QUESTION NUMBER	SCHEME	MARKS
3	Accept column vectors throughout this question	
3(a)	Complete method to find greatest height (h) e.g. $0 = 14^2 + 2(-g)h$	M1
	$h = 10$	A1
		(2)
3(b)	Vertical component $v = 14 - g(2.4)$	M1
	Use Pythagoras to find Speed = $\sqrt{8^2 + (14 - 2.4g)^2}$	M1
	12.4 or 12 (ms^{-1})	A1
		(3)
3(c)	Relevant equation in t formed using vertical motion. e.g. $3 = 14t + \frac{1}{2}(-g)t^2$	M1 A1
	Use Horizontal motion to find the required distance $8t$	M1
	8x 2.6..	A1
	21 or 21.0 (m)	A1
		(5)
	ALT method forming trajectory equation	
	Relevant equation in t and y formed using vertical motion. $y = 14t - \frac{1}{2}gt^2$	M1
	Form relevant horizontal equation in x and t $x = 8t$	M1
	Eliminate t to form correct equation in x and y $y = 14 \times \frac{x}{8} - \frac{1}{2}g\left(\frac{x}{8}\right)^2$	A1
	Substitute y=3 into correct equation and solve for x	A1
	21 or 21.0 (m)	A1
		(5)
	ALT method using Energy	
	Vertically: $\frac{1}{2}(m)(14^2 - v^2) = 3(m)g$	M1
	Form vertical suvat equation in their v and t $v = 14 - gt$	M1
	$\sqrt{\frac{686}{5}} = 14 - gt$	A1

	8x2.6…	A1
	21 or 21.0 (m)	A1
		(5)
		(10)
	Notes for question	
3(a)		
M1	Complete method to find greatest height. Condone sign errors.	
A1	cao	
3(b)		
M1	Complete method to find the vertical component at t=2.4 Condone sign errors.	
M1	Use of Pythagoras with both components to find speed	
A1	Correct answer, 2/3sf	
3(c)		
M1	Relevant equation formed using vertical motion. Condone sign errors.	
A1	Correct unsimplified equation(s). (Note t = 2.62 (3sf) but does not need to be seen for this mark)	
M1	Use horizontal motion to find the required distance	
A1	Uses 'larger' t=2.6...to calculate distance AB	
A1	Correct answer with 2 or 3sf. Accept 21, 21.0.	
	Alt method Trajectory **Enter marks in correct M and A spaces**	
M1	Relevant equation formed in t and y using vertical motion.	
M1	Form relevant horizontal equation in x and t	
A1	Eliminate t to form correct equation in x and y	
A1	Substitute t=3 into correct equation and solve for x	
A1	Correct answer with 2 or 3sf. Accept 21, 21.0.	
	Alt method Energy	
M1	Form (vertical) energy equation,m's may have been cancelled and 8^2 may have been added to both velocity parts	
M1	Form vertical suvat equation in their v and t	
A1	Substitute correct value for v ($\sqrt{\frac{686}{5}}$=11.71..) and solve for t	
A1	Uses t=2.62...to calculate distance AB	
A1	Correct answer with 2 or 3sf. Accept 21, 21.0.	