Question Number	Scheme	Marks	Notes
8a	Conservation of energy from A to general position	M1	Need all terms. Dimensionally correct. Condone sign errors and sine / cosine confusion
	$\frac{1}{2}m\times 4ag + mg\times 4a\cos\theta = \frac{1}{2}mv^2$	A1	Correct unsimplified equation
	Equation for circular motion	M1	Need all terms. Dimensionally correct. Condone sign errors and sine / cosine confusion
	$T - mg\cos\theta = \frac{mv^2}{4a}$	A1	Correct unsimplified equation
	Eliminate v^2 and solve for T	DM1	Dependent on both preceding M marks
	$\frac{mv^2}{4a} = T - mg\cos\theta = mg + 2mg\cos\theta$ $\Rightarrow T = mg(1+3\cos\theta)$ *	A1*	Obtain given answer from correct working.
		(6)	
8b	Substitute $\theta = 0$ in the energy equation	M1	Or equivalent method to obtain the speed
	$4amg + 8amg = mv^2 \Rightarrow v = \sqrt{12ag}$	A1	$3.5\sqrt{ag}$ or better
		(2)	
8c	Conservation of energy from A to C	M1	Or equivalent. Need all terms. Dimensionally correct. Condone sign errors
	$\frac{1}{2}m\times 4ag + mg\times 2a = \frac{1}{2}mw^2$	A1	Correct unsimplified equation
	$w = \sqrt{8ag}$	A1	Or exact equivalent
		(3)	
8d	Speed of $P = 2\sqrt{ag}$	B1	Seen or implied
	Equation of motion: $T + mg = \frac{mv^2}{2a}\left(= \frac{m\times 4ag}{2a}\right)$	M1	Need all terms, with *their* v substituted. Condone sign errors.
	$T = mg$	A1	cso
		(3)	
		[14]	