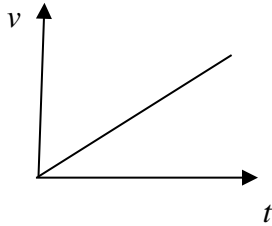


Question	Scheme	Marks	AOs
1(a)	(i) Equation of motion for P	M1	3.3
	$T - 2mg = 2ma$	A1	1.1b
	(ii) Equation of motion for Q	M1	3.3
	$5mg - T = 5ma$	A1	1.1b
	N.B. (allow $(-a)$ in both equations)	(4)	
1(b)	Solve equations for a or use whole system equation and solve for a	M1	3.4
	$a = \frac{3g}{7} = 4.2$	A1	1.1b
	$v = \sqrt{2 \times \frac{3g}{7} \times h} = \sqrt{8.4h}$ or $v^2 = 2 \times \frac{3g}{7} \times h (= 8.4h)$	M1	1.1b
	$0 = \frac{6gh}{7} - 2gH$	M1	1.1b
	$H = \frac{3h}{7}$	A1	1.1b
	Total height = $2h + h + H$	M1	2.1
	Total height = $\frac{24h}{7}$	A1	1.1b
		(7)	
1(c)	e.g. The distance that Q falls to the ground would not be exactly h oe	B1	3.5b
		(1)	
1(d)	e.g. The accelerations of the balls would not have equal magnitude (allow 'wouldn't be the same' oe) B0 if they say 'inextensible => acceleration same'	B1	3.5a
		(1)	
(13 marks)			
Notes:			
1a	M1	Translate situation into the model and set up the equation of motion for P (must contain T and a)	
	A1	Correct equation	
	M1	Translate situation into the model and set up the equation of motion for Q (must contain T and a)	

	A1	Correct equation
		N.B. Allow the above 4 marks if the equations appear in (b). If m 's are omitted consistently, max (a) M1A0M1A0 (b)M1A0M1M1A1M1A0
1b	M1	Solve for a
	A1	Allow 4.2 (m s^{-2}) or must be in terms of g only.
		N.B. Allow the above 2 marks if they appear in (a).
	M1	Complete method to produce an expression for v or v^2 in terms h , using their a
	M1	Complete method to produce an expression for H in terms of h , using $a = -g$ and $v = 0$
	A1	Correct expression for H
	M1	Complete method to find the total distance
	A1	cao but allow $3.4h$ or better
1c	B1	B0 if any incorrect extras are given
1d	B1	B0 if any incorrect extras are given or for an incorrect statement e.g. tension is not constant so accelerations will be different

Question	Scheme	Marks	AOs
	Mark parts (a) and (b) together		
2(a)	Equation of motion for A	M1	3.3
	$3mg \sin \alpha - F - T = 3ma$	A1	1.1b
		(2)	
2(b)	Resolve perpendicular to the plane	M1	3.4
	$R = 3mg \cos \alpha$	A1	1.1b
	$F = \frac{1}{6}R$	B1	1.2
	Equation of motion for B OR for whole system	M1	3.3
	$T - mg = ma$ OR $3mg \sin \alpha - F - mg = 3ma + ma$	A1	1.1b
	Complete method to solve for a	DM1	3.1b
	$a = \frac{1}{10}g$ *	A1*	2.2a
		(7)	
2(c)		B1	1.1b
	e.g. acceleration (of B) is constant; dependent on first B1	DB1	2.4
		(2)	
2(d)	e.g. the tensions in the two equations of motion would be different. Tension on A would be different to tension on B	B1	3.5a
		(1)	
(12 marks)			
Notes: N.B. If m's are consistently missing treat as a MR, so max (a) M1A0 (b) M1A0B0M1A1M1A1 (c) B1B1 (d) B1			
For (a) and (b), allow verification, but must see full equations of motion.			
2a	M1	Equation in T and a with correct no. of terms, condone sign errors and sin/cos confusion (If one of the 3's is missing, allow M1) N.B. Treat sin(3/5) etc as an A error but allow recovery	
	A1	Correct equation (allow $-a$ instead of a in <u>both</u> equations)	

2b	M1	Correct no. of terms, condone sign errors and sin/cos confusion Allow if appears in (a)
	A1	Correct equation
	B1	Seen anywhere in (a) or (b), including on a diagram
	M1	Equation (for B) in T and a with correct no. of terms, condone sign errors and sin/cos confusion OR Whole system equation with correct no. of terms, condone sign errors and sin/cos confusion
	A1	Correct equation
	DM1	Complete method (trig may not be substituted), dependent on M1 in (a) and second M1 in (b) if they use two equations, or second M1 in (b) if they use one equation.
	A1*	Correct answer correctly obtained.
2c	B1	Straight line starting at the origin (could be reflected in the t -axis). B0 if continuous vertical line at the end.
	DB1	Dependent on first B1, for any equivalent statement
2d	B1	B0 if incorrect extras