Question	Scheme	Marks	AOs
1(a)	Complete method to produce an equation in U only	M1	3.4
	e.g. $10^2 = U^2 + 2\times g\times 1.8$ oe	A1	1.1b
	OR a **complete** method where they find T first and use it to find an equation in U only M1		
	A correct equation in U only. A1		
	$U = 8$ (<u>only</u> this answer)	A1	1.1b
		(3)	
(b)	Complete method to find an equation in T only: $10 = -8 + gT$ or $1.8 = 10T - \frac{1}{2}gT^2$ or $1.8 = \frac{(-8+10)}{2}T$ or $1.8 = -8T + \frac{1}{2}gT^2$ **OR** a **complete** method if they split the time. In both cases, the M1 is only earned on the final line when they try to add the two times to give an equation in T. **ALT 1**: time up + time down e.g. $0 = 8 - gt_{UP}$ $(\Rightarrow t_{UP} = 0.8)$ $h_{UP} = \frac{(8+0)}{2}\times 0.8$ $(= 3.2)$ $(h_{UP} + 1.8) = \frac{(0+10)}{2}\times t_{DOWN}$ $(\Rightarrow t_{DOWN} = 1)$ $T = t_{UP} + t_{DOWN}$ **ALT 2:** time to A + time from A to ground e.g. $8 = -8 + gt_A$ $(\Rightarrow t_A = 1.6)$ $1.8 = \frac{(8+10)}{2}\times t_{AG}$ $(\Rightarrow t_{AG} = 0.2)$ $T = t_A + t_{AG}$	M1	3.4
	$T = 1.8$ oe e.g. 9/5	A1	1.1b
		(2)	
(c)	e.g. Use a more accurate (less rounded) value for g (or gravity), use $g = 9.8$ or $g = 9.81$, allow for wind effects, allow for the spin of the stone, include dimensions of stone (not a particle), shape and/or size of stone, allow for variable acceleration. If air resistance is mentioned as an extra, ignore it.	B1	3.5c

		(1)	
(d)	*U* would be greater. Allow without *U*, e.g it would be greater, or just 'greater' oe ISW	B1	3.5a
		(1)	
			(7 marks)

Notes:

1a	M1	Use the model to obtain an equation in *U* only, condone sign errors, but M0 if using an incorrect formula.
	A1	A correct equation in *U* only, *g* does not need to be substituted (so allow $g = 9.8$ or 9.81)
	A1	cao (A0 if $g = 10$ has not been used)
1b	M1	Use the model to obtain an equation in *T* only , *g* does not need to be substituted (so allow $g = 9.8$ or 9.81) condone sign errors, but M0 if using an incorrect formula. Follow through on their *U* where necessary
	A1	cao (A0 if $g = 10$ has not been used) A0 if they give two answers.
1c	B1	Any appropriate refinement. B0 if an incorrect extra is given e.g. the mass or weight is mentioned
1d	B1	cao