

Mechanics 1 Momentum Answers

1(a)	$\begin{array}{ccc} \rightarrow 6\text{ms}^{-1} & & \\ 2 \text{ kg } \bigcirc & & \bigcirc \text{ } 3 \text{ kg} \\ & & \rightarrow v \end{array}$ $2 \times 6 = 3 \times v$ $\underline{v = 4 \text{ms}^{-1}}$	M1 A1 A1	3	
(b)	$\begin{array}{ccc} \rightarrow 6\text{ms}^{-1} & & \\ 2 \text{ kg } \bigcirc & & \bigcirc \text{ } 3 \text{ kg} \\ & & \rightarrow 4v \\ \leftarrow v & & \end{array}$ $2 \times 6 = -2 \times v + 3 \times 4v$ $12 = 10v$ $\underline{v = 1.2 \text{ms}^{-1}}$	M1 A1 A1 [√]	3	all terms √ sign error ($v=0.857$)
Total			6	

8(a)	$m(5\mathbf{i} - 3\mathbf{j}) + 0.2(2\mathbf{i} + 3\mathbf{j})$	M1 A1	2	Momentum terms added All correct
(b)(i)	$(0.2 + m)(k\mathbf{i} + \mathbf{j})$ use of conservation of momentum $-3m + 0.6 = 0.2 + m$ $m = 0.1$	B1 M1 A1	3	Seen or used to find m Used with candidate's expressions in 2D equation or used to give one of the 1D equations below Full verification accepted, CAO
(ii)	$5m + 0.4 = 0.2k + mk$ substitute m $k = 3$	A1 m1 A1	3	
Total			8	

1(a)	$3 \times 4 + 2 \times (-4) = 5v$ $4 = 5v$ $v = \frac{4}{5} = 0.8$	M1 A1 A1	3	Three term equation for conservation of momentum. Correct equation Correct speed (for use of mg instead of m deduct the first A1)
(b)	$3 \times 4 + 2 \times (-4) = 3 \times 0.4 + 2v$ $4 = 1.2 + 2v$ $v = \frac{4 - 1.2}{2} = 1.4$	M1 A1 A1	3	Four term equation for conservation of momentum. Correct equation Correct speed (for use of mg instead of m deduct the first A1)
			6	

2(a)	$2 \begin{bmatrix} 3 \\ -2 \end{bmatrix} + 3 \begin{bmatrix} -4 \\ 1 \end{bmatrix} = 5\mathbf{v}$ $\mathbf{v} = \frac{1}{5} \begin{bmatrix} -6 \\ -1 \end{bmatrix} = \begin{bmatrix} -1.2 \\ -0.2 \end{bmatrix}$	M1 A1 A1	 3	Three term vector equation, with a '+' sign, for conservation of momentum Correct equation Deduct this first A mark for use of mg Correct velocity
(b)	$v = \sqrt{1.2^2 + 0.2^2} = 1.22 \text{ ms}^{-1}$	M1 A1F	 2	Finding speed from their velocity in part (a) (Must include addition of two terms) Correct speed from their velocity Accept 1.21
Total			5	