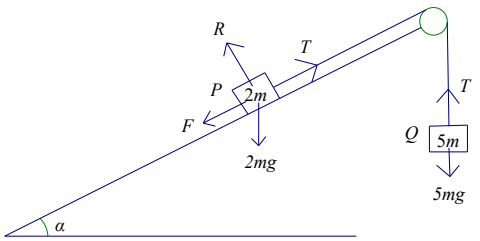
Question Number	Scheme	Marks	Notes
7			
	N.B. If *m*'s missing consistently, can score max (a)M1A0 (b)M1A0M1M1A0DM0A0 (d)M1A1DM0A0. For inconsistent omission of *m*'s, mark as per the scheme.(Omission of an *m* is an M error)		
7a	Equation of motion for Q:	M1	Need correct terms. Condone sign errors.
	$5mg - T = 5ma$	A1	Correct equation
		[2]	
7b	Resolve perpendicular to the plane	M1	Condone sine /cosine confusion N.B. $R = mg\cos\alpha$ is M0
	$R = 2mg\cos\alpha$	A1	Correct unsimplified.
	$F = \frac{1}{8} \times 2mg\cos\alpha$	M1	Use of $F = \frac{1}{8}R$
	Equation of motion for *P*:	M1	Need correct terms. Condone sign errors and sin/cos confusion.
	$T - F - 2mg\sin\alpha = 2ma$	A1	Correct equation. Condone combined equation: $5mg - F - 2mg\sin\alpha = 7ma$
	$\begin{cases} 10mg - 2T = 10ma \\ 5T - 5mg = 10ma \end{cases}$	DM1	Solve for *T*, dependent on first and third M marks. N.B. DM0 if they do not use the 2 equations that have earned marks.
	$T = \frac{15mg}{7}$	A1	Accept 2.1*mg* or better
		[7]	

7c	The acceleration of both blocks / particles is the same.	B1	Or equivalent. N.B. Accept: 'They have the same acceleration but not 'it (or the string) has the same acceleartion.' B0 if include additional incorrect statement e.g. same tension, string won't break
		[1]	
7d	Resolve to find force on pulley	M1	Complete method to obtain the resultant force, allow sin/cos confusion but must be correct numerical angle or correct in terms of α
	$2T\cos\left(\frac{90^\circ-\alpha}{2}\right)$	A1	Correct unsimplified expression
ALT 1	Use cosine rule to find force on pulley	M1	Complete method to obtain the resultant force. Allow WITHOUT ROOT
	$\sqrt{T^2+T^2-2\times T\times T\cos(90^\circ+\alpha)}$	A1	Correct unsimplified expression WITH ROOT but must be correct angle.
ALT 2	Use horiz and vert components and Pythagoras	M1	Complete method to obtain the resultant force, allow sin/cos confusion, Allow WITHOUT ROOT
	$\sqrt{(T\cos\alpha)^2+(T+T\sin\alpha)^2}$	A1	Correct unsimplified expression WITH ROOT
	N.B. For ALT 1 and 2, allow without root sign, if they equate it to $(kmg)^2$ oe		
	Substitute for *T* and trig. and solve for *T*, must take square root when appropriate, and must be a multiple of *mg*	DM1	Dependent on the previous M1

	$k = 3.57$ **to 3 sf**	**A1**	**3 sf only** $\left(\frac{90\sqrt{13}}{91}\right)$ **is A0** **3.57*mg* oe is A0**
		[4]	
		(14)	