

- 2 Two atoms X and Y, have masses $3m$ and $2m$ respectively. The 2 atoms move head-on towards each other with the same speed v as shown in Fig. 2.1.



Fig. 2.1

Fig. 2.2 comprises two velocity-time graphs A and B, which show how the velocity of each atom varies with time. The interaction between the atoms is elastic.

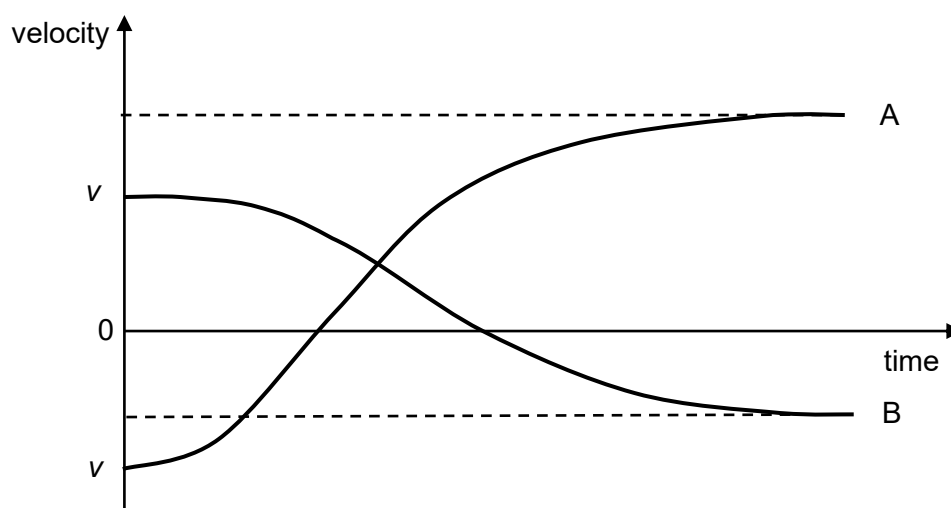


Fig. 2.2 (not to scale)

- (a) (i) Explain why it is not possible for the atoms to stop at the same instant.

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..... [1]

- (ii) At one instant during the interaction between the atoms, they are both travelling in the same direction with the same speed. Calculate this speed, in terms of v .

speed = [2]

(b) (i) State and explain, which of the curves A or B is the velocity-time sketch for atom Y.

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..... [3]

(ii) On Fig. 2.2, mark the instant in time at which the atoms are at their distance of closest approach. Label this point **T**. [1]

(iii) Determine the final speed of each atom in terms of v .

final speed of X =

final speed of Y = [3]

[Total: 10]

