Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

Question Number	Answer		Mark
(a)(i)	Finds extension = 3.4 (cm) **Or** line on graph at 3.4 cm Force = 3.2 (N) (accept range between 3.10 and 3.25 N)	(1) (1)	2
(a)(ii)	An attempt to find an area under the graph **Or** use of ½ FΔx A calculation of the correct area using counting squares or trapezium for a extension of 3.0 - 3.4 cm (ecf their extension from (a)(i)) (counting 1 cm squares is approximately 51 - 52 squares) Example of calculation Using counting cm squares: energy = (51 squares × 1.25×10^{-3} J) = 0.064 (J)	(1) (1)	2
(a)(iii)	Use of gpe = mgh **Or** equations that would allow h to be calculated Height = 1.7 (m) (ecf) (0.06 J → 1.61 m, 0.054 J → 1.45 m) (Candidates may use the longer route of 0.063 J = ½ mv^2 to find v = 5.78 m s^{-1} and then use $mgh = 1/2mv^2$ to give h = 1.7 m) Example of calculation 0.063 J = 0.0038 kg x 9.81 N kg^{-1} x h h = 1.7(m)	(1) (1)	2
(b)(i)	25.8 cm an anomaly (accept outlier in place of anomaly) excluded from the mean **Or** mean of the remaining three numbers is 30.0 cm **Or** (30.0 + 30.3 + 29.7)/3 = 30.0 (cm)	(1) (1)	2
(b)(ii)	The block moves Some energy is transferred to the block **Or** acceleration (of marble) is less **Or** launch velocity is less **Allow one mark only for one of the following if no mention of block moving** Energy transferred due to friction **Or** energy transferred due to air resistance **Or** friction was acting between moving parts **Or** air resistance was acting on the marble **Or** energy transferred to internal energy in the band **Or** energy transferred to thermal energy of the surroundings **Or** energy dissipated as heat	(1) (1) (1)	2

(b)(iii)	Any **one** from Use additional rubber band(s) Double up rubber band Use a longer channel Use a lighter block/type of wood Replace elastic band with a stiffer, shorter or wider one Any sensible practical idea to reduce friction e.g. use a lubricant/oil **Or** a material with lower friction e.g. plastic	(1)	1

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	• Use of $\Delta F = k\Delta x$ (1) • 45 ($N\ m^{-1}$) [accept 0.45 $N\ cm^{-1}$] (1)	Example of calculation $k = \frac{2.5\ N}{5.5 \times 10^{-2}\ m} = 45.45\ N\ m^{-1}$	2
(ii)	• Use of $w = mg$ (1) • Use of vertical component of spring forces (1) • Use of $\Delta F = k\Delta x$ (1) • $\Delta x = 0.050$ m [accept 5.0 cm] (1) (ECF from (a)(i))	Example of calculation $w = 0.400\ kg \times 9.8\ N\ kg^{-1} = 3.92\ N$ $2T \cos 30° = 3.92\ N\ \therefore$ $F = \frac{3.92\ N}{2 \cos 30°} = 2.26\ N$ $\Delta x = \frac{2.26\ N}{45.45\ N\ m^{-1}} = 0.0498\ m$	4