

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

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) $A D B$ $5g \checkmark 2g$ $M(D) \qquad 5g \times x = 8g \times (0.75 - x) + 2g (1.5 - x)$ Solving to $x = 0.6$ ($AD = 0.6$ m)	M1 A2(1, 0) DM1 A1 (5) [9]
4.	(a) v 2 horizontal lines v Joined by straight line sloping down 25 0 10 18 30 t	B1 B1 B1 (3)
	(b) $25 \times 10 + \frac{1}{2}(25+V) \times 8 + 12 \times V = 526$ Solving to $V = 11$	M1 <u>A1</u> A1 DM1 A1 (5)
	$a = 1.75 \text{ (m s}^{-2})$	A1 (3) [11]

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

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

Question Number	Scheme	Marks	
7.	(a) $\mathbf{v} = \frac{8\mathbf{i} + 11\mathbf{j} - (3\mathbf{i} - 4\mathbf{j})}{2.5}$ 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	
	$= 3\mathbf{i} - 4\mathbf{j} + (2\mathbf{i} + 6\mathbf{j})\mathbf{t}$	A1cao	(3)
	(c) i component: $-9 + 6t = 3 + 2t$	M1	
	<i>t</i> = 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 <i>B</i> and <i>C</i> are the same cso	A1	(3) [14]