Question Number	Scheme	Marks
6(a)	$S - mg\cos\theta = \frac{mv^2}{a}$	M1A1
	$\frac{1}{2}\times mv^2 - \frac{1}{2}\times m\times\frac{9ag}{5} = mga\cos\theta$	M1A1
	$mv^2 = 2mga\cos\theta + \frac{9}{5}mga$	
	$S = mg\cos\theta + 2mg\cos\theta + \frac{9}{5}mg$	DM1
	$S = \frac{3}{5}mg\left(5\cos\theta + 3\right)$ *	A1* cso (6)
(b)	$S = 0 \quad \cos\theta = -\frac{3}{5}$	B1
	$v^2 = \frac{3ag}{5} \qquad v = \sqrt{\frac{3ag}{5}}$ *	M1A1*
		(3)
(c)	vert comp = $\sqrt{\frac{3ag}{5}}\times\frac{4}{5}$	M1
	Vert distance to highest point: $0 = \frac{16}{25}\times\frac{3ag}{5} - 2gs$	M1
	$s = \frac{24}{125}a$	A1
	Total distance above $O = \frac{24}{125}a + \frac{3}{5}a = \frac{99}{125}a$, 0.79$a$ or better	A1ft
		(4)
	Notes	**[13]**

(a) M1	Equation of motion along the radius. Must have 3 terms with weight resolved. Acceleration in either form.
A1	Fully correct equation with acceleration v^2/r
M1	Energy equation from A to general position. Difference of 2 KE terms and loss of PE (one or two terms) required. M0 for $v^2 = u^2 + 2as$
A1	Fully correct equation
DM1	Eliminate v^2 between the 2 equations. Depends on both preceding M marks
A1 *cso	Obtain the **given** result from fully correct working.
(b)	
B1	$\cos\theta = -\frac{3}{5}$ seen explicitly or used
M1	Use their value of $\cos\theta$ to obtain the value of v^2 or v
A1*	Correct answer from correct working
(c)	
M1	Use their values for θ and v to obtain the vertical comp of velocity (allow sin/cos confusion)
M1	Correct method to find the vertical distance to highest point using their vertical comp of vel
A1	Correct expression for this vertical distance (may be implied)
A1ft	Find the total distance above O by adding $\frac{3a}{5}$ to their previous answer. Both M marks needed.

ALT 1	**Conservation of Energy from <u>slack</u> to find vertical height**
M1	Uses their value of θ and v to obtain the horizontal component at the highest point $\sqrt{\frac{3ag}{5}}\cos\theta$
M1	Forms an energy equation. **Must** have 2 KE terms and gain in PE $\frac{1}{2}m\frac{3ag}{5}-\frac{1}{2}m\frac{3ag}{5}\left(\frac{3}{5}\right)^2=mgs$
A1	Correct expression for this vertical distance $s=\frac{24}{125}a$
A1ft	Find the total distance above O by adding $\frac{3a}{5}$ to their previous answer. Both M marks needed. $\frac{99}{125}a$, 0.79a or better
ALT 2	**Conservation of Energy from <u>initial position</u> (A) to find vertical height**
M1	Uses their value of θ and v to obtain the horizontal component at the highest point $\sqrt{\frac{3ag}{5}}\cos\theta$
M1	Forms an energy equation. **Must** have 2 KE terms and gain in PE
A1	$\frac{1}{2}m\frac{9ag}{5}-\frac{1}{2}m\frac{3ag}{5}\left(\frac{3}{5}\right)^2=mgh$
A1	Gives the total distance above O as $h=\frac{99}{125}a$ (do not isw)