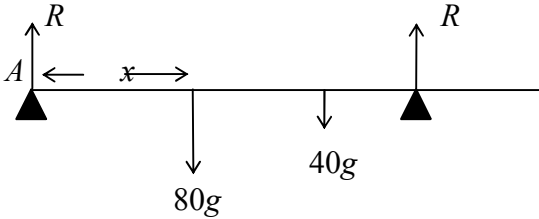
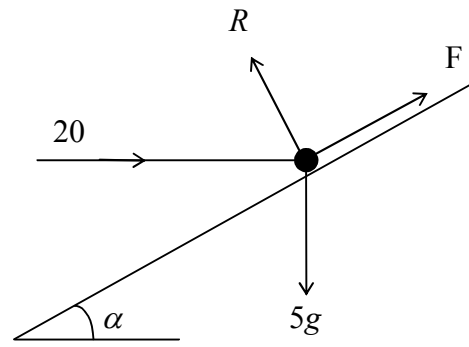
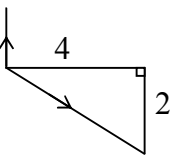
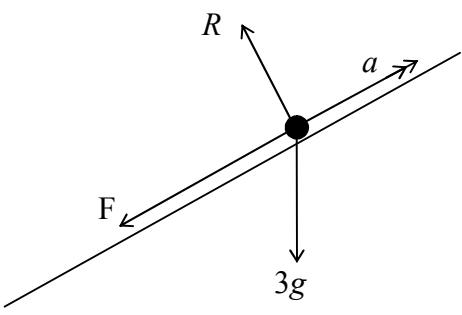
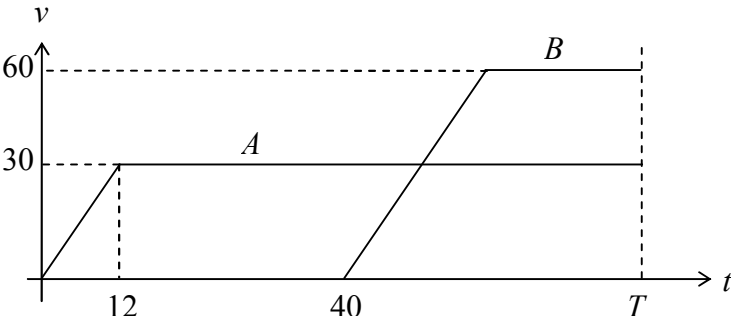


Question Number	Scheme	Marks
<p>1. (a)</p>  <p><math>R(\uparrow): 2R = 80g + 40g</math>  <math>R = 60g</math> or 588 N</p> <p>(b) <math>M(A): 80g \times x + 40g \times 2 = 60g \times 3</math>  <math>\Rightarrow x = 1\frac{1}{4}</math> m</p>	<p>M1  A1 (2)  M1 A2 ft  (-1 eeo)</p> <p>A1 (4)</p> <p><b>(6 marks)</b></p>	
<p>2. (a)</p> <p>(b)</p> <p>(c)</p>	<p><math>I = 0.12 \times 3 = 0.36, \text{Ns}</math></p> <p><math>0.12 \times 3 = 0.12 \times 1.2 + 0.08v</math>  <math>\Rightarrow v = 2.7 \text{ m s}^{-1}</math></p> <p><math>I = 0.12 \times (3 - 1.2)</math> or <math>0.08 \times 2.7</math>  <math>= 0.216 \text{ Ns}</math></p>	<p>B1, B1 (2)  M1 A1  A1 (3)  M1  A1 (2)</p> <p><b>(7 marks)</b></p>
<p>3. (a)</p> <p>(b)</p> <p>(c)</p>	<p>“<math>v^2 = u^2 + 2as</math>”: <math>v^2 = 4^2 + 2 \times g \times 5</math>  <math>v \approx 10.7 \text{ m s}^{-1}</math> (accept <math>11 \text{ m s}^{-1}</math>)</p> <p>“<math>v = u + at</math>”: <math>-10.7 = 4 - gt</math>  <math>t = \frac{14.7}{g} = 1.5 \text{ s}</math></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)</p> <p><b>(8 marks)</b></p>
<p>4.</p> 	<p><math>R(\searrow): R = 5g \cos \alpha + 20 \sin \alpha</math></p> <p><math>R(\nearrow): F + 20 \cos \alpha = 5g \sin \alpha</math></p> <p>Using <math>\cos \alpha = \frac{4}{5}</math> or <math>\sin \alpha = \frac{3}{5}</math></p> <p>[<math>\Rightarrow R = 51.2 \text{ N}; F = 13.4 \text{ N}</math>]</p> <p>Using <math>F = \mu R</math></p> <p>Solving: <math>\mu = 0.262</math> (accept 0.26)</p>	<p>M1 A1  M1 A1  B1  M1  M1 A1 (8)</p> <p><b>(8 marks)</b></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>“<math>v = u + at</math>”: <math>\mathbf{v} = (-2 + 2t)\mathbf{i} + (7 - 3t)\mathbf{j}</math></p> <p><math>\mathbf{v}</math> parallel to <math>\mathbf{i} \Rightarrow 7 - 3t = 0 \Rightarrow t = 2\frac{1}{3}</math> s</p> <p><math>t = 3, \mathbf{v} = 4\mathbf{i} - 2\mathbf{j}</math></p> <p><math> \mathbf{v}  = \sqrt{20} \approx 4.47 \text{ m s}^{-1}</math></p> <p>Angle = <math>(\arctan \frac{2}{4}), + 90^\circ = 116.6^\circ</math> (accept <math>117^\circ</math>)  [or <math>180^\circ - (\arctan \frac{4}{2})</math>]</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><b>(10 marks)</b></p>
<p>6. (a)</p> <p>(b)</p>	 <p><math>R(\sphericalangle): R = 3g \cos 30^\circ (= 25.46 \text{ N})</math></p> <p><math>F = 0.4R \approx 10.2 \text{ N}</math> (accept 10 N)</p> <p><math>R(\sphericalcap): -F + 3g \sin 30^\circ = 3a</math></p> <p><math>\Rightarrow a \approx 8.3 \text{ m s}^{-2}</math></p> <p>“<math>v^2 = u^2 + 2as</math>”: <math>6^2 = 2 \times a \times s</math></p> <p><math>\Rightarrow s \approx 2.17 \text{ m}</math> (accept 2.2 m)</p>	<p>M1 A1</p> <p>M1 A1 (4)</p> <p>M1 A2 (-1 eeo)</p> <p>M1 A1</p> <p>M1</p> <p>A1 (7)</p> <p><b>(11 marks)</b></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 = <math>\frac{1}{2} \times 12 \times 30, + 30(T - 12)</math></p> <p>B accelerates for 24 s</p> <p>Distance moved by B = <math>\frac{1}{2} \times 24 \times 60, + 60(T - 64)</math></p> <p><math>\frac{1}{2} \times 12 \times 30, + 30(T - 12) = \frac{1}{2} \times 24 \times 60, + 60(T - 64)</math></p> <p><math>\Rightarrow T = 98 \text{ s}</math></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><b>(12 marks)</b></p>

(ft = follow through mark; -1 eeo = 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 $28 \text{ m s}^{-1}$ if rope had not broken = $\frac{28 - 20}{0.7} = 11.43 \text{ s}$	M1 A1
	Difference = $6.1 \text{ s} \approx 6 \text{ s} (*)$	A1 (7) <b>(13 marks)</b>

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