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Mark Scheme (Results)
Summer 2007

GCE

GCE Mathematics

Mechanics M1 6677

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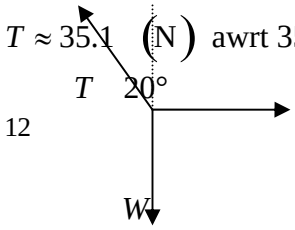
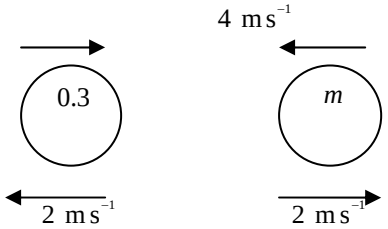
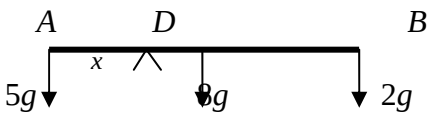
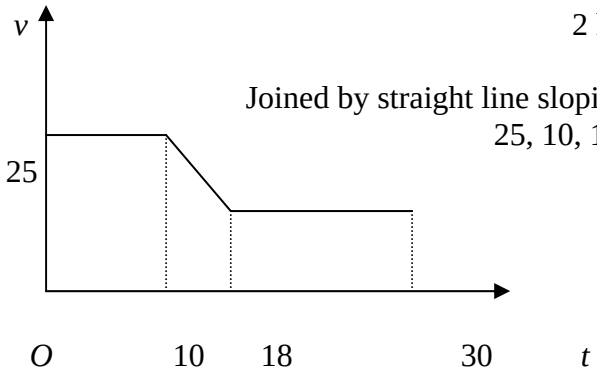
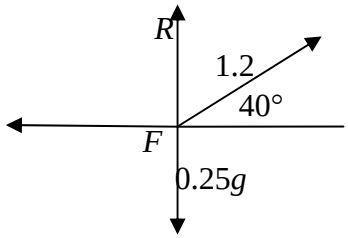
June 2007
6677 Mechanics M1
Mark Scheme

Question Number	Scheme	Marks
1.	(a) $\rightarrow T\sin 20° = 12$  $T \approx 35.1$ (N) awrt 35 (b) $\uparrow W = T\cos 20°$ ≈ 33.0 (N) awrt 33	M1 A1 A1 **(3)** M1 A1 DM1 A1 **(4)** **[7]**
2.	 (a) A: $I = 0.3(8+2)$ $= 3$ (Ns) (b) LM $0.3\times 8 - 4m = 0.3\times(-2) + 2m$ $m = 0.5$ *Alternative to* (b) B: $m(4+2) = 3$ $m = 0.5$ The two parts of this question may be done in either order.	M1 A1 A1 **(3)** M1 A1 DM1 A1 **(4)** **[7]** M1 A1 DM1 A1 **(4)**

Question Number	Scheme	Marks
3.	(a) M(C) $8g \times (0.9 - 0.75) = mg(1.5 - 0.9)$ Solving to $m = 2$ ✱ cso	M1 A1 DM1 A1 **(4)**
	(b)  M(D) $5g \times x = 8g \times (0.75 - x) + 2g(1.5 - x)$ Solving to $x = 0.6$ (AD = 0.6 m)	M1 A2(1, 0) DM1 A1 **(5)** **[9]**
4.	(a)  lines 2 horizontal Joined by straight line sloping down 25, 10, 18, 30 oe	B1 B1 B1 **(3)**
	(b) $25 \times 10 + \frac{1}{2}(25 + V) \times 8 + 12 \times V = 526$ Solving to $V = 11$	M1 A1 A1 DM1 A1 **(5)**
	(c) "$v = u + at$" $\Rightarrow$ $11 = 25 - 8a$ ft their V $a = 1.75$ $\left(\text{m s}^{-2}\right)$	M1 A1ft A1 **(3)**
		[11]

Question Number	Scheme	Marks
5.	(a) 	
	$\uparrow \quad \pm\ R + 1.2\sin 40° = 0.25g$	M1 A1
	Solving to $R = 1.7 \quad (\text{N})$ accept 1.68	DM1 A1 **(4)**
	(b) $\rightarrow \quad F = 1.2\cos 40° \quad (\approx 0.919)$	M1 A1
	Use of $F = \mu R$	B1
	$1.2\cos 40° = \mu R$ ft their R	DM1 A1ft
	$\mu \approx 0.55$ accept 0.548	A1 cao **(6)**
		[10]

Question Number	Scheme	Marks
6.	(a) $s = ut + \frac{1}{2}at^2 \Rightarrow 3.15 = \frac{1}{2}a \times \frac{9}{4}$ $a = 2.8 \quad (\text{m s}^{-2})$ ∗ cso	M1 A1 A1 **(3)**
	(b) N2L for P: $0.5g - T = 0.5 \times 2.8$ $T = 3.5 \quad (\text{N})$	M1 A1 A1 **(3)**
	(c) N2L for Q: $T - mg = 2.8m$ $m = \frac{3.5}{12.6} = \frac{5}{18}$ ∗ cso	M1 A1 DM1 A1 **(4)**
	(d) The acceleration of P is equal to the acceleration of Q.	B1 **(1)**
	(e) $v = u + at \Rightarrow v = 2.8 \times 1.5$ (or $v^2 = u^2 + 2as \Rightarrow v^2 = 2 \times 2.8 \times 3.15$) $(v^2 = 17.64, v = 4.2)$	M1 A1
	$v = u + at \Rightarrow 4.2 = -4.2 + 9.8t$ $t = \frac{6}{7}$, 0.86, 0.857 (s)	DM1 A1 DM1 A1 **(6)**
		[17]

Question Number	Scheme	Marks
7.	(a) $\mathbf{v} = \dfrac{8\mathbf{i} + 11\mathbf{j} - (3\mathbf{i} - 4\mathbf{j})}{2.5}$ or any equivalent	M1 A1
	$\mathbf{v} = 2\mathbf{i} + 6\mathbf{j}$	A1 **(3)**
	(b) $\mathbf{b} = 3\mathbf{i} - 4\mathbf{j} + \mathbf{v}t$ ft their $\mathbf{v}$	M1 A1 ft
	$= 3\mathbf{i} - 4\mathbf{j} + (2\mathbf{i} + 6\mathbf{j})t$	A1cao **(3)**
	(c) **i** component: $-9 + 6t = 3 + 2t$	M1
	$t = 3$	M1 A1
	j component: $20 + 3\lambda = -4 + 18$	M1
	$\lambda = -2$	A1 **(5)**
	(d) $v_B = \sqrt{(2^2 + 6^2)}$ or $v_C = \sqrt{(6^2 + (-2)^2)}$	M1
	Both correct	A1
	The speeds of B and C are the same cso	A1 **(3)** **[14]**