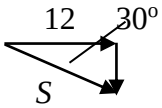
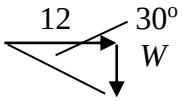
7(a)	Use of conservation of energy	M1
	$\frac{1}{2}m\times 20^2-\frac{1}{2}mv^2=mg\times 11$	A1
	$\frac{1}{2}m\times 20^2-\frac{1}{2}m\left(V^2+(2V)^2\right)=mg\times 11$	A1
	$V=6$ *	A1*
		(4)
7(b)	At A,  $S=\frac{12}{\cos 30^o}$ $(8\sqrt{3})$	M1A1
	$\frac{1}{2}m\times 20^2-\frac{1}{2}mS^2=mgH$ (from O to A) OR $\frac{1}{2}mS^2-\frac{1}{2}m\times(6^2+12^2)=mgh$ (from ht. 11m to A)	M1A1
	Solve for H or h (0.6)	DM1
	H = 10 m (2sf)	A1
		(6)
	OR	
	At A,  $W=12\tan 30^o$ $(4\sqrt{3})$ (**OR**: $12=S\cos 30^o$ **AND** $W=S\sin 30^o$)	M1A1
	$W^2=\left(20\times\frac{4}{5}\right)^2-2gH$ (from O to A) **OR** $W^2=\left(20^2-12^2\right)-2gH$ (from O to A) **OR** $W^2=6^2-2gs$ (from ht. 11m to A) **N.B.** All 3 equations are using positive UP	M1A1
	Solve for H (10.4) OR $s=-0.6$ so height is $11-0.6=10.4$	DM1
	Height is 10 m (2sf)	A1
		(6)
		(10)
	Notes for question 7	
7(a)	M1 for an energy equation, dimensionally correct with correct terms, condone sign errors **N.B.** M0 if not using energy. **N.B.** If clearly using V, must include both horizontal and vertical cpts.	
	A1 correct equation in v May find v first: $(v^2=180)$	
	A1 correct equation in V then $V^2+(2V)^2=180$	
	A1* for correct given answer correctly obtained, by putting g = 10,	

	cancelling *m*'s and solving for *V*.	
7(b)	M1 for using perpendicularity at *A* to find *S*, the speed at *A* Condone sin/cos confusion.	
	A1 for correct unsimplified speed	
	M1 for complete method using energy to find an equation in *S* and *H*, or *S* and *h*, correct no. of terms, condone sign errors	
	A1 correct equation **without *S* replaced**	
	DM1, dependent on both M marks, solve for *H*	
	A1 cao	
	OR	
	M1 for using perpendicularity at *A* to find *W*, the vertical velocity component at *A*. Condone 30^o / 60^o confusion.	
	A1 for correct unsimplified vertical component. Allow + or −.	
	M1 for complete method using *suvat* to find an equation in *W* and *H*, condone sign errors, **N.B.** They may find *t* first and then use that to form this equation.	
	A1 correct equation **without *W* replaced**	
	DM1, dependent on both M marks, solve for *H*	
	A1 cao	

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