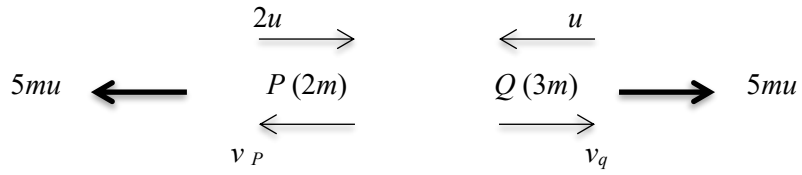
Question Number	Scheme	Marks
1(a)		
	$5mu = 2m(v_P - -2u)$ or $5mu = 2m(-v_P - -2u)$	M1 A1
	Speed of P is $\frac{1}{2}u$	A1
		(3)
(b)	Reversed	B1
		(1)
(c)	$5mu = 3m(v_Q - -u)$ or $5mu = 3m(-v_Q - -u)$	M1 A1
	Speed of Q is $\frac{2}{3}u$	A1
		(3)
	OR	
	$2m2u - 3mu = -2m\frac{1}{2}u + 3mv_Q$ or $2m2u - 3mu = -2m\frac{1}{2}u - 3mv_Q$	M1 A1
	Speed of Q is $\frac{2}{3}u$	A1
		(3)
		7
	Notes	
(a)		
M1	Complete method to find an equation in v_P, m and u only: Use of $5mu$ = change in momentum of P (must have $2m$ in both terms so allow with $2m$ outside the bracket even if it changes after the brackets are removed) (M0 if *clearly* adding momenta) but condone sign errors. **N.B.** they could find v_Q first and then use CLM	
A1	Correct equation for *their* v_P	
A1	$\frac{1}{2}u$ oe (A0 if –ve)	
(b)		
B1	cao; **only** allow if $\frac{1}{2}u$ or $-\frac{1}{2}u$ has been correctly obtained in (a). Allow: '(Yes) it has' but NOT just 'Yes' nor 'has been changed' nor just "opposite"	

(c)		
M1	Complete method to find an equation in v_Q, m and u only: Use of $5mu$ = change in momentum of Q (must have $3m$ in both terms so allow with $3m$ outside the bracket even if it changes after the brackets are removed) but condone sign errors.	
A1	Correct equation	
A1	$\frac{2}{3}u$; Accept $0.67u$ or better. (A0 if –ve)	
	OR	
M1	Complete method to find an equation in v_Q, m and u only: Use of CLM with correct no. of terms and correct pairings and their v_P (M0 for CLM with 2 unknowns) but condone sign errors.	
A1	Correct equation for their v_Q	
A1	$\frac{2}{3}u$; Accept $0.67u$ or better. (A0 if –ve)	