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Mark Scheme (Results)
Summer 2010

GCE

GCE Mechanics M1 (6677/01)

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Summer 2010

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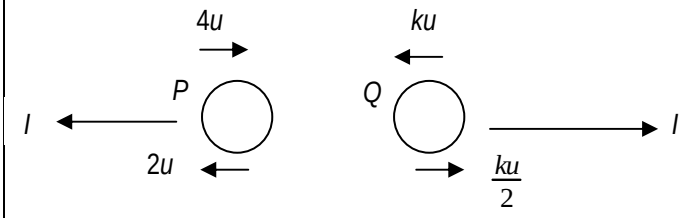
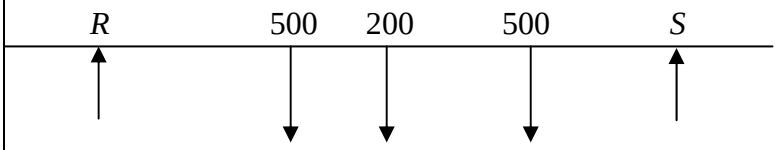
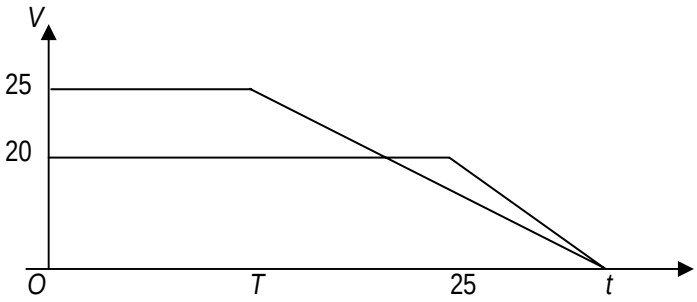
Mechanics M1 6677
Mark Scheme

Question Number	Scheme	Marks
Q1	$(-4\mathbf{i}-7\mathbf{j})=\mathbf{r}+4(-3\mathbf{i}+2\mathbf{j})$ $\mathbf{r}=(8\mathbf{i}-15\mathbf{j})$ $\lvert\mathbf{r}\rvert=\sqrt{8^2+(-15)^2}=17$ 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, $I = m(2u - -4u)$ $= 6mu$ **OR** For Q, $I = 3m(\frac{ku}{2} - -ku)$	M1 A1 A1 (3) **(M1A1)** **[7]**
Q3	$(\rightarrow)$ $100\cos30 = F$ $F = 0.5R$ *seen* $(\downarrow)$ $mg + 100\cos60 = R$ $m = 13$ kg or 12.6 kg	M1 A1 A1 **(B1)** M1 A1 **DM**1 A1 **[7]**

Question Number	Scheme	Marks
Q4	 $M(B)$, $500x + 500.2x + 200x3 = Rx5 + Sx1$ (or any valid moments equation) $(\downarrow)\ R + S = 500 + 500 + 200 = 1200$ (or a moments equation) solving for x; $x = 1.2$ m	M1 A1 A1 M1 A1 M1 A1 cso **[7]**
Q5 (a)	 Shape (both) Cross Meet on t-axis Figures 25,20,T,25	B1 B1 B1 B1 (4)
(b)	For Q: $20\left(\frac{t+25}{2}\right) = 800$ $t = 55$ For P: $25\left(\frac{T+55}{2}\right) = 800$ solving for T: $T = 9$	M1 A1 **DM1** A1 M1 A1 **DM1** A1 (8) **[12]**

Question Number	Scheme	Marks
Q6 (a)	$(\uparrow) v^2 = u^2 + 2as$ $0 = 14.7^2 - 2\text{x } 9.8 \text{ x } s$ s = 11.025 (or 11 or 11.0 or 11.03) m Height is 60 m or 60.0 m **ft**	M1A1 A1 A1ft (4)
(b)	$(\downarrow) v^2 = u^2 + 2as$ $v^2 = (-14.7)^2 + 2\text{x } 9.8 \text{ x } 49$ $v = 34.3$ or 34 m s^{-1}	M1 A1 A1 (3)
(c)	$(\downarrow) v = u + at$ **OR** $(\downarrow) s = ut + \frac{1}{2}at^2$ $34.3 = -14.7 + 9.8t$ $49 = -14.7t + 4.9t^2$ $t = 5$ $t = 5$	M1 A1 A1 (3) **[10]**
Q7 (a)	$F = \frac{1}{3}R$ $(\uparrow)\ R\cos\alpha - F\sin\alpha = 0.4g$ $R = \frac{2}{3}g = 6.53$ or 6.5	B1 M1 A1 M1 A1 (5)
(b)	$(\rightarrow) P - F\cos\alpha - R\sin\alpha = 0$ $P = \frac{26}{45}g = 5.66$ 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 $T = 3.36$ or 3.4 or $12g/35$ (N)	M1 A1 M1 A1 **DM1** A1 (6)
(b)	$0.4g - 0.3g = 0.7a$ $a = 1.4$ m s^{-2}, $g/7$	**DM1** A1 (2)
(c)	$(\uparrow) v = u + at$ $v = 0.5$ x 1.4 $= 0.7$	M1 A1 ft on a
	$(\uparrow) s = ut + \frac{1}{2}at^2$ $s = 0.5$ x 1.4 x 0.5^2 $= 0.175$	M1 A1 ft on a
	$(\downarrow) s = ut + \frac{1}{2}at^2$ $1.175 = -0.7t + 4.9t^2$ $4.9t^2 - 0.7t - 1.175 = 0$ $t = \frac{0.7 \pm \sqrt{0.7^2 + 19.6 \text{ x } 1.175}}{9.8}$ $= 0.5663..$or $-...$	**DM1** A1 ft **DM1** A1 cao
	Ans 0.57 or 0.566 s	A1 cao (9) **[17]**

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