Question number	Scheme	Marks
6(a)	$\frac{1}{2}mv^2 - \frac{1}{2}mu^2 = mga\sin\theta$	M1A1A1
	$T - mg\sin\theta = \frac{mv^2}{a}$	M1A1A1
	$T = \frac{mu^2}{a} + 3mg\sin\theta$ *	A1*
		(7)
(b)	$0 = \frac{m(\frac{12ag}{5})}{a} + 3mg\sin\theta$	M1
	$\sin\theta = -\frac{4}{5}$	A1
	$\frac{1}{2}mv^2 - \frac{1}{2}m\left(\frac{12ag}{5}\right) = mga\times -\frac{4}{5}$ **OR** $0 - mg\times -\frac{4}{5} = \frac{mv^2}{a}$	M1
	$v = 2\sqrt{\frac{ag}{5}}$, $0.89\sqrt{ag}$ or better	A1
		(4)
(c)	Vertical motion $0 = \left(2\sqrt{\frac{ag}{5}}\times\frac{3}{5}\right)^2 - 2gh$ OR Energy $mgh = \frac{1}{2}m\left(2\sqrt{\frac{ag}{5}}\right)^2 - \frac{1}{2}m\left(2\sqrt{\frac{ag}{5}}\times\frac{4}{5}\right)^2$	M1A1ft
	$h = \frac{18a}{125}$	A1
	H, height above O $= h - a\sin\theta = \frac{18a}{125} + \frac{4a}{5}$	dM1
	$= \frac{118a}{125}$, $0.94a$, $0.944a$	A1
		(5)
	OR using energy from start to top	
	$mgH = \frac{1}{2}m\left\{\frac{12ag}{5} - \left(2\sqrt{\frac{ag}{5}}\times\frac{4}{5}\right)^2\right\}$	M2A1ft A1
	$H = \frac{118a}{125}$, $0.94a$, $0.944a$	A1
		(5)
		(16)
	Notes	
6(a)		
M1	Energy equation with correct no. of terms, dim correct. May use h instead of $a\sin\theta$	
A1	Correct equation with at most one error	

A1	Correct equation
M1	Equation of motion towards *O*, correct no. of terms, condone sign errors and sin/cos confusion. Accept acceleration in either circular form but do not accept '*a*'. The radius may be given as *r*.
A1	Equation with at most one error
A1	Correct equation
A1*	Given answer correctly obtained and written exactly as printed.
6(b)	
M1	Put $T = 0$ and $u = 2\sqrt{\frac{3ag}{5}}$
A1	Correct value of $\sin\theta$
M1	Put $u = 2\sqrt{\frac{3ag}{5}}$ and their $\sin\theta$ into energy equation **OR** put $T = 0$ and their $\sin\theta$ into equation of motion
A1	Correct answer
6(c)	If an energy approach is used in (c) the equation must have 2 KE terms, one of which must have a sin/cos component included.
M1	Use vertical motion or energy to obtain an equation in *h* only. A component of speed must be used for either approach.
A1ft	Correct equation ft on their answer to (b).
A1	Correct value of *h*
dM1	Correct method to find *H*. Dependent on previous M.
A1	cao
	OR
M2	Complete method to obtain an equation in *H* only (must be using horizontal cpt of velocity at the top)
A1ft	Correct equation with at most one error
A1	Correct equation
A1	Correct answer