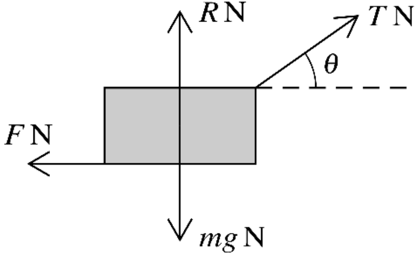
Question			Answer	Marks	AO	Guidance
16	(a)					
			Resolve vertically $R = mg - T\sin\theta$	B1	3.1a	Must be explicit – may be seen on the diagram. Allow $R + T\sin\theta = mg$ if $F = \mu(mg - T\sin\theta)$ also seen
			Motion so $F = \mu R$ $F = \mu(mg - T\sin\theta)$	M1	3.3	Allow only if R seen explicitly or correct vertical equation seen Allow $F = \mu mg$ only if $R = mg$ seen explicitly or on the diagram
			Resolve horizontally $T\cos\theta - F = ma$ $ma = T\cos\theta - \mu mg + T\mu\sin\theta$	M1	3.1a	All forces correct and no extras. Allow sign errors
			$a = \frac{T}{m}\cos\theta - \mu g + \frac{T}{m}\mu\sin\theta$	A1	2.1	**AG** Complete argument needed
				[4]		

Question			Answer	Marks	AO	Guidance
16	(b)		$\frac{da}{d\theta} = -\frac{T}{m}\sin\theta + \frac{T}{m}\mu\cos\theta$	M1	3.1a	Attempt to differentiate wrt θ
			$-\frac{T}{m}\sin\alpha + \frac{T}{m}\mu\cos\alpha = 0$	M1	1.1a	Equate their derivative to 0 and attempt to rearrange using a trig identity. Condone using θ not α
			$\frac{\sin\alpha}{\cos\alpha} = \mu$ so $\alpha = \tan^{-1}\mu$	A1	1.1	Must be $\alpha =$ Also allow for $\alpha = \frac{\pi}{2} - \tan^{-1}\frac{1}{\mu}$
			Alternative solution			
			Maximum a when $\frac{T}{m}(\cos\theta + \mu\sin\theta)$ is max			
			Acceleration is $(R\cos(\theta - \beta))$ where $\beta = \tan^{-1}\mu$	M1 M1		Uses trig identity Attempt to find the value of β
			Max acceleration when $(\alpha - \beta) = 0$			
			Giving $\alpha = \tan^{-1}\mu$	A1		Must be $\alpha =$ Also allow for $\alpha = \frac{\pi}{2} - \tan^{-1}\frac{1}{\mu}$
				[3]		