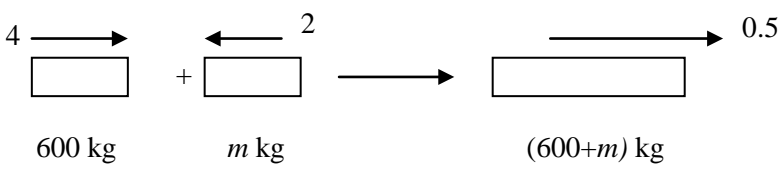
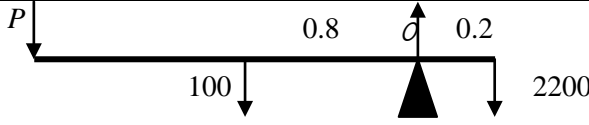
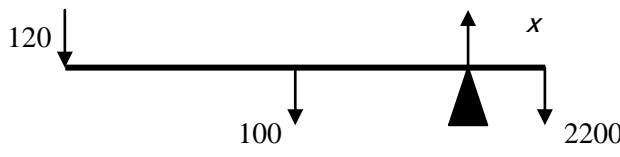
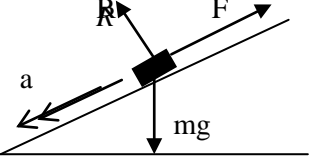
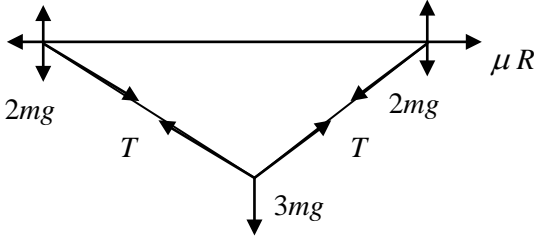
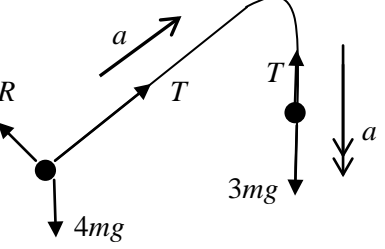
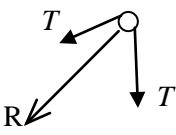
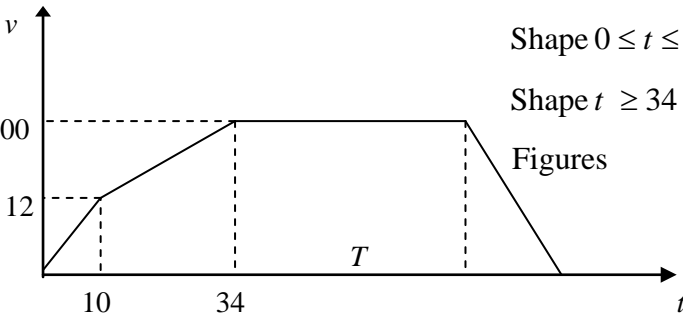


Question Number	Markscheme	Marks
1	<div style="text-align: center;">  </div> <p>(a) CLM: $600 \times 4 - m \times 2 = (600 + m) \times 0.5$</p> <p style="margin-left: 40px;">$\Rightarrow m = \underline{840\text{kg}}$</p> <p>(b) $I = 600(4 - 0.5)$</p> <p style="margin-left: 40px;">$= \underline{2100 \text{Ns}}$</p>	<p style="text-align: center;">M1 A1 ↓ M1 A1 (4)</p> <p style="text-align: center;">M1 → M1</p> <p style="text-align: center;">A1 (3)</p>
2	<p>(a)</p> <div style="text-align: center;">  </div> <p>M(C): $P \times 1.8 + 100 \times 0.8 = 2200 \times 0.2$</p> <p style="margin-left: 40px;">$\Rightarrow P = \underline{200 \text{N}}$</p> <p>(b)</p> <div style="text-align: center;">  </div> <p>M(C): $120(2 - x) + 100(1 - x) = 2200x$</p> <p style="margin-left: 40px;">$\Rightarrow 340 = 2420x \Rightarrow x \approx \underline{14 \text{cm}}$ (Solve x)</p>	<p style="text-align: center;">M1 A2, 1, 0</p> <p style="text-align: center;">A1 (4)</p> <p style="text-align: center;">M1 A2, 1, 0 ↓ M1 A1 (5)</p>

