

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 8 Momentum

### Exercise A, Question 17

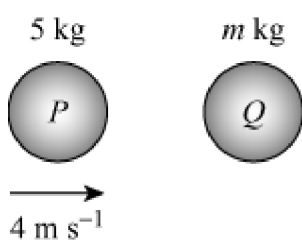
#### Question:

A particle,  $P$ , has mass 5 kg. It is moving along a straight line with speed  $4 \text{ m s}^{-1}$ , when it collides directly with another particle,  $Q$ , which is at rest. The mass of  $Q$  is  $m$  kg.

After the collision  $P$  moves with a speed of  $1.2 \text{ m s}^{-1}$  and  $Q$  moves with a speed of  $1.4 \text{ m s}^{-1}$ .

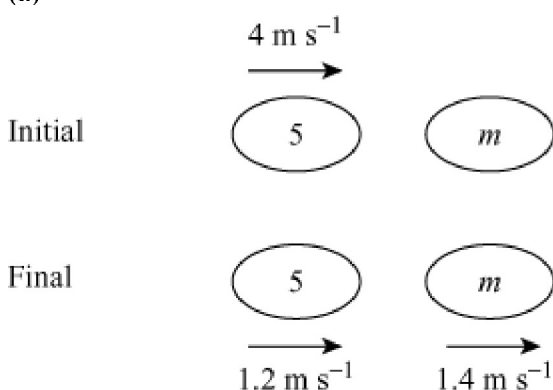
(a) If  $P$  and  $Q$  both move in the same direction after the collision, show that  $m = 10$ .

(b) If  $P$  and  $Q$  move in opposite directions after the collision, find  $m$ . [A]



#### Solution:

(a)



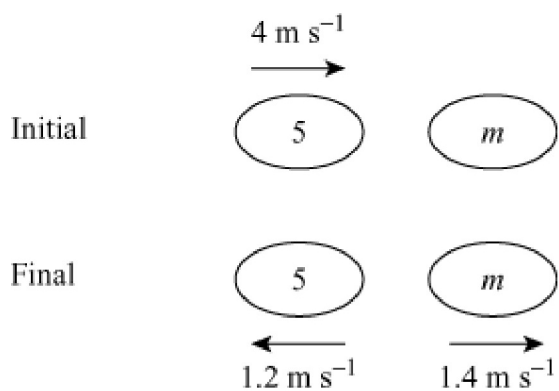
Using conservation of momentum

$$5 \times 4 = 5 \times 1.2 + m \times 1.4$$

$$20 = 6 + 1.4m$$

$$m = 10 \text{ kg}$$

(b)



Using conservation of momentum (speeds to the 'right' are positive)

$$5 \times 4 = m \times 1.4 + 5 \times (-1.2)$$

$$20 = 1.4m - 6$$

$$26 = 1.4m$$

$$m = \frac{26}{1.4}$$

$$= 18.57\dots$$

$$m = 18.6 \text{ kg}$$