

Question Number	Answer	Mark
18(a)	<p>Use of $P = W / t$ and $\Delta W = F \Delta s$ (1) Force = 13.9 (kN) (1)</p> <p><u>Example of calculation</u> In 1 second $W = 6250$ J and distance travelled = 0.450 m $F = 6250 \text{ W} \div 0.450 \text{ m s}^{-1} = 13.9 \text{ kN}$</p>	2
18(b)	<p>Use of $\Delta W = F \Delta s$ (1) Use of $\Delta s = 4.35 / \sin 6.0^\circ$ (1) Total work = 5.8×10^5 J (allow ecf from (a)) (1)</p> <p><u>Example of calculation</u> $\Delta W = 13.9 \times 10^3 \text{ N} \times 4.35 \text{ m} \div \sin 6.0^\circ = 578 \text{ kJ}$</p>	3
18(c)	<p>Use of $\Delta E_{\text{grav}} = m g \Delta h$ (1) Useful work done = 89.6 (kJ) (1)</p> <p><u>Example of calculation</u> $\Delta E_{\text{grav}} = 2.10 \times 10^3 \text{ kg} \times 9.81 \text{ N kg}^{-1} \times 4.35 \text{ m} = 89.6 \text{ kJ}$</p>	2
18(d)	<p>Use of $\varepsilon = \text{useful energy output} / \text{total energy input}$ (1) Efficiency = 0.16 (allow ecf from (b) and (c)) (1)</p> <p><u>Example of calculation</u> $\varepsilon = 89.6 \text{ kJ} \div 578 \text{ kJ} = 0.155$</p>	2
Total for question 18		9