

Question Number	Answer	Mark
16(a)(i)	<ul style="list-style-type: none"> • Use $v^2 = u^2 + 2as$ (1) • $a = (-) 10.6 \text{ (m s}^{-2}\text{)}$ (1) <p><u>Example of calculation</u></p> $(75 \text{ m s}^{-1})^2 = (460 \text{ m s}^{-1})^2 + (2 \times a \times 9700 \text{ m})$ $a = -10.6 \text{ m s}^{-2}$	2
16(a)(ii)	<ul style="list-style-type: none"> • Use of $F = ma$ Or $W = mg$ (1) • Use of $mg - F\cos 6 = ma$ (1) • $F = 8700 \text{ N}$ (1) <p>(ecf from (a)(i), direction of a must be negative for MP2, $F = 8900 \text{ N}$ using the show that value)</p> <p><u>Example of calculation</u></p> $600 \text{ kg} \times (3.8 \text{ N kg}^{-1}) - F\cos 6 = 600 \text{ kg} \times (-10.6 \text{ m s}^{-2})$ $F = 8690 \text{ N}$	3

16(b)	<p>Either</p> <ul style="list-style-type: none"> Free fall means that weight/gravity is the only force acting on the object/probe (1) There will also be resistive forces acting on the probe (1) Use $v^2 = u^2 + 2as$ to determine the acceleration (1) $a = 2.4 \text{ m s}^{-2}$ (1) Acceleration (of free-fall on Mars) = $3.8 \text{ (m s}^{-2}\text{)}$ (1) Comparison of their calculated acceleration to acceleration of free-fall with reason e.g. 2.4 m s^{-2} is lower than 3.8 m s^{-2} so it was not in free fall. (1) <p>Or</p> <ul style="list-style-type: none"> Free fall means that weight/gravity is the only force acting on the object/probe (1) There will also be resistive forces acting on the probe (1) Use $v^2 = u^2 + 2as$ to determine the final velocity (1) using $a = 3.8 \text{ (m s}^{-2}\text{)}$ (1) $v = 181 \text{ m s}^{-1}$ (1) Comparison of their calculated velocity to 150 m s^{-1} with reason (1) <p>Or</p> <ul style="list-style-type: none"> Free fall means that weight/gravity is the only force acting on the object/probe (1) There will also be resistive forces acting on the probe (1) Use $v^2 = u^2 + 2as$ to determine the displacement (1) Using $a = 3.8 \text{ (m s}^{-2}\text{)}$ (1) $s = 2.4 \text{ km}$ (1) Comparison of their calculated displacement to 3.7 km with reason (1) <p><u>Example of calculation</u> $(150 \text{ m s}^{-1})^2 = (68 \text{ m s}^{-1})^2 + (2 \times a \times 3700 \text{ m})$ $a = 2.42 \text{ m s}^{-2}$</p>	6
	Total for question 16	11