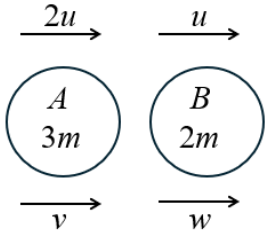
Question Number	Answer	Mark
7		
7(a)	Equation for CLM	M1
	$3m(2u)+2mu=3mv+2mw$	A1
	Use of impact law	M1
	$eu=w-v$	A1
	Solve to reach given answer for speed of B $\frac{u}{5}(8+3e)$ *	A1*
		(5)
7(b)	Speed of B after collision = $\frac{7u}{4}$	B1
	Speed of A after collision = $\frac{3u}{2}$	B1
	Difference in KE before and after in terms of m and u only	M1
	KE Loss = $\frac{1}{2}3m(2u)^2+\frac{1}{2}2m(u)^2-\frac{1}{2}3m\left(\frac{3u}{2}\right)^2-\frac{1}{2}2m\left(\frac{7u}{4}\right)^2$	A1
	Percentage of KE lost = $\frac{\frac{9}{16}mu^2}{7mu^2}\times 100=\frac{225}{28}\%$ (8.03571…%)	A1
		(5)
7(c)	Time taken for B to reach wall = $\frac{d}{\left(\frac{7u}{4}\right)}$ oe	M1
	Rebound speed of B = $\frac{7uf}{4}$	B1
	Remaining time $=\frac{60d}{91u}-\frac{4d}{7u}$ $\left(=\frac{8d}{91u}\right)$ (Time moved by B after hitting the wall)	M1
	Complete method to form an equation in f only: **ALT 1**: $d=\frac{7fu}{4}\left(\frac{8d}{91u}\right)+\frac{3u}{2}\left(\frac{60d}{91u}\right)$ **ALT 2**: $d-\left(\frac{3u}{2}\times\frac{4d}{7u}\right)=\frac{7fu}{4}\left(\frac{8d}{91u}\right)+\frac{3u}{2}\left(\frac{8d}{91u}\right)$	**d**M1

	$f = \frac{1}{14}$	A1
		(5)
		(15)
	Notes for question	
(a)		
M1	Equation for CLM. Dimensionally correct, all terms required, correct pairings of masses and velocities.Condone sign errors.	
A1	Correct unsimplified equation.	
M1	Use of impact law. Condone sign errors but must be used the right way round.	
A1	Correct unsimplified equation, signs consistent with CLM.	
A1*	Obtain given answer from correct working. Accept terms in bracket reversed and all over 5.	
(b)		
B1	Seen or implied	
B1	Seen or implied	
M1	Expression for difference in KE in terms of *m* and *u* only **using their speeds.** Must be dimensionally correct with all terms present and with the correct structures. Mass and velocity must be correctly paired. Must be $\pm$(initial KE $-$ final KE)	
A1	Correct unsimplified expression for the KE loss	
A1	Correct percentage, accept 8% or better (8.03571…%)	
(c)		
M1	Find, in terms of *u* and *d*, the time taken for *B* to reach wall using their speed of *B*, seen	
B1	Cao, seen or implied. Allow $-\frac{7uf}{4}$ **N.B.** Allow $f v_B$ if their v_B is correct.	
M1	Remaining time, in terms of *u* and *d*, seen or implied, either as an expression or in an equation. **N.B**. Accept unsimplified	
dM1	Complete method to form an equation in *f* only**.Allow uncancelled *d*'s and *u*'s.** Dependent on both previous M's.	
A1	Accept 0.071 or better (0.07142857…..)	