

Mark Scheme (Results)

Summer 2007

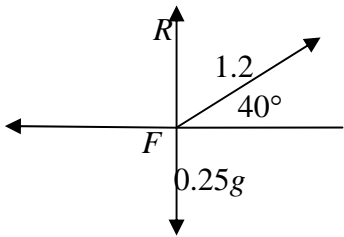
GCE

GCE Mathematics

Mechanics M1 6677

June 2007
6677 Mechanics M1
Mark Scheme

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

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

Question Number	Scheme	Marks
6.	(a) $s = ut + \frac{1}{2}at^2 \Rightarrow 3.15 = \frac{1}{2}a \times \frac{9}{4}$ $a = 2.8 \text{ (ms}^{-2}\text{)} *$	M1 A1 A1 (3)
	(b) N2L for P : $0.5g - T = 0.5 \times 2.8$ $T = 3.5 \text{ (N)}$	M1 A1 A1 (3)
	(c) N2L for Q : $T - mg = 2.8m$ $m = \frac{3.5}{12.6} = \frac{5}{18} *$	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 $v^2 = u^2 + 2as \Rightarrow v^2 = 2 \times 2.8 \times 3.15$) $(v^2 = 17.64, v = 4.2)$ $v = u + at \Rightarrow 4.2 = -4.2 + 9.8t$ $t = \frac{6}{7}, 0.86, 0.857 \text{ (s)}$	M1 A1 DM1 A1 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 $\mathbf{v} = 2\mathbf{i} + 6\mathbf{j}$	M1 A1 A1 (3)
	(b) $\mathbf{b} = 3\mathbf{i} - 4\mathbf{j} + \mathbf{v}t$ ft their \mathbf{v} $= 3\mathbf{i} - 4\mathbf{j} + (2\mathbf{i} + 6\mathbf{j})t$	M1 A1 ft A1cao (3)
	(c) \mathbf{i} component: $-9 + 6t = 3 + 2t$ $t = 3$	M1 M1 A1
	\mathbf{j} component: $20 + 3\lambda = -4 + 18$ $\lambda = -2$	M1 A1 (5)
	(d) $v_B = \sqrt{2^2 + 6^2}$ or $v_C = \sqrt{6^2 + (-2)^2}$	M1
	Both correct The speeds of B and C are the same	A1 cso A1 (3) [14]