

Question		Scheme	Marks	AOs
5(a)	Using horizontal motion		M1	3.3
	$U \cos 45^\circ t = 100$		A1	1.1b
	Using vertical motion		M1	3.4
	$U \sin 45^\circ t - \frac{1}{2}gt^2 = -25$		A1	1.1b
	Solve problem by eliminating t and solving for U		M1	3.1b
	$U = 28^*$		A1*	1.1b
			(6)	
5(b)	Using vertical motion		M1	3.4
	$0^2 = (28 \sin 45^\circ)^2 - 2gh$		A1	1.1b
	Greatest height = 45 m		A1	1.1b
			(3)	
5(c)	New value > 28		B1	3.5a
			(1)	
5(d)	e.g. wind effects, more accurate value of g , spin of ball, include size of the ball, not model as a particle, shape of ball		B1	3.5c
			(1)	
(11 marks)				
Notes:				
5a	M1	Complete method to give equation in U and t only, condone sin/cos confusion and sign errors		
	A1	Correct equation		
	M1	Complete method to give equation in U and t only, condone sin/cos confusion and sign errors		
	A1	Correct equation (g does not need to be substituted)		
	M1	Must have earned the previous two M marks. Eliminate t and solve for U . N.B. They may solve for t first ($100 - \frac{1}{2}gt^2 = -25$) and then use it to find U .		
	A1*	Exact given answer correctly obtained with no wrong working (e.g. $g = 9.81$ used) or approximation seen.		
5b	M1	Complete method to give equation in h only (allow if U not substituted), condone sin/cos confusion and sign errors		

	A1	Correct equation (g does not need to be substituted) (A0 if U is used instead of 28)
	A1	cao
5c	B1	Clear statement
5d	B1	Penalise incorrect extras i.e. B0 if there are incorrect extras. The ground being horizontal, the cliff being vertical, .. are not part of the model so B0 Include weight/mass of the ball B0