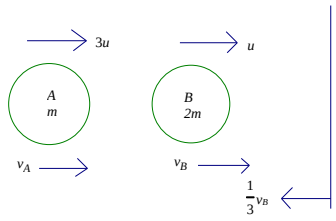
Q	Mark Scheme	Marks	Marking guidance
7 (a)			Check their diagram but remember that the directions used in their equations might not be consistent with the diagram. In this case, ignore their diagram.
	Conservation of momentum	M1	Need all terms. Dimensionally correct. Condone sign errors. Condone *m* missing throughout or *g* present throughout.
	$3mu + 2mu = mv_A + 2mv_B \quad (5u = v_A + 2v_B)$	A1	Correct unsimplified equation. Allow with v_A negative
	Use of NEL	M1	Used the right way round. Condone sign errors
	$v_B - v_A = e(3u - u) \qquad (2ue = v_B - v_A)$	A1	Correct unsimplified equation. Allow with v_A negative. Signs consistent between the two equations.
	Solve for v_A or v_B	DM1	Dependent on two previous M marks
	Obtain $v_B = \frac{5+2e}{3}u$ *	A1*	Obtain **given answer** from correct working
	Obtain $v_A = \frac{5-4e}{3}u$	A1	Or equivalent. v_A must be positive
		7	
7 (b)	Time for *B* to reach the wall $t_B = \frac{d}{2u}$	B1	Seen or implied. Allow $\frac{d \times 3}{(5+2e)u}$
	Speed of *B* after impact with wall $= \frac{2}{3}u$	B1	Seen or implied. Allow $\frac{1}{3}\left(\frac{5+2e}{3}\right)$
	Distance travelled by *A* before *B* hits the wall $= u \times \frac{d}{2u}\left(= \frac{d}{2}\right)$	M1	Substitute $e = \frac{1}{2}$ and use their v_A and their t_b to find distance
	Time to close the gap	M1	Correct formula with their relevant speeds
	$\frac{d}{2} = u \times t + \frac{2u}{3} \times t\left(= \frac{5ut}{3}\right) \quad \left(t = \frac{3d}{10u}\right)$	A1	Correct unsimplified equation
	Total time $= \frac{d}{2u} + \frac{3d}{10u} = \frac{8d}{10u}\left(= \frac{4d}{5u}\right)$	A1	ISW Any equivalent form
		6	
7(b) alt	In time *T*, *A* travels *x* metres $x = uT$ *B* travels *d* metres in *t* sec $d = 2ut$ First B1 *B* travels $d - x$ metres in *t*' sec $d - x = 2ut'/3$ Second B1 and first M1 $t + t' = T$ $(d + 3d - 3uT)/2u = T$ Second M1 and first A1 $T = 4d/5u$ Second A1		Equivalent statement Correct value implied and Distance travelled by *B* after it hits the wall Correct formula for time and Correct unsimplified equation Correct answer
		(13)	