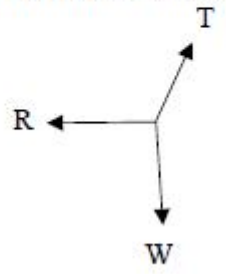
Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable answers		Additional guidance	Mark
(a)	• Arrow upwards and to the right at approximately 20° to the vertical labelled Tension/T	(1)		
	• Arrow to left and horizontal labelled Reaction/R	(1)	Accept Push (from rock) /Contact 	
	• Arrow vertically down labelled Weight/W/mg/540 N	(1)	Max 2 if any additional arrows drawn	3

Question Number	Acceptable answers		Additional guidance	Mark
(b)(i)	• Resolve tension vertically: $T\cos 20$ **Or** $T\sin 70$	(1)	Example of calculation $55 \times 9.81 = T \cos 20$	
	• Equate mg and their vertical component of T	(1)	$T = 574$ N	
	• Tension = 570 (N)	(1)		3

Question Number	Acceptable answers		Additional guidance	Mark
(b)(ii)	• Use of $\Delta E = ½ F \Delta x$	(1)	(ecf from (b)(i)) show that value gives 7.5 J	
	• Energy stored = 7.1 – 7.2 J	(1)	Example of calculation $\Delta E = \frac{1}{2} \times 570 \text{ N} \times 2.5 \times 10^{-2} \text{ m}$ $\Delta E = 7.1$ J	2

Question Number	Acceptable answers	Additional guidance	Mark
(b)(iii)	• Rope has extended linearly **Or** Hooke's law applies **Or** extension ∝ force **Or** has not exceeded limit of proportionality (1)	Do not accept elastic limit	1

Q2.

Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	• Comparison to $y = mx + c$ (1) • Identify that η, ρ_s, ρ_f and g are constants (1) • $c = 0$ so the graph passes through the origin **Or** when $d^2 = 0$, $v = 0$ so would pass through the origin (1)	MP1 e.g. $y = mx + c$ so $v = \left(\frac{g(\rho_b - \rho_f)}{18\eta}\right) \times d^2$ (+ 0)	3

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)	• Axes labelled with quantities and units (1) • Suitable scale (1) • Correct plotting (1) • Line of best fit (judged by eye) (1)	MP1: v / 10^{-3} m s^{-1} on y-axis and d^2 / 10^{-6} m^2 on x-axis	4

d^2 / 10^{-6} m^2	v / 10^{-3} m s^{-1}
1.0	2.3
4.0	11
9.0	23
16.0	39
25.0	64

Question Number	Acceptable Answer		Additional Guidance	Mark
(c)	• Attempt to find gradient, at least half drawn line used	(1)		
	• Use of $\eta = \frac{g(\rho_s - \rho_f)}{18} \times \frac{1}{\text{gradient}}$	(1)		
	• $\eta =$ 1.4 – 1.5 (Pa s)	(1)		
	• Corn syrup identified as the fluid	(1)	MP4 to be consistent with calculated value for η Example of calculation $\eta = \frac{9.81\ \text{N kg}^{-1} \times (8000\ \text{kg m}^{-3} - 1260\ \text{kg m}^{-3})}{18 \times 2.52 \times 10^{3}\ \text{m}^{-1}\ \text{s}^{-1}}$ $\eta = 1.46$ Pa s	4