

Mark Scheme (Results)

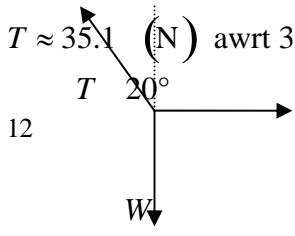
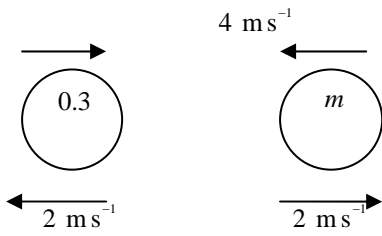
Summer 2007

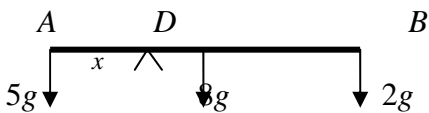
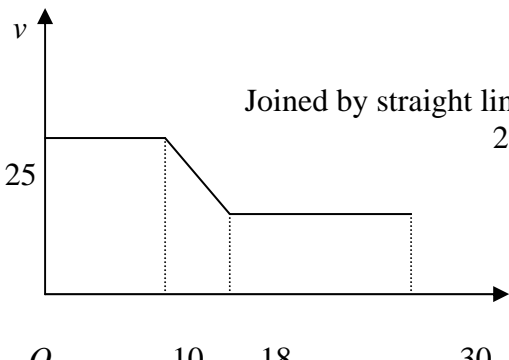
GCE

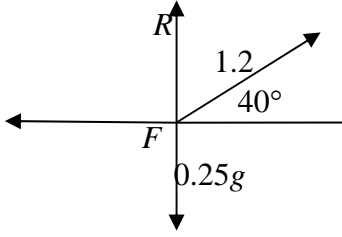
GCE Mathematics

Mechanics M1 6677

June 2007
6677 Mechanics M1
Mark Scheme

Question Number	Scheme	Marks
<p style="text-align: center;">1.</p>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  </div> <div style="width: 50%;"> <p>(a) $\rightarrow T \sin 20^\circ = 12$</p> <p>(b) $\uparrow W = T \cos 20^\circ$ $\approx 33.0 \text{ (N)}$</p> </div> </div>	<p>M1 A1 A1 (3)</p> <p>M1 A1 DM1 A1 (4)</p> <p>[7]</p>
<p style="text-align: center;">2.</p>	<div style="text-align: center; margin-bottom: 20px;">  </div> <p>(a) A: $I = 0.3(8 + 2)$ $= 3 \text{ (Ns)}$</p> <p>(b) LM $0.3 \times 8 - 4m = 0.3 \times (-2) + 2m$ $m = 0.5$</p> <p>Alternative to (b) B: $m(4 + 2) = 3$ $m = 0.5$</p> <p>The two parts of this question may be done in either order.</p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 DM1 A1 (4)</p> <p>[7]</p> <p>M1 A1 DM1 A1 (4)</p>

Question Number	Scheme	Marks
3.	<p>(a) $M(C) 8g \times (0.9 - 0.75) = mg(1.5 - 0.9)$ Solving to $m = 2$ *</p> <p>(b)</p> <div style="text-align: center;">  </div> <p>$M(D) \quad 5g \times x = 8g \times (0.75 - x) + 2g(1.5 - x)$ Solving to $x = 0.6$ ($AD = 0.6$ m)</p>	<p>M1 A1 DM1 A1 (4)</p> <p>cso</p> <p>M1 A2(1, 0) DM1 A1 (5) [9]</p>
4.	<p>(a)</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>lines</p> <p>25</p> <p>O</p> </div> <div style="margin-right: 20px;">  </div> <div style="margin-left: 20px;"> <p>2 horizontal</p> <p>Joined by straight line sloping down</p> <p>25, 10, 18, 30 oe</p> </div> </div> <p>(b) $25 \times 10 + \frac{1}{2}(25 + V) \times 8 + 12 \times V = 526$ Solving to $V = 11$</p> <p>(c) "$v = u + at$" $\Rightarrow 11 = 25 - 8a$ ft their V $a = 1.75 \text{ (ms}^{-2}\text{)}$</p>	<p>B1 B1 B1 (3)</p> <p>M1 <u>A1</u> A1 DM1 A1 (5)</p> <p>M1 A1ft A1 (3)</p> <p>[11]</p>

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

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

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) i component: $-9 + 6t = 3 + 2t$ $t = 3$	M1 M1 A1
	j component: $20 + 3\lambda = -4 + 18$ $\lambda = -2$	M1 A1 (5)
	(d) $v_B = \sqrt{2^2 + 6^2}$ or $v_C = \sqrt{6^2 + (-2)^2}$ Both correct The speeds of <i>B</i> and <i>C</i> are the same cso	M1 A1 A1 (3) [14]