Question	Scheme	Marks	AOs
10(a)	Using the model and horizontal motion: $s = ut$	M1	3.4
	$36 = U t\cos\alpha$	A1	1.1b
	Using the model and vertical motion: $s = ut + \frac{1}{2}at^2$	M1	3.4
	$-18 = U t\sin\alpha - \frac{1}{2}gt^2$	A1	1.1b
	Correct strategy for solving the problem by setting up two equations in t and U and solving for U	M1	3.1b
	$U = 15$	A1	1.1b
		(6)	
(b)	Using the model and horizontal motion: $U\cos\alpha$ (12)	B1	3.4
	Using the model and vertical motion: $v^2 = (U\sin\alpha)^2 + 2(-10)(-7.2)$	M1	3.4
	$v = 15$	A1	1.1b
	Correct strategy for solving the problem by finding the horizontal and vertical components of velocity and combining using Pythagoras: Speed = $\sqrt{(12^2 + 15^2)}$	M1	3.1b
	$\sqrt{369} = 19$ m s $^{-1}$ (2sf)	A1 **ft**	1.1b
		(5)	
(c)	Possible improvement (see below in notes)	B1	3.5c
	Possible improvement (see below in notes)	B1	3.5c
		(2)	
			(13 marks)

Question 10 continued

Notes:

(a)

1st M1: for use of $s = ut$ horizontally

1st A1: for a correct equation

2nd M1: for use of $s = ut + \frac{1}{2}at^2$ vertically

2nd A1: for a correct equation

3rd M1: for correct strategy (need both equations)

2nd A1: for $U = 15$

(b)

B1: for $U\cos\alpha$ used as horizontal velocity component

1st M1: for attempt to find vertical component

1st A1: for 15

2nd M1: for correct strategy (need both components)

2nd A1ft: for 19 m s $^{-1}$ (2sf) following through on incorrect component(s)

(c)

B1, B1: for any two of

e.g. Include air resistance in the model of the motion

e.g. Use a more accurate value for g in the model of the motion

e.g. Include wind effects in the model of the motion

e.g. Include the dimensions of the stone in the model of the motion