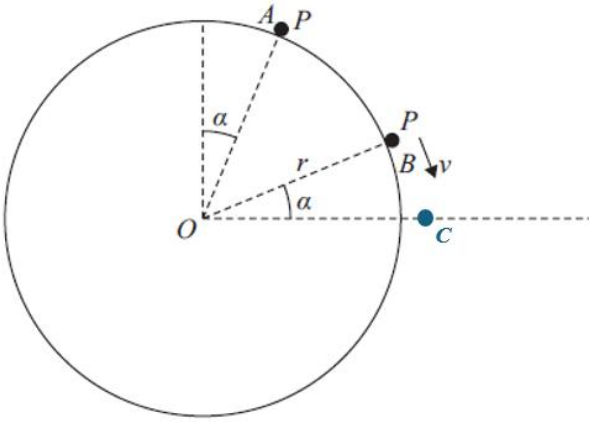
Question Number	Scheme	Marks
		
5(a)	Form an energy equation from A to B	M1
	$\frac{1}{2}mv^2 = mgr\cos\alpha - mgr\sin\alpha$	A1
	$v^2 = 2gr(\cos\alpha - \sin\alpha)$ *	A1*
		(3)
5(b)	N2L towards O with $R = 0$	M1
	$mg\sin\alpha = \frac{mv^2}{r}$	A1
	Eliminate v^2 $\frac{1}{2}mgr\sin\alpha = mgr(\cos\alpha - \sin\alpha)$	M1
	$(3\sin\alpha = 2\cos\alpha \quad \Rightarrow) \qquad \tan\alpha = \frac{2}{3}$ *	A1*
		(4)
5(c)	Expression for the horizontal component of the speed of P at C. Condone cos/sin confusion.	M1
	For example, $W\cos\theta$ or $W_{horiz} = v\sin\alpha \quad \left(= \sqrt{\frac{8gr}{13\sqrt{13}}}\right)$	A1
	Method to form relevant equation for the motion from A to C or B to C. Condone cos/sin confusion, consistent with their horizontal component.	M1
	[1] Energy from A to C $\frac{1}{2}mW^2 = mgr\cos\alpha$ [2] Energy from B to C $\frac{1}{2}mW^2 - \frac{1}{2}mv^2 = mgr\sin\alpha$ [3] Vertical motion under gravity from B to C $(w\sin\theta)^2 = (v\cos\alpha)^2 + 2gr\sin\alpha$	A1
	Dependent on the previous M only. Follow their notation. Use method [1] or [2] to find an expression for the speed of P at C in terms of g and r only.	dM1

	$\left(W = \sqrt{\frac{6gr}{\sqrt{13}}} \right)$ Or Use method [3] to find the vertical component of the speed of P at C in terms of g and r only. For example, $W\sin\theta$ or $W_{vert} = \sqrt{\frac{70gr}{13\sqrt{13}}}$	
	Dependent on the first two M marks. Use the motion of P at C to form an expression in θ only.	dM1
	Obtain given answer from correct working $\cos\theta = \frac{2}{\sqrt{39}}$ *	A1*
		(7)
		(14)
Notes for question 5		
(a)		
M1	Complete method to form a dimensionally correct conservation of energy equation in (m), g, r and α (m must be seen at some stage). All required terms present and no extra. Condone sign errors and sin/cos confusion on GPE terms.	
A1	A correct equation	
A1*	Given answer correctly obtained and written exactly as printed.	
(b)		
M1	Use N2L to form a dimensionally correct equation of motion towards O. All required terms present with no extras. If R is present, must use $R = 0$ at some point. M0 if R is never zero. Condone sin/cos confusion.	
A1	A correct equation	
M1	Eliminate v^2 using the given answer in (a) to form an equation in α (m and g)	
A1*	Given answer correctly obtained. A line of working with terms collected must be seen before reaching the given answer.	
(c)		
	Note: $\cos\alpha = \frac{3}{\sqrt{13}}$, $\sin\alpha = \frac{2}{\sqrt{13}}$, $v = \sqrt{\frac{2gr}{\sqrt{13}}}$ $W_{horiz} = \sqrt{\frac{8gr}{13\sqrt{13}}}$, $W_{vert} = \sqrt{\frac{70gr}{13\sqrt{13}}}$, $W = \sqrt{\frac{6gr}{\sqrt{13}}}$	
M1	Use of constant horizontal velocity component at C, condone sin/cos confusion.	
A1	Correct equation (follow their notation)	
M1	Energy equation with the correct terms or use of $v^2 = u^2 + 2as$ vertically. Condone sin/cos confusion consistent with their horizontal component. If t is used in a *suvat* equation, a second *suvat* equation is also required to eliminate t correctly.	
A1	A correct equation (follow their notation)	
dM1	Dependent on the previous M mark only. Accept expressions for the speed or velocity squared. Follow their notation.	

	Use method [1] or [2] to find an expression for the speed of P at C in terms of g and r only. or Use method [3] to find the vertical component of the speed of P at C in terms of g and r only.	
dM1	Dependent on the first 2 method marks. Use the motion of P at C to form an expression in θ only. Accept the trig expression squared.	
A1*	Correctly obtain the given answer. A0* if the final answer comes from working with a decimal value of α	