Question Number	Scheme	Marks
3(a)		
	$22.5 = 5V - \frac{1}{2} \times g \times 5^2$	M1A1
	$(h =)$ 22.5 or 23	A1
		(3)
(b)	$v^2 = u^2 + 2as$ (or cons. of energy)	
	First ball: $V^2 = 20^2 + 2 \times g \times 22.5$ **OR** $V = -20 + (5 \times g)$ **OR** $22.5 = 5V - \frac{1}{2} \times g \times 5^2$	M1A1
	$(V^2 = 841)$ $V = 29$	
	Second ball: $\left(\frac{3}{4} \times '29'\right)^2 = w^2 + 2 \times g \times '22.5'$	M1A1**ft** (their V and their h)
	$w^2 = \frac{9}{16} \times 841 - 2 \times 9.8 \times 22.5$	
	$w = 5.66$ or 5.7	A1
		(5)
		8
	Notes	
(a)		
M1	Complete method to find an equation in h only: $s = ut + \frac{1}{2}at^2$: Must be using 5 and 20 but condone slips in substitution, condone sign errors. Alternatives will use time and distance to top (2.0408.. s and 20.408.. m) or speed at ground (29 m s^{-1})	
A1	Correct equation in h or s only **N.B.** Allow premature approximation	
A1	22.5 or 23 only. Ignore units. Must be positive. **N.B.** $\frac{45}{2}$ is A0	
(b)		
M1	First ball: Use of *suvat* to find an equation in V or V^2, using their h. (this may have been done in (a)), condone sign errors.	
A1	Correct unsimplified equation.	
M1	Second ball: Use of *suvat* to find an equation in w only, using $\frac{3}{4}\times$ their V, condone sign errors	
A1ft	Correct equation in w only using their V and their h	
A1	5.66 or 5.7 only. Ignore units. Alternatives will use the time (1.64519 s)	