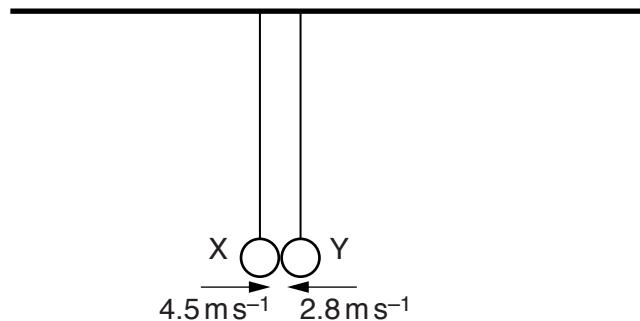


- 3 Two balls X and Y are supported by long strings, as shown in Fig. 3.1.



**Fig. 3.1**

The balls are each pulled back and pushed towards each other. When the balls collide at the position shown in Fig. 3.1, the strings are vertical. The balls rebound in opposite directions.

Fig. 3.2 shows data for X and Y during this collision.

| ball | mass | velocity just before collision/m s <sup>-1</sup> | velocity just after collision/m s <sup>-1</sup> |
|------|------|--|---|
| X    | 50 g | +4.5   | -1.8  |
| Y    | M    | -2.8   | +1.4  |

**Fig. 3.2**

The positive direction is horizontal and to the right.

- (a) Use the conservation of linear momentum to determine the mass M of Y.

$$M = \dots \text{ g} [3]$$

- (b) State and explain whether the collision is elastic.

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[1]

- (c) Use Newton's second and third laws to explain why the magnitude of the change in momentum of each ball is the same.

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.....  
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[3]