

**PROJECTILES MECHANICS ANSWERS OCR A LEVEL YEAR 1**

1.

Question	Expected Answers	Marks	Additional Guidance
(a)	Downward arrow at P	B1	Arrow must be close to or at point P
(b)	From <u>gravitational</u> potential (energy) to kinetic (energy) / KE / E <sub>k</sub> (wtte)	B1	The term gravitational to be included and spelled correctly in (b) to gain the <u>first</u> B1 mark
	Any further detail: KE maximum at bottom / Zero (G)PE at bottom / (G)PE is maximum at top / (G)PE and KE at top (wtte)	B1	<b>Not:</b> Heat / sound at ground
(c)	The acceleration / force / weight is at right angles to horizontal motion / velocity (wtte)	B1	<b>Allow:</b> 'In this direction the force / acceleration is zero'
(d)	time = $\frac{3.6}{7.0}$ (= 0.514 s)	B1	<b>Allow:</b> time = $\sqrt{(1.3 \times 2) / 9.81}$ (= 0.515 s) <b>Allow:</b> Use of 9.8 (m s <sup>-2</sup> )
(e)	$u = 0$ <b>and</b> $v = u + at$ or $v^2 = u^2 + 2as$	C1	<b>Watch out for:</b> ' $v^2 = u^2 + 2as = 7^2 + (2 \times 9.81 \times 1.3) = 8.6'$ – this scores <b>no</b> marks because of <b>wrong</b> physics.
	'vertical' velocity = $9.81 \times 0.5(14)$ or 'vertical' velocity = $\sqrt{2 \times 9.81 \times 1.3}$	C1	<b>Note:</b> Getting an answer 5.0 (m s <sup>-1</sup> ) scores the first 2 marks
	'vertical' velocity = 5.0 (m s <sup>-1</sup> )	C1	
	$v^2 = 7.0^2 + 5.0^2$	A0	<b>Note:</b> Using $t = 0.5$ (s) gives 8.55 (m s <sup>-1</sup> ) <b>Note:</b> Bald answer scores zero marks – since this is a 'show' question (Allow full marks for correct analysis using the principle of conservation of energy.)
	$v = 8.6$ (m s <sup>-1</sup> )		
<b>Total</b>		<b>8</b>	

2.

a	time = 1.2/8.0	M1	<b>Note:</b> The mark is for dividing the distance by the speed – hence must be seen
	time = 0.15 (s)	A0	
b	$s = ut + \frac{1}{2}at^2$ <b>and</b> $u = 0$ / $s = \frac{1}{2}at^2$ / $h = \frac{1}{2} \times 9.81 \times 0.15^2$	C1	
	$h = 0.11$ (m)	A1	
c	They both have same (vertical) acceleration / same acceleration of free fall / acceleration of 9.8 <u>ms<sup>-2</sup></u> (and zero initial vertical velocity)	B1	<b>Note:</b> Must have reference to both objects
<b>Total</b>		<b>4</b>	