Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable Answers	Additional Guidance	Mark
	• Calculate force = mg (1) • calculate the cross-sectional area $A = \pi\frac{d^2}{4}$ (1) • x- and y- variables to produce a suitable straight-line graph (1) • correct use of the gradient from their graph to determine E (1)	Accept $A = \pi r^2$ **and** $r = \frac{d}{2}$	**4**

Q2.

Question Number	Acceptable Answers	Additional guidance	Mark
	• Recognises that $F=0$ (1) **Or** Uses $D = U - W$ • Use of $W = mg$ with $m =$ 5.2 g (1) • Use of $U =$ weight of air displaced by balloon (1) **Or** $U = \frac{4}{3}\rho_a \pi r^3 g$ **Or** $U = \rho_a V g$ **and** $V = \frac{4}{3}\pi r^3$ **Or** $U = mg$ **and** $\rho = \frac{m}{V}$ **and** $V = \frac{4}{3}\pi r^3$ • 0.034 N (1)	Example of calculation $D = (\frac{4}{3}\pi \times (0.12\ \text{m})^3 \times 1.2\ \text{kg m}^{-3} \times 9.81\ \text{m s}^{-2})$ $-((4+1.2)\ \text{kg} \times 9.81\ \text{m s}^{-2})$ $= 0.034\ \text{N}$	**4**

Q3.

Question Number	Acceptable Answers	Additional Guidance	Mark
(a)	An explanation that makes reference to: • balance measures to 1 g **(1)** • more rubber bands should have been placed on the balance to obtain a reading of at least 10 g **(1)** • so that a more precise reading is obtained **(1)**		**3**
(b)	• use of area under graph to represent work done **(1)** • uses area accurately between line and distance axis to determine work done **(1)** • 0.97 J (range from printed graph) **(1)**	Do not award first mark for use of E=1/2Fx	**3**
(c)	• use of ke = ½ mv^2 **(1)** • v = 70 m s^{-1} **(1)**	Example of calculation: 0.97 J = ½ mv^2 = ½ 0.0004 kg × v^2 v = 70 m s^{-1}	**2**
(d)	An explanation that makes reference to: • video the band over a short distance so it determines the initial speed **(1) OR** because its speed will rapidly reduce because of air resistance **(1)** • include a scale or object of known length in the area filmed **(1)** • analyse the video to determine the time taken to travel the known distance **AND** calculate the speed using the measured time in speed = distance/time **(1)** • (light gates would not be suitable because) the band is not sufficient in size to interrupt the light gate beam **(1)**		**4**