Question	Answer	Marks	Guidance
(a)	$0.6^2 = 0 + 2a \times 0.45$	**M1**	Use of constant acceleration equations to find a.
	$a = 0.4$	**A1**	
	$R = 0.1g \times \cos\alpha = 0.1g \times \frac{24}{25} = 0.1g \times \cos 16.3° \left[R = \frac{24}{25} = 0.96\right]$	**B1**	Must use a value for $\cos\alpha$.
	$0.1g \times \frac{7}{25} - F = 0.1 \times 0.4$ [$0.28 - F = 0.04 \rightarrow F = 0.24$]	**M1**	Newton's second law, 3 terms.
	$F = \mu \times 0.1g \times \frac{24}{25}$ $\left[F = \frac{24\mu}{25} = 0.96\mu\right]$	**M1**	Use of $F = \mu R$, where R is a component of $0.1g$
	$\mu = 0.25$	**A1**	**AG** Must be from exact working $\mu = 0.25$ only

Question	Answer	Marks	Guidance
(a)	**Alternative scheme for question (a)**		
	Attempt PE loss or KE gain	**M1**	Use of either PE = mgh or KE = ½ mv^2
	PE loss $= 0.1\times g\times 0.45\sin 16.3 = 0.1\times g\times 0.45\times\frac{7}{25}$ $\left[=\frac{63}{500}=0.126\right]$ KE gain $=\frac{1}{2}\times 0.1\times 0.6^2$ $\left[=\frac{9}{500}=0.018\right]$	**A1**	Both correct.
	$R = 0.1g\times\cos\alpha = 0.1g\times\frac{24}{25} = 0.1g\times\cos 16.3°$ $\left[R=\frac{24}{25}=0.96\right]$	**B1**	Must use a value for cosα.
	$0.1\times g\times 0.45\times\frac{7}{25}=\frac{1}{2}\times 0.1\times 0.6^2+F\times 0.45$ $\left[\frac{63}{500}=\frac{9}{500}+\mu\times\frac{54}{125}\right]$ or $\left[0.126=0.018+\mu\times 0.432\right]$	**M1**	Use of work-energy equation as PE loss = KE gain + WD against friction
	$F = \mu\times 0.1g\times\frac{24}{25}$ $\left[F=\frac{24\mu}{25}=0.96\mu\right]$	**M1**	Use of $F = \mu R$, where R is a component of $0.1g$
	$\mu = 0.25$	**A1**	**AG** Must be from exact working $\mu = 0.25$ only
		6	

Question	Answer	Marks	Guidance
(b)	$0.1 \times 0.6 = 0.5v$	**M1**	Use of conservation of momentum, 2 terms.
	$v = 0.12$	**A1**	
	For B $0.5g \times \frac{7}{25} - 0.275 \times 0.5g \times \frac{24}{25} = 0.5a$ [leading to $a = 0.16$]	**B1**	Apply Newton's second law for particle B, 3 terms. Allow correct unsimplified expression in a only.
	$s_A = 0 + \frac{1}{2} \times 0.4t^2$ $s_B = 0.12t + \frac{1}{2} \times 0.16t^2$	***M1**	Attempt an expression for either s_A or s_B. Must see $u_A = 0$ and $u_B \neq 0$ but u_B must have been found from a momentum equation.
	For both s_A and s_B and attempt to solve $s_A = s_B$ to find t	**DM1**	Must be from 3 terms leading to a 2-term quadratic. If energy used in **7(a)** then must find $a = 0.4$ for A. *Their* working must be leading to a positive t value.
	Required time is $t = 1$ s	**A1**	
		6	