3 **(a)** State the principle of conservation of momentum.

....

....

....[2]
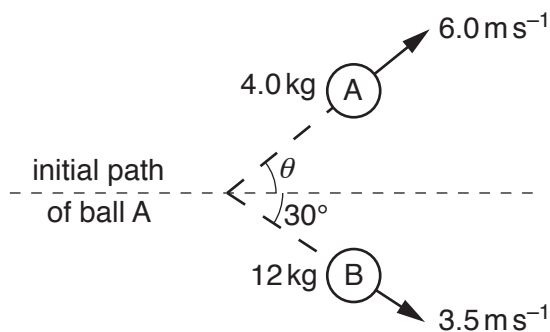
(b) Ball A moves with speed v along a horizontal frictionless surface towards a stationary ball B, as shown in Fig. 3.1.
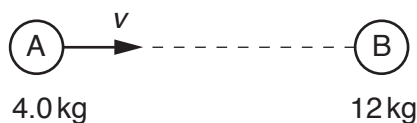
before collision

after collision

Fig. 3.1   **Fig. 3.2** (not to scale)

Ball A has mass 4.0 kg and ball B has mass 12 kg.
The balls collide and then move apart as shown in Fig. 3.2.
Ball A has velocity 6.0 m s^{-1} at an angle of θ to the direction of its initial path.
Ball B has velocity 3.5 m s^{-1} at an angle of 30° to the direction of the initial path of ball A.

(i) By considering the components of momentum at right-angles to the direction of the initial path of ball A, calculate θ.

$\theta =$ .... ° [3]

(ii) your answer in **(i)** to show that the initial speed v of ball A is $12\,\mathrm{m\,s^{-1}}$. Explain your working.

[2]

(iii) By calculation of kinetic energies, state and explain whether the collision is elastic or inelastic.

....

....[3]

[Total: 10]