Question Number	Markscheme	Marks
3 (a)	 <p style="text-align: center;">R</p> $R(\perp): R = mg \cos 30$ $R(\parallel): ma = mg \sin 30 - F$ <p style="text-align: center;">$F = 0.4 R$ used</p> <p style="text-align: center;">Eliminate R $ma = mg \sin 30 - 0.4 \cdot mg \cos 30$</p> <p style="text-align: center;">Solve: $a = 4.9 - 0.4 \times 9.8 \times \frac{\sqrt{3}}{2}$ $\approx \underline{1.5 \text{ or } 1.51 \text{ m s}^{-2}}$</p> <p>(b) $v^2 = 2 \times 1.51 \times 3 \Rightarrow v = \underline{3 \text{ or } 3.01 \text{ m s}^{-1}}$</p> <p>(c) $1.5/1.51 \text{ m s}^{-2}$ (same as (a))</p>	<p style="text-align: right;">B1</p> <p style="text-align: right;">M1 A1</p> <p style="text-align: right;">B1</p> <p style="text-align: center;">↓</p> <p style="text-align: right;">M1</p> <p style="text-align: center;">↓</p> <p style="text-align: right;">M1</p> <p style="text-align: right;">A1 (7)</p> <p style="text-align: right;">M1 A1 (2)</p> <p style="text-align: right;">B1 (1)</p>
4 (a)	 <p style="text-align: right;">$R \uparrow$ for C: $2T \sin \theta = 3 mg$</p> <p style="text-align: right;">$\sin \theta = \frac{3}{5} \Rightarrow T = \frac{5}{2} mg$ (*)</p> <p>(b) $R \uparrow$ for A or B: $R = 2mg + T \sin \theta$</p> <p style="text-align: center;">$= 2mg + \frac{5}{2} mg \cdot \frac{3}{5} = \frac{7}{2} mg$</p> <p>$R \rightarrow$ for A or B: $T \cos \theta = \mu R$</p> <p>Solve to get μ as number: $\frac{5}{2} mg \cdot \frac{4}{5} = \mu \cdot \frac{7}{2} mg \Rightarrow \mu = \frac{4}{7}$ (Accept 0.57 awrt)</p>	<p style="text-align: right;">M1 A1</p> <p style="text-align: right;">A1</p> <p style="text-align: right;">(3)</p> <p style="text-align: right;">M1 A1</p> <p style="text-align: center;">↓</p> <p style="text-align: right;">M1 A1</p> <p style="text-align: right;">M1</p> <p style="text-align: center;">↓ ↓</p> <p style="text-align: right;">M1 A1 (7)</p>

Question Number	Markscheme	Marks
5 (a)	 $A: T - 4g \sin 30 = 4a$ $B: 3g - T = 3a$ $\Rightarrow T = \frac{18g}{7} = \underline{25.2 \text{ N}}$	<p>M1 A1</p> <p>M1 A1</p> <p>M1 A1 (6)</p>
5 (b)	 $R = 2T \cos 30$ $\approx \underline{44 \text{ or } 43.6 \text{ N}}$	<p>M1 A1</p> <p>A1 (3)</p>
5 (c)	(i) String has no weight/mass	B1
	(ii) Tension in string constant, i.e. same at A and B	B1 (2)
6 (a)	<p>After 10 s, speed = $1.2 \times 10 = 12 \text{ m s}^{-1}$</p> <p>After next 24 s, $v = "u + at" = 12 + 0.75 \times 24 = 30 \text{ m s}^{-1}$</p>	<p>B1</p> <p>M1 A1 (3)</p>
6 (b)	 <p>Shape $0 \leq t \leq 34$</p> <p>Shape $t \geq 34$</p> <p>Figures</p>	<p>B1</p> <p>B1</p> <p>B1</p>
6 (c)	$\text{Distance} = \frac{1}{2} \times 10 \times 12 + \frac{1}{2} (30 + 12) 24$ $= 60 + 504 = \underline{564 \text{ m}}$	<p>B1, M1 A1</p> <p>A1 (4)</p>
6 (d)	$\text{Distance travelled decelerating} = \frac{1}{2} \times 30 \times 10$ $564 + 30T + \frac{1}{2} \times 30 \times 10 = 3000$ $\Rightarrow T = \underline{76.2 \text{ s}}$	<p>B1</p> <p>M1 A1$\sqrt{\quad}$</p> <p>A1 (4)</p>

Question Number	Markscheme	Marks
7 (a)	$\tan \theta = \frac{3}{5} \Rightarrow \theta = 031^\circ$	M1 A1 (2)
(b)	$\mathbf{a} = 9t \mathbf{j}$ $\mathbf{b} = (-10 + 3t)\mathbf{i} + 5t \mathbf{j}$	B1 M1 A1 (3)
(c)	B south of A $\Rightarrow -10 + 3t = 0$ $t = 3\frac{1}{3} \Rightarrow \underline{1520 \text{ hours}}$	M1 A1 (2)
(d)	$AB = \mathbf{b} - \mathbf{a} = (3t - 10)\mathbf{i} + 5t \mathbf{j}$ $d^2 = \mathbf{b} - \mathbf{a} ^2 = (3t - 10)^2 + 16t^2$ $= 25t^2 - 60t + 100 \quad (*)$	M1 A1 ↓ M1 A1 (4)
(e)	$d = 10 \Rightarrow d^2 = 100 \Rightarrow 25t^2 - 60t = 0$ $\Rightarrow t = (0 \text{ or }) 2.4$ $\Rightarrow \text{time } \underline{1424 \text{ hours}}$	M1 A1 (3)