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	raye 4	GCE AS/A LEVEL – Octo	GCE AS/A LEVEL – October/November 2010				
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1	(i)	M1		For usinor $0 = V$	g -g = (0 - V)/(2 - gt)	- 0)	
	V = 20		A1	[2]			
	(ii) Speed i	$s 40 \mathrm{ms}^{-1}$	B1	[1]			
	(iii)	M1		For using $h = \frac{1}{2} 4 \times 40$ or $h = \frac{1}{2}g \times 4^2$ or $40^2 = 2gh$			
	Height	A1	[2]				
2	[F - R = ma	M1		For usir (3 terms	ng Newton's secor s)	nd law	
	$F_{\rm A} - 800 = 6$	A1					
	$F_A = 40000/25 (1600)$		B1				
	$40000/v_{\rm B} - 800 = 600 \ (400/600)$		A1				
	Speed is 33.3 ms^{-1}		A1	[5]			
5			MI		For usin or for re or for us or for re ver (eq tha	ng triangle of force esolving in dir ⁿ XF sing Lami's theore esolving forces at trically and horizo quations must cont n one unknown an	es P ₁ em X ntally ain not more ngle)
	For correct Δ or resolve XP ₁ and $\cos \alpha = 5.5/7.3$; or $5.5/\sin(90^\circ + \alpha) = 7.3/\sin 90^\circ$ (Lami); or $5.5\cos \alpha + W\sin \alpha = 7.3$ and $5.5\sin \alpha = W\cos \alpha$.		A1				
	Angle $AP_1X = 41.1^\circ \text{ or } 0.718^\circ$		A1				
	For correct triangle and $W^2 = 7.3^2 - 5.5^2$; or W/sin(180° - 41.1°) = 7.3/sin90°; or Wsin41.1° = 7.3 - 5.5cos41.1° or Wcos41.1° = 5.5sin41.1°		A1ft		ft incorr	rect α	
	W = 4.8		A1	[5]			
4	(i) (1.5 + 3	(3.5)/2 = s/10	B1		For usir	$\log \frac{(u+v)}{2} = \frac{s}{t}$	
	Displac	cement is 25 m	B1	[2]			
	(ii)		M1		For usir	ng $v = \int a dt$	
	v = 0.0	$15t^{2}(+C)$	A1				
	$[3.5 = 0.015 \times 100 + C \rightarrow C = 2]$		B1				
	$[s = 0.005t^3 + 2t + (0)]$		M1		For usir	ng $s = \int v dt$	
	Displac	ement is 25 m, same as P.	A1	[5]			

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5	(i)	$[v^2 = 3^2]$	$+2 \times 2.5 \times 8$]	M1	[0]	For usi			
		Speed 1	s / ms	Al	[2]				
	(ii)	KE gair	$n = \frac{1}{2} \ 0.8(7^2 - 3^2) \ (= 16)$	B1ft		ft incor	rect speed		
		PE loss	= 16 + 7	B1ft		ft incor	rect expression for	r KE	
		$[0.8 \times 1]$	$0 \times 8\sin\alpha = 23$]	M1		For usi	ng PE loss = $mgLs$	sinα	
		Angle i	s 21.1° or 0.368°	A1	[4]				
	(ii)	(ii) ALTERNATIVELY							
		F = 7/8		B1					
		$[0.8 \times 10 \sin \alpha - F = 0.8 \times 2.5]$				For usin	or using Newton's second law		
		$0.8 \times 10 \sin \alpha - 0.875 = 0.8 \times 2.5$							
		Angle i	s 21.1° or 0.368°	A1					
	(iii)	(iii) $5^2 = 3^2 + 2 \times 2.5s$ (s = 3.2)							
		[WD/7 or WD or WD	= 3.2/8 = 0.875 × 3.2 = 8 × 3.2 × (23/64) $(2 0.8(5^2 - 3^2))$]	M1		For using WD proport'l to dist. or WD = $F(AX)$ or WD = PE loss – KE gain			
		Work d	one is 2.8 J	A1	[3]				
6	(i)	(a) PE	loss = 0.2g(3 - h)	B1					
		[0.	2g(3-h) = 1.6]	M1		For usin	ng PE loss = KE g	ain	
		h =	= 2.2	A1	[3]				
		(b) KE	E is 6 J	B1	[1]				
		(c) [v _c or	$v_{\rm G} / v_{\rm B} = (3/(3 - 2.2))^{1/2}$ $v_{\rm G} / v_{\rm B} = \sqrt{6/1.6}$]	M1		For usin or (v _G /	$ \underset{\mathrm{V}_{\mathrm{B}}}{\operatorname{ng}} v^{2} \propto (3 - \mathrm{ht}) $ $ \underset{\mathrm{V}_{\mathrm{B}}}{\operatorname{v}}^{2} = \mathrm{Ans.} (\mathbf{i})(\mathbf{b}) $	÷ 1.6	
		Ra	tio is 1.94	A1	[2]	Accept	$\sqrt{60} \div 4 \text{ or } \sqrt{15} \div$	- 2	
	(ii)		M1		For using or using and ¹ / ₂ r elimina	$mg v^{2} \propto (H - ht)$ $g \frac{1}{2} m(2.55v_{B})^{2} = mg(H - 2.2t_{B})^{2}$ $mv_{B}^{2} = mg(H - 2.2t_{B})^{2}$ $mv_{B}^{2} = mg(H - 2.2t_{B})^{2}$	mgH 2) and		
		H/(H –	$(2.2) = 2.55^2$	A1					
		H = 2.6		A1	[3]				

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7	(i)			M1		For reso	olving forces on Q	vertically
		R + 3.2s	$\sin 30^\circ = 0.5$ g	A1				-
			M1	-	For resolving forces on Q horizontally and using $T = W_P$			
		F + 0.2g	$g = 3.2\cos 30^\circ$	A1				
		$[\mu = (3.2)$	$2\cos 30^\circ - 2)/(5 - 3.2\sin 30^\circ)]$	M1		For usir	ng $F = \mu R$	
		Coeffici	ent is 0.227	A1	[6]			
	(ii)	(ii) $2 - T = 0.2a$		B1				
		T – 0.22	$27 \times 5 = 0.5a$	B1ft				
					-	Allow H 2 – 0.22 <i>one</i> of t	B1ft for $27 \times 5 = (0.2 + 0.5)$ he above equation)a instead of s
				M1		For solv	ving for a or T	
		Accelera 1.75 N	ation is 1.24 ms^{-2} and tension is	A1	[4]	Allow a	a = 1.25	