Question	Scheme	Marks
5(a)	Horizontal motion to find expression for the distance	M1
	$(XY =) u\cos\theta t$	A1
	Method using vertical motion to find relevant equation in t, u, g, θ. Eg • Using vertical distance $= 0$ to find expression for time. • Find expression for time to max height and $\times 2$	M1
	Correct unsimplified equation in t, u, g, θ. $u\sin\theta t - \frac{1}{2}gt^2 = 0$	A1
	Solve to obtain the distance in terms of u, g and θ	DM1
	$XY = u\cos\theta \times \frac{2u\sin\theta}{g} = \frac{u^2\sin 2\theta}{g}$ *	A1*
		(6)
5(b)	$CB = \frac{20^2 \times \sin 120°}{g} - 12$	M1
	$CB = 23(\text{m})$ or $CB = 23.3(\text{m})$	A1
		(2)
5(c)	Horizontal motion	M1
	$12 = 20\cos 60° t$	A1
	Vertical motion $y = 20\sin 60° \times 1.2 - \frac{1}{2} \times g \times 1.2^2 (-5)$	M1
	Height above D = $8.7(\text{m})$ or $8.73(\text{m})$	A1
		(4)
		(12)
	Notes	
	Over-accuracy or under-accuracy is penalised max **once** per complete question. Penalise final A mark in the appropriate part. Use of g = 9.81 or 10 is penalised max **once** per complete question. Penalise final A mark in the appropriate part. If both errors occur they could lose the final two A marks.	
5(a)		
M1	Use horizontal motion to find an expression for the horizontal distance.	
A1	Correct unsimplified equation.	
M1	Method using vertical motion with relevant *suvat* to find an equation in t, u, g, θ (condone use of 9.8). M0 if $t = \frac{2u\sin\theta}{g}$ or $t = \frac{u\sin\theta}{g}$ is quoted (ie if it appears without any evidence of method)	
A1	Correct equation, (condone use of 9.8) Eg • $u\sin\theta t - \frac{1}{2}gt^2 = 0$	

	• $-u\sin\theta = u\sin\theta - gt$ • $u\sin\theta - gt = 0$ double the time.	
DM1	Dependent on the preceding M marks. Solve to obtain the distance in terms of u, g and θ.	
A1*	Obtain given answer from correct working. Must recover g if 9.8 is used. Must have $XY =$ at this stage.	
5(b)		
M1	Complete method using result in (a), or using horizontal motion from first principles, to find the horizontal distance *CB*.	
A1	Correct answer, 2sf or 3sf	
5(c)		
M1	Complete method for horizontal motion to obtain an equation in t. If t =1.2 o.e. is seen in earlier working, it must be used in (c) to earn the marks.	
A1	Correct unsimplified equation (t = 1.2)	
M1	Method using *suvat* with vertical motion to obtain a relevant vertical distance. Height of pole not required.	
A1	Correct answer, 2 sf or 3 sf	