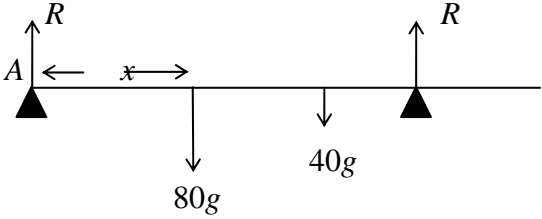
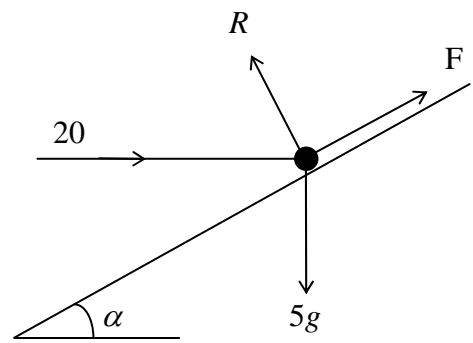
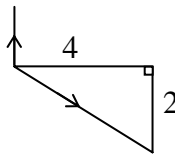
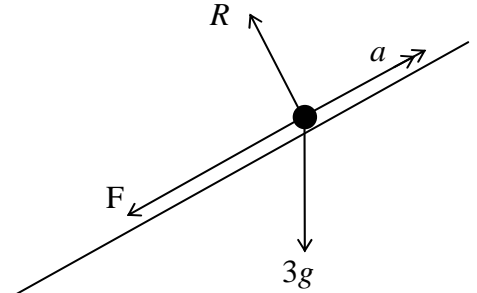
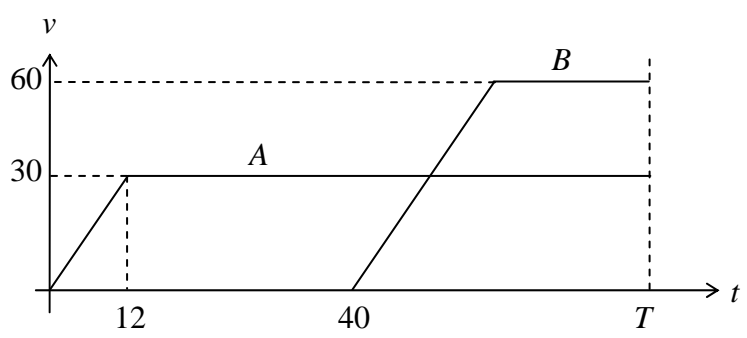


Question Number	Scheme	Marks
<p>1. (a)</p>  <p>$R(\uparrow): 2R = 80g + 40g$ $R = 60g$ or 588 N</p> <p>(b) $M(A): 80g \times x + 40g \times 2 = 60g \times 3$ $\Rightarrow x = 1\frac{1}{4}$ m</p>		<p>M1 A1 (2) M1 A2 ft (-1 eoo) A1 (4) (6 marks)</p>
<p>2. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$I = 0.12 \times 3 = 0.36$, Ns</p> <p>$0.12 \times 3 = 0.12 \times 1.2 + 0.08v$ $\Rightarrow v = 2.7$ m s⁻¹</p> <p>$I = 0.12 \times (3 - 1.2)$ or 0.08×2.7 $= 0.216$ Ns</p>	<p>B1, B1 (2) M1 A1 A1 (3) M1 A1 (2) (7 marks)</p>
<p>3. (a)</p> <p>(b)</p> <p>(c)</p>	<p>“$v^2 = u^2 + 2as$”: $v^2 = 4^2 + 2 \times g \times 5$ $v \approx 10.7$ m s⁻¹ (accept 11 m s⁻¹)</p> <p>“$v = u + at$”: $-10.7 = 4 - gt$ $t = \frac{14.7}{g} = 1.5$ s</p> <p>Air resistance; ‘spin’; height of diver; hit board again; horizontal component of velocity (any two)</p>	<p>M1 A1 A1 (3) M1 A1 ft A1 (3) B1 B1 (2) (8 marks)</p>
<p>4.</p> 	<p>$R(\sphericalangle): R = 5g \cos \alpha + 20 \sin \alpha$ $R(\sphericalleftarrow): F + 20 \cos \alpha = 5g \sin \alpha$ Using $\cos \alpha = \frac{4}{5}$ or $\sin \alpha = \frac{3}{5}$ [$\Rightarrow R = 51.2$ N; $F = 13.4$ N] Using $F = \mu R$ Solving: $\mu = 0.262$ (accept 0.26)</p>	<p>M1 A1 M1 A1 B1 M1 M1 A1 (8) (8 marks)</p>

