

Mark Scheme (Results) Summer 2010

GCE

GCE Mechanics M1 (6677/01)

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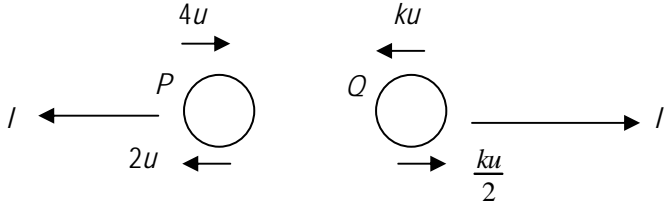
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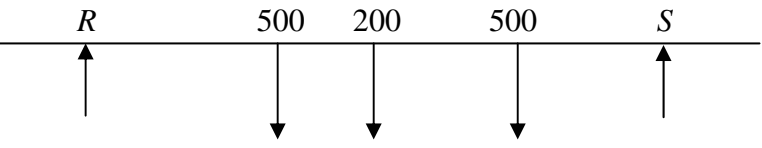
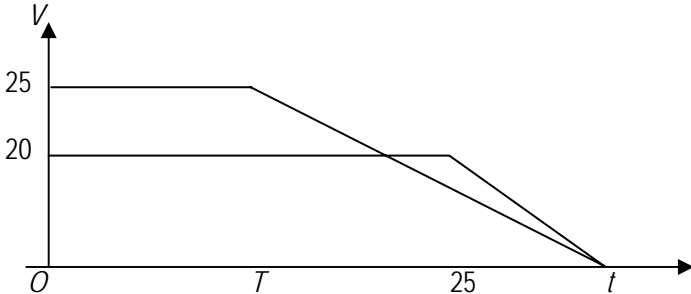
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Question Number	Scheme	Marks
Q1	$(-4\mathbf{i} - 7\mathbf{j}) = \mathbf{r} + 4(-3\mathbf{i} + 2\mathbf{j})$ $\mathbf{r} = (8\mathbf{i} - 15\mathbf{j})$ $ \mathbf{r} = \sqrt{8^2 + (-15)^2} = 17 \text{ m}$	M1 A1 A1 M1 A1 ft <div style="text-align: right;">[5]</div>
Q2 (a)	 $4mu - 3mku = -2mu + 3mk \frac{u}{2}$ $k = \frac{4}{3}$	M1 A1 M1 A1cso (4)
(b)	For P, $I = m(2u - -4u)$ $= 6mu$ OR For Q, $I = 3m(\frac{ku}{2} - -ku)$	M1 A1 A1 (3) (M1A1) <div style="text-align: right;">[7]</div>
Q3	$(\rightarrow) 100\cos 30 = F$ $F = 0.5 R \text{ seen}$ $(\downarrow) mg + 100\cos 60 = R$ $m = 13 \text{ kg or } 12.6 \text{ kg}$	M1 A1 A1 (B1) M1 A1 DM1 A1 <div style="text-align: right;">[7]</div>

Question Number	Scheme	Marks
Q4	<div style="text-align: center;">  </div> <p>$M(B)$, $500x + 500 \cdot 2x + 200 \cdot 3 = Rx5 + Sx1$ (or any valid moments equation)</p> <p>(\downarrow) $R + S = 500 + 500 + 200 = 1200$ (or a moments equation)</p> <p>solving for x; $x = 1.2$ m</p>	<p>M1 A1 A1</p> <p>M1 A1</p> <p>M1 A1 cso</p> <p>[7]</p>
Q5 (a)	<div style="display: flex; align-items: center;"> <div style="flex: 1;">  </div> <div style="flex: 1; padding-left: 20px;"> <p>Shape (both) Cross Meet on t-axis Figures 25,20,T,25</p> </div> </div>	<p>B1 B1 B1 B1</p> <p>(4)</p>
(b)	<p>For Q: $20 \left(\frac{t+25}{2} \right) = 800$ $t = 55$</p> <p>For P: $25 \left(\frac{T+55}{2} \right) = 800$ solving for T: $T = 9$</p>	<p>M1 A1</p> <p>DM1 A1</p> <p>M1 A1</p> <p>DM1 A1 (8)</p> <p>[12]</p>

Question Number	Scheme	Marks
Q6	<p>(a) $(\uparrow)v^2 = u^2 + 2as$ $0 = 14.7^2 - 2 \times 9.8 \times s$ $s = 11.025$ (or 11 or 11.0 or 11.03) m Height is 60 m or 60.0 m ft</p> <p>(b) $(\downarrow)v^2 = u^2 + 2as$ $v^2 = (-14.7)^2 + 2 \times 9.8 \times 49$ $v = 34.3$ or 34 m s⁻¹</p> <p>(c) $(\downarrow)v = u + at$ OR $(\downarrow)s = ut + \frac{1}{2}at^2$ $34.3 = -14.7 + 9.8t$ $49 = -14.7t + 4.9t^2$ $t = 5$ $t = 5$</p>	<p>M1A1 A1 A1ft (4)</p> <p>M1 A1 A1 (3)</p> <p>M1 A1 A1 (3) [10]</p>
Q7	<p>(a) $F = \frac{1}{3}R$ $(\uparrow) R \cos \alpha - F \sin \alpha = 0.4g$ $R = \frac{2}{3}g = 6.53$ or 6.5</p> <p>(b) $(\rightarrow)P - F \cos \alpha - R \sin \alpha = 0$ $P = \frac{26}{45}g = 5.66$ or 5.7</p>	<p>B1</p> <p>M1 A1 M1 A1 (5)</p> <p>M1 A2 M1 A1 (5) [10]</p>

Question Number	Scheme	Marks
Q8 (a) Mark together	$(\downarrow)0.4g - T = 0.4a$ $(\uparrow)T - 0.3g = 0.3a$ solving for T $T = 3.36 \text{ or } 3.4 \text{ or } 12g/35 \text{ (N)}$	M1 A1 M1 A1 DM1 A1 (6)
(b)	$0.4g - 0.3g = 0.7a$ $a = 1.4 \text{ m s}^{-2}, g/7$	DM1 A1 (2)
(c)	$(\uparrow)v = u + at$ $v = 0.5 \times 1.4$ $= 0.7$ $(\uparrow)s = ut + \frac{1}{2}at^2$ $s = 0.5 \times 1.4 \times 0.5^2$ $= 0.175$ $(\downarrow)s = ut + \frac{1}{2}at^2$ $1.175 = -0.7t + 4.9t^2$ $4.9t^2 - 0.7t - 1.175 = 0$ $t = \frac{0.7 \pm \sqrt{0.7^2 + 19.6 \times 1.175}}{9.8}$ $= 0.5663 \text{..or } - \dots$ Ans 0.57 or 0.566 s	M1 A1 ft on a M1 A1 ft on a DM1 A1 ft DM1 A1 cao A1 cao (9) [17]

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