Question Number	Answer		Mark
15(a)	• Use of $v^2 = u^2 + 2as$ AND $u = 0$ **Or** $mgh = \frac{1}{2}mv^2$	(1)	
	• $v = 3.4$ (m s^{-1})	(1)	
	Example of calculation $v^2 = 2 \times 9.81$ m s^{-2} $\times 0.60$ m $v = \sqrt{11.77}$ m s^{-1} $v = 3.43$ m s^{-1}		
			(2)
15(b)	• Horizontal $3.4 \times \sin 70°$ **Or** $3.4 \times \cos 20°$ **Or** calculated value.	(1)	
	• Vertical $3.4 \times \cos 70°$ **Or** $3.4 \times \sin 20°$ 1.16 **Or** calculated value. Allow e.c.f. from part (a)	(1)	
			(2)

15(c)	Use of $v = s/t$ to determine time to end of ramp (0.38 s).		
	• Use of $s = ut - ½\,g\,t^2$ to determine drop in altitude after time t (0.27 m).	(1)	
	• Ball does not bounce on the ramp.	(1)	
	• Justifies conclusion from numbers calculated. e.g. $0.86 - 0.27 > 0.00$ means has not reached ground by end of ramp.	(1)	
	Example of calculation	(1)	
	$$t = \frac{1.23 \text{ m}}{3.4 \text{ m s}^{-1} \times \sin 70°}$$ $$t = 0.39 \text{ s}$$ $$s = (3.4 \text{ (m s}^{-1}) \times \cos 70° \times 0.39 \text{ s}) + (½ \times (-9.81 \text{ m s}^{-2}) \times (0.39 \text{ s})^2)$$ $$s = -0.28 \text{ m}$$		
	Or		
	• Use of $s = ut - ½\,g\,t^2$ to determine time to $s = -0.86$		
	• Use of $s = vt$ to calculate s	(1)	
	• Ball does not bounce on the ramp.	(1)	
	• Justifies conclusion from numbers calculated. e.g. $1.23 < 1.79$	(1)	
	Or	(1)	
	• Use of $v = u - gt_1$ with $v = 0$ to get time to max height (0.12s) **and** use of $s = ½\,g\,t_1^2$ to get gain in height (0.07m) **and** use of $s = ut + ½\,g\,t_2^2$ with $u = 0$ and $s = 0.93$ to get time from there to the ground (0.44s) Total time $t = t_1 + t_2$.	(1)	
	• Use of $s = vt$ to calculate s	(1)	
	• Ball does not bounce on the ramp.	(1)	
	• Justifies conclusion from numbers calculated. e.g. $1.23 < 1.79$	(1)	(4)
	Total for question 15		**8**