3   Two balls, X and Y, move along a horizontal frictionless surface, as illustrated in Fig. 3.1.
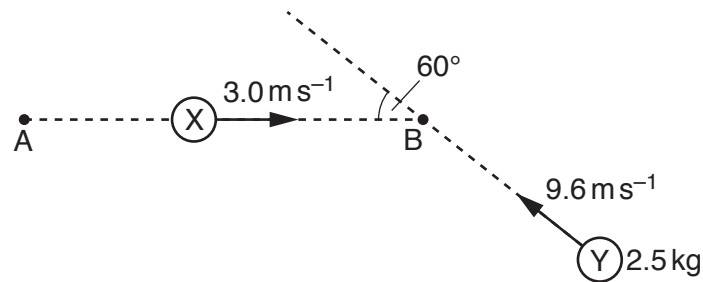

Fig. 3.1 (not to scale)

Ball X has an initial velocity of $3.0\,\text{m s}^{-1}$ in a direction along line AB. Ball Y has a mass of 2.5 kg and an initial velocity of $9.6\,\text{m s}^{-1}$ in a direction at an angle of 60° to line AB.

The two balls collide at point B. The balls stick together and then travel along the horizontal surface in a direction at right-angles to the line AB, as shown in Fig. 3.2.
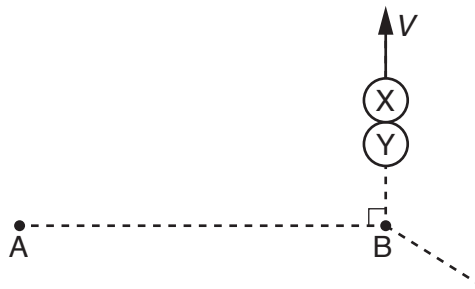

Fig. 3.2

(a) By considering the components of momentum in the direction from A to B, show that ball X has a mass of 4.0 kg.

[2]

(b) Calculate the common speed V of the two balls after the collision.

$V =$ .... m s^{-1} [2]

(c) Determine the difference between the initial kinetic energy of ball X and the initial kinetic energy of ball Y.

difference in kinetic energy = ... J [2]

[Total: 6]