Q3.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	• Use of $E = \frac{1}{2}mv^2$ with $E = 2.9 - 3.0 \times 10^{-19}$ J (1) • $v = 8 \times 10^5$ m s^{-1} (1)	Example of calculation $v = \sqrt{\frac{2 \times 2.9 \times 10^{-19}\ \text{J}}{9.11 \times 10^{-31}\ \text{kg}}} = 7.98 \times 10^5$ m s^{-1}	2
(ii)	• Use of $hf_0 = \emptyset$ with $f_0 = 5.4 - 5.6 \times 10^{14}$ Hz **Or** Extrapolates graph to y axis (1) • Conversion between J and eV (1) • $\emptyset = 2.1$ to 2.4 eV **and** the metal was caesium (1)	Example of calculation $\emptyset = 3.6 \times 10^{-19}$ J $= (3.6 \times 10^{-19}\ \text{J}) / (1.6 \times 10^{-19}\ \text{C})$ $= 2.3$ eV	3

Q4.

Question Number	Acceptable answers	Additional guidance	Mark
(a)(i)	• Weight vertically downwards (1) • Resistive forces acting up the slope (1) • Normal reaction force perpendicular to the slope (1)	Accept W Accept N or R 	3
(a)(ii)	• Use of $1.2 \times 10^4 \times \sin 11°$ (1) • Use of total force up slope equals total force down slope (1) • Driving force = 240 N (1)	Example of Calculation Component of weight parallel to the slope = 1.2×10^4 N $\times \sin 11°$ Component of weight parallel to the slope = 2290 N Driving force = 2530 N − 2290 N Driving force = 240 N	3

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