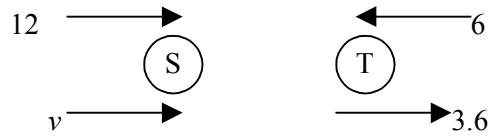
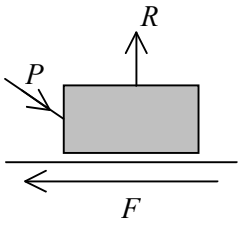
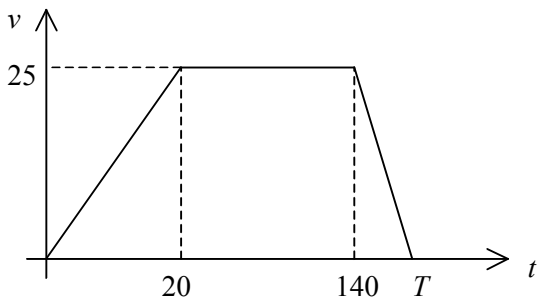
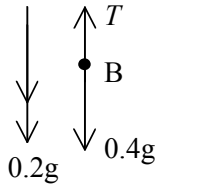
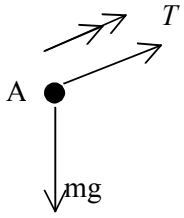
EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

Question Number	Scheme	Marks
1.	**(a)** $0^2 = u^2 - 2\times 9.8\times 40$	M1 A1
	$\Rightarrow \quad \underline{u = 28 \text{ ms}^{-1}}$	A1 (3)
	(b) $-28 = 28 - 9.8\times t$	M1 A1$\surd$
	$\Rightarrow \quad \underline{t = 5.7 \text{ or } 5.71 \text{ s}}$	A1 (3) **6**
2.		
	(a) $28800 = 2000\,(12 - v)$	M1 A1
	$v = -2.4\text{ms}^{-1}$ Speed $= \underline{2.4 \text{ ms}^{-1}}$	A1 (3)
	(b) due west / $\leftarrow$ /reversed direction (o.e.)	A1$\surd$ (1)
	(c) T : $28800 = m(6 + 3.6)$	M1 A1
	$\Rightarrow m = \underline{3000 \text{ kg}}$	M1 A1 (4)
	OR $2000\times 12 - 6\times m = -\ 2000\times 2.4 + m\times 3.6$	M1 A1$\surd$
	$\Rightarrow \quad m = 3000\,\text{kg}$	M1 A1 **8**
3.		
	R $\uparrow$: $R = 50\text{g} + P\sin 30°$	M1 A2, 1, 0
	R $\rightarrow$: $F = P\cos 30°$	M1 A1
	$F = \frac{3}{5}R$ used	B1
	$P\cos 30° = \frac{3}{5}(50\text{g} + P\sin 30°)$ Elim F, R	M1
	Solve $\underline{P = 520 \quad \text{or} \quad 519 \text{ N}}$	M1 A1 **9**

Question Number	Scheme	Marks
4.	**(a)**  Shape Figs	B1 B1 (2)
	(b) $\frac{1}{2}(T+120)\times 25 = 4000$ $\left[\text{ or } \frac{1}{2}.20.25, +120.25+\frac{1}{2}(T-140).25 = 4000\right]$ $\rightarrow T = \underline{200\text{ s}}$	M1 A1 A1 (3)
	(c) Car: $\frac{1}{2}.20.25, +25(t-20) = 1500$ $\rightarrow t = 70\text{s}$ Hence motorcycle travels for 60s	M1 A1, A1 M1 A1 (5)
	(d) $1500 = \left(\frac{0+v}{2}\right).60$ $v = \underline{50\,\text{ms}^{-1}}$	M1 A1 (2)
		12
5.	**(a)** $a = \frac{1}{4}\left[(5\mathbf{i}+11\mathbf{j})-(3\mathbf{i}-5\mathbf{j})\right] = -2\mathbf{i}+4\mathbf{j}$	M1 A1 (2)
	(b) $\mathbf{F} = m\mathbf{a} = -6\mathbf{i}+12\mathbf{j}$ $\lvert\mathbf{F}\rvert = \sqrt{180} \simeq 13.4\text{ N}$ (AWRT) [**OR** $\lvert\mathbf{a}\rvert = \sqrt{20} \simeq 4.47 \Rightarrow \lvert\mathbf{F}\rvert = 3\times 4.47 \simeq 13.4\text{ N}$]	M1 A1 M1 A1 (4)
	(c) $t=6$ $\mathbf{v} = 3\mathbf{i}-5\mathbf{j}+6(-2\mathbf{i}+4\mathbf{j})$ $[=-9\mathbf{i}+19\mathbf{j}]$ At B : $\mathbf{r} = (6\mathbf{i}-29\mathbf{j})+3(-9\mathbf{i}+19\mathbf{j})$ $[=-21\mathbf{i}+28\mathbf{j}]$ $\text{OB} = \sqrt{(21^2+28^2)} = \underline{35\,\text{m}}$	M1 A1√ M1 A1√ M1 A1√ (6)
		12

Question Number	Scheme	Marks
6.	**(a)** M(D): $160 \times 2.5 = W \times 4 + 200(4 - x)$ $400 = 4W + 800 - 200x$ $200x - 4W = 400 \Rightarrow 50x - W = 100$ *	M1 A2, 1, 0 M1 A1 (5)
	(b) M(D): $50 \times 2.5 + W \times 1 = 200(4 - x)$ $200x + W = 675$	M1 A2, 1, 0 (3)
	(c) Solving $\rightarrow$ $x = \underline{3.1\text{m}}$: $W = \underline{55\text{N}}$	M1 A1 M1 A1 (4)
		12
7.	**(a)**  $0.4\text{g} - T = 0.4 \times \frac{1}{5}\text{g}$	M1 A1 (2)
	(b) $T = \underline{\frac{8}{25}g}$ or 3.14 or 3.1 N	M1 A1 (2)
	(c)  $T - mg\sin 30° = m \times \frac{1}{5}\text{g}$ $\rightarrow m = \underline{\frac{16}{35}}$ *	M1 A1 M1 A1 (4)
	(d) Same T for A & B	B1 (1)
	(e) $v^2 = 2 \times \frac{1}{5}g \times 1$ $v = \underline{\sqrt{\frac{2g}{5}} \simeq 1.98 \text{ or } 2 \text{ ms}^{-1}}$	M1 A1 (2)
	(f) A: $-\frac{1}{2}mg = ma \Rightarrow a = -\frac{1}{2}g$ $v^2 = \frac{2g}{5} - 2 \times \frac{1}{2}g \times 0.4$ $\Rightarrow v = 0$	M1 A1 M1 A1√ (5) A1
		16