

# Mark Scheme (Results) Summer 2010

GCE

## GCE Mechanics M1 (6677/01)

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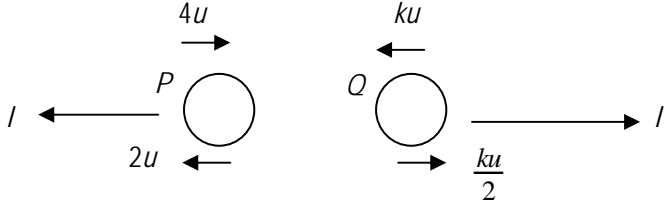
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**Summer 2010**  
**Mechanics M1 6677**  
**Mark Scheme**

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 [5]
Q2 (a)	 $4mu - 3mku = -2mu + 3mk \frac{u}{2}$ $k = \frac{4}{3}$	M1 A1 M1 A1cso (4)
(b)	For P, $I = m(2u - -4u)$ $= 6mu$ <b>OR</b> For Q, $I = 3m(\frac{ku}{2} - -ku)$	M1 A1 A1 (3) (M1A1) [7]
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 [7]

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

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

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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