(ft = follow through mark; -1eeoo = minus one mark for each error or omission)

Question Number	Scheme	Marks
<p>5. (a)</p> <p>(b)</p> <p>(c)</p>	<p>“$v = u + at$”: $\mathbf{v} = (-2 + 2t)\mathbf{i} + (7 - 3t)\mathbf{j}$</p> <p>$\mathbf{v}$ parallel to $\mathbf{i} \Rightarrow 7 - 3t = 0 \Rightarrow t = 2\frac{1}{3}$ s</p> <p>$t = 3, \mathbf{v} = 4\mathbf{i} - 2\mathbf{j}$</p> <p>$\mathbf{v} = \sqrt{20} \approx 4.47 \text{ m s}^{-1}$</p> <p>Angle = $(\arctan \frac{2}{4}), + 90^\circ = 116.6^\circ$ (accept 117°) [or $180^\circ - (\arctan \frac{4}{2})$]</p> 	<p>M1 A1</p> <p>M1 A1 (4)</p> <p>M1</p> <p>M1 A1 (3)</p> <p>M1, M1 A1 (3)</p> <p>[M1 M1 A1]</p> <p>(10 marks)</p>
<p>6. (a)</p> <p>(b)</p>	 <p>$R(\sphericalangle): R = 3g \cos 30^\circ (= 25.46 \text{ N})$</p> <p>$F = 0.4R \approx 10.2 \text{ N}$ (accept 10 N)</p> <p>$R(\sphericalcap): -F + 3g \sin 30^\circ = 3a$</p> <p>$\Rightarrow a \approx 8.3 \text{ m s}^{-2}$</p> <p>“$v^2 = u^2 + 2as$”: $6^2 = 2 \times a \times s$</p> <p>$\Rightarrow s \approx 2.17 \text{ m}$ (accept 2.2 m)</p>	<p>M1 A1</p> <p>M1 A1 (4)</p> <p>M1 A2 (-1 eooo)</p> <p>M1 A1</p> <p>M1</p> <p>A1 (7)</p> <p>(11 marks)</p>
<p>7. (a)</p> <p>(b)</p>	 <p>Shape for A</p> <p>Shape for B with parallel slope</p> <p>Figures</p> <p>Distance moved by A = $\frac{1}{2} \times 12 \times 30, + 30(T - 12)$</p> <p>B accelerates for 24 s</p> <p>Distance moved by B = $\frac{1}{2} \times 24 \times 60, + 60(T - 64)$</p> <p>$\frac{1}{2} \times 12 \times 30, + 30(T - 12) = \frac{1}{2} \times 24 \times 60, + 60(T - 64)$</p> <p>$\Rightarrow T = 98 \text{ s}$</p>	<p>B1</p> <p>B1</p> <p>B1 (3)</p> <p>B1, M1 A1</p> <p>B1</p> <p>B1, M1 A1</p> <p>M1</p> <p>A1 (9)</p> <p>(12 marks)</p>

(ft = follow through mark; -1 eooo = minus one mark for each error or omission)

Question Number	Scheme	Marks
8.	(a) Car + truck: $2000a = 2400 - 600 - 400$ $a = 0.7 \text{ m s}^{-2}$	M1 A1 A1 (3)
	(b) Car only: $T - 400 = 800 \times 0.7$ [or truck only: $2400 - T - 600 = 1200 \times 0.7$] $T = 960 \text{ N}$	M1 A1 ft A1 (3)
	(c) New acceleration of truck a' given by $1200 a' = 2400 - 600$ $a' = 2400 - 600 = 1.5 \text{ m s}^{-1}$	M1 A1
	Time to reach $28 \text{ m s}^{-1} = \frac{28 - 20}{1.5} = 5.33 \text{ s}$	M1 A1
	Time to reach 28 m s^{-1} if rope had not broken = $\frac{28 - 20}{0.7} = 11.43 \text{ s}$ Difference = $6.1 \text{ s} \approx 6 \text{ s} (*)$	M1 A1 A1 (7) (13 marks)

(ft = follow through mark; (*) indicates final line is given on the paper)