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

.....

.....

.....[2]

(b) A stationary firework explodes into three different fragments that move in a horizontal plane, as illustrated in Fig. 2.1.

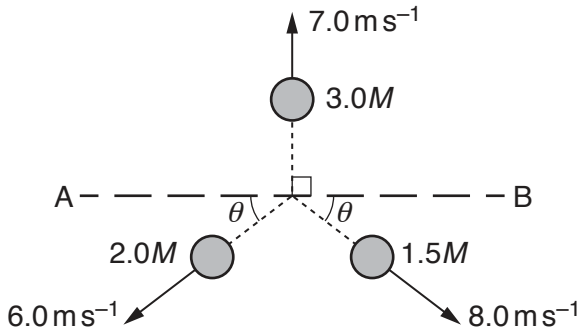

Fig. 2.1

The fragment of mass $3.0M$ has a velocity of $7.0\,m\,s^{-1}$ perpendicular to line AB.
The fragment of mass $2.0M$ has a velocity of $6.0\,m\,s^{-1}$ at angle θ to line AB.
The fragment of mass $1.5M$ has a velocity of $8.0\,m\,s^{-1}$ at angle θ to line AB.

(i) Use the principle of conservation of momentum to determine θ.

θ = ... ° [3]

(ii) Calculate the ratio

$$\frac{\text{kinetic energy of fragment of mass } 2.0M}{\text{kinetic energy of fragment of mass } 1.5M}.$$

ratio = ...[2]

[Total: 7]