2 A wooden block moves along a horizontal frictionless surface, as shown in Fig. 2.1.

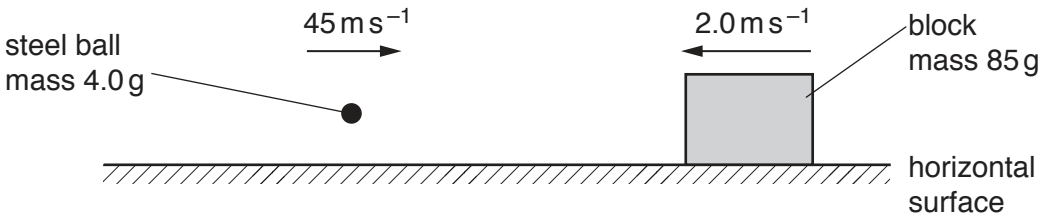

Fig. 2.1

The block has mass 85 g and moves to the left with a velocity of 2.0 m s^{-1}. A steel ball of mass 4.0 g is fired to the right. The steel ball, moving horizontally with a speed of 45 m s^{-1}, collides with the block and remains embedded in it. After the collision the block and steel ball both have speed *v*.

(a) Calculate *v*.

v = ... m s^{-1} [2]

(b) (i) For the block and ball, state

1. the relative speed of approach before collision,

relative speed of approach = ... m s^{-1}

2. the relative speed of separation after collision.

relative speed of separation = ... m s^{-1}
[1]

(ii) Use your answers in **(i)** to state and explain whether the collision is elastic or inelastic.

.....

..... [1]

(c) Use Newton's third law to explain the relationship between the rate of change of momentum of the ball and the rate of change of momentum of the block during the collision.

.....

.....

.....

..... [2]

[Total: 6]

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