

Question		Scheme	Marks	AOs
4(a)		$(\lambda \mathbf{i} = 9 \mathbf{i}) \quad \lambda = 9$	B1	3.3
		Vertical distance:	M1	3.4
		$9^2 = 12^2 - 2gh$	A1ft	1.1b
		$h = 3.2(1)$	A1	1.1b
			(4)	
(b)		Min speed = 9 (m s ⁻¹)	B1	2.2a
			(1)	
(c)		Vertical component of velocity = $\sqrt{12^2 - 9^2} (= \sqrt{63})$	M1	3.1b
		$\Rightarrow -\sqrt{63} = \sqrt{63} - gt$	A1ft	1.1b
		Complete strategy to find the required time	M1	3.1b
		$t = 1.6(2) \text{ (s)}$	A1	2.2a
			(4)	
(d)		Consider the dimensions of the ball	B1	3.5c
			(1)	
(10 marks)				
Notes:				
(a)	B1	Comparison of horizontal components of velocities.		
	M1	Use the model and <i>suvat</i> to form an equation in <i>h</i> . Condone sign errors		
	A1ft	Correct unsimplified equation. Follow their λ .		
	A1	3.2 or 3.21 only (follows use of 9.8)		
(b)	B1	Correct answer only		
(c)	M1	Use of Pythagoras to find vertical component		
	A1ft	Correct unsimplified equation in <i>t</i> OR find both solutions of $12 - gt = \pm\sqrt{63}$. Follow their vertical component.		
	M1	Complete strategy for the required time e.g. find the vertical component of the velocity when speed is 12 m s ⁻¹ and use <i>suvat</i>		
	A1	1.6 or 1.62 only (follows use of 9.8)		
(d)	B1	e.g consider the dimensions of the ball the ball could be spinning the effect of the wind		