Name : *Solution*   Id :   Sec. # : **25**

An average force of magnitude 1200 N is applied to a 0.5 kg ball moving at a speed of 15 m/s in a collision lasting 10 ms. If the force is in a direction opposite to the initial velocity of the ball, find the final speed and direction of the ball.

Assume that the ball is moving to the right. Take the initial velocity direction to be the positive direction, then

$$V_i = + 15 \text{ m/s}$$

$$F = - 1200 \text{ N}$$

Then, using the definition of the impulse

$$J = F_{avg} \Delta t = \Delta P$$

$$\Rightarrow F_{avg} \Delta t = m(V_f - V_i)$$

$$\Rightarrow V_f = \frac{F_{avg} \Delta t}{m} + V_i$$

$$= \frac{-1200 \times 10 \times 10^{-3}}{0.5} + 15$$

$$\Rightarrow \boxed{V_f = -9 \text{ m/s}}$$

The final velocity of the ball has a speed of 9 m/s and a direction opposite to the direction of $\vec{V_i}$.