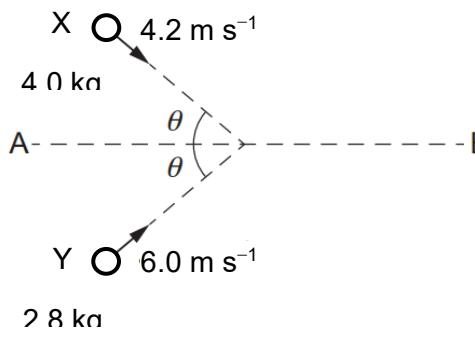


- 1 (a) State the principle of conservation of momentum.

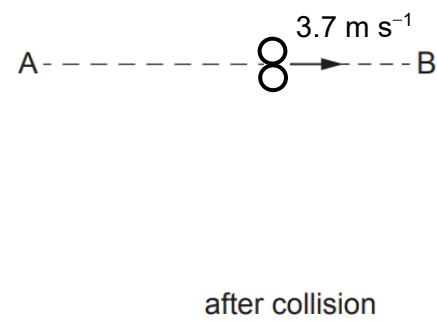
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.....  
.....

[2]

- (b) Two balls, X and Y, move along a horizontal surface frictionless surface, as shown in Fig. 1.1.



before collision



after collision

Fig. 1.1

Fig. 1.2

Ball X has a mass of 4.0 kg and a velocity of  $4.2 \text{ m s}^{-1}$  in a direction at angle  $\theta$  to a line AB. Ball Y has a mass of 2.8 kg and a velocity of  $6.0 \text{ m s}^{-1}$  in a direction at angle  $\theta$  to a line AB.

The balls collide and stick together. After colliding, the balls have a velocity of  $3.7 \text{ m s}^{-1}$  along the line AB on the horizontal surface, as shown in Fig. 1.2. The duration of collision is 3.0 ms.

- (i) By considering the components of the momenta **along** the line AB, determine  $\theta$ .

$$\theta = \dots \text{ } ^\circ \quad [2]$$

- (ii) Determine the impulse experienced by ball X along the direction **perpendicular** to line AB.

$$\text{impulse} = \dots \text{ N s} \quad [2]$$

- (iii) Given that balls X and Y moves along line AB after collision, explain why the value of the angle  $\theta$  for ball X and Y must be the same.

.....  
.....  
.....  
.....

[2]

- (iv) With calculations, state and explain whether the collision of the balls is elastic or inelastic collision.

[2]

[Total: 10]

