Question Number	Scheme	Marks
7a	NB: sine/cosine confusion is not condoned in projectile questions Use of conservation of energy $\frac{1}{2}m\times 25^2=\frac{1}{2}m\times 15^2+mgh$ $\Rightarrow h=20$ or 20.4 (m)	M1 A1 A1 (3)
7b	Vertical distance $20.4=25\sin\alpha\times 3-4.5\times 9.8$ $\alpha=59°$ or $59.3°$	M1 A1ft A1 (3)
7c	Horizontal component of speed is constant $\Rightarrow 25\cos\alpha=15\cos\beta$ $\beta=32°$ or $31.8°$	M1 A1ft A1 (3)
7c alt	Vertical distance $20.4=-15\sin\beta\times 3+4.5\times 9.8$ $\beta=32°$ or $31.8°$	M1 A1ft A1 (3)
	Notes	
7a M1	Need energy equation with all 3 terms. Must be dimensionally correct. Condone sign errors.	
A1	Correct unsimplified equation	
A1	Max 3 sf Not $\frac{1000}{49}$ nor $\frac{200}{g}$	
7b M1	Use of *suvat* to find α	
A1ft	Correct unsimplified equation in their h	
A1	0.554 rads. Max 3 sf From CWO	
7c M1	Or horizontal distance travelled	
A1ft	Correct unsimplified in α or their α	
A1	0.554 rads. Max 3 sf From CWO	
7c alt		
M1	Use of *suvat* to find β	
A1ft	e.g. using $s=vt-\frac{1}{2}gt^2$. Correct unsimplified equation in their h	
A1	0.554 rads. Max 3 sf From CWO	

Question Number	Scheme	Marks
7d	Min speed = horizontal component $= 25\cos\alpha \left(= 15\cos\beta\right)$ $= 13$ or 12.8 (m s^{-1})	M1 A1 (2)
7e	By considering vertical component of speed at B: $15\sin 31.8° - gT = -15\sin 31.8°$ $T = 1.6$ or 1.61 (s)	M1 A1ft A1 (3)
	Notes	**[14]**
7d M1 **A1**	Follow their angle. Must show working if using incorrect angle. Max 3 sf From CWO	
7e M1 **A1ft** **A1**	Complete method using *suvat* to find T Correct unsimplified equation in T - follow their angles. Max 3 sf From CWO	