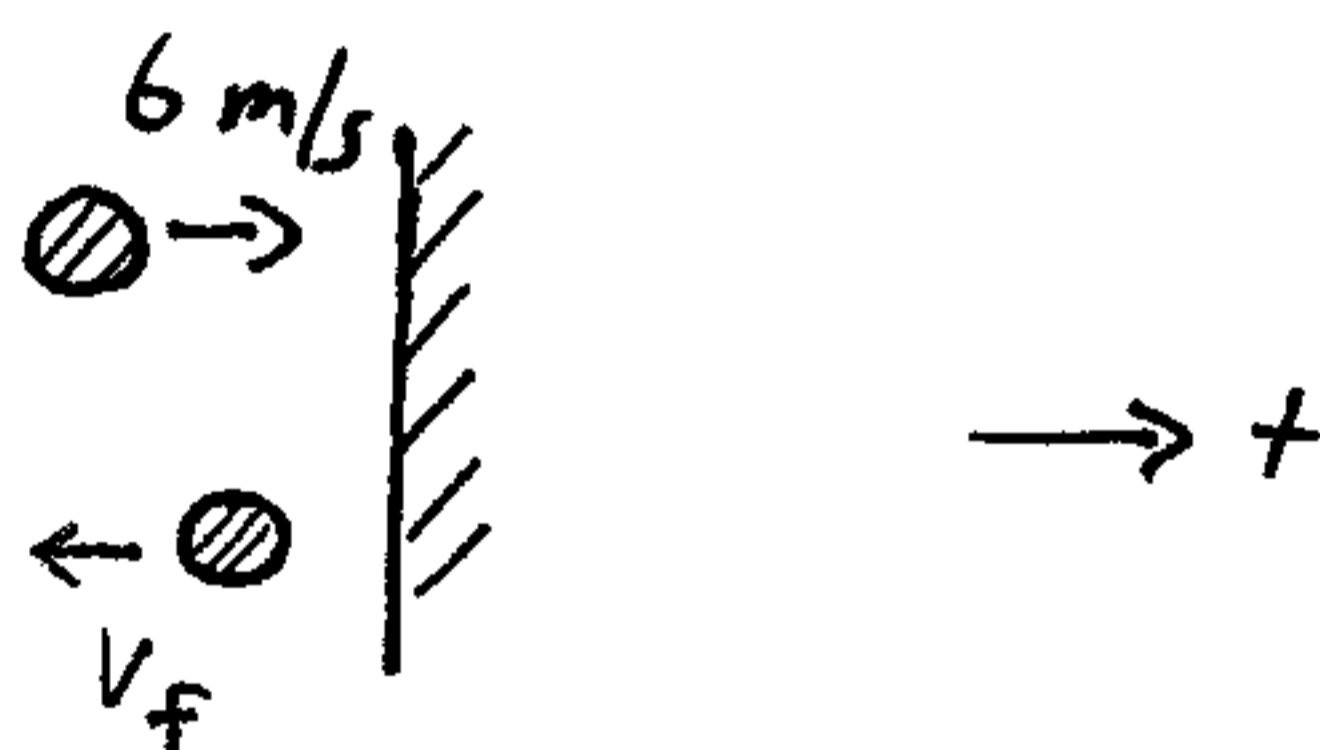


This is a problem involving momentum.

A child throws a ball having a mass of 150 g against a wall, with a speed of 6 m/s. The ball rebounds with a 40% reduction in its kinetic energy.

Determine, (a) the speed of the ball immediately after rebounding, (b) the impulse acting on the ball and wall, and (c) the average force exerted on the ball if the contact time between ball and wall was 8.3 ms.

Solution:



(a) The initial kinetic energy is:  $\frac{1}{2}(0.150 \text{ kg})(6 \text{ m/s})^2 = 2.7 \text{ J}$

After the ball rebounds, its kinetic energy is:

$$\Rightarrow 1.62 = \frac{1}{2}(0.150)v_f^2 \quad \begin{matrix} 0.60 \times 2.7 \text{ J} \\ = 1.62 \text{ J} \end{matrix}$$

$$v_f = 4.65 \text{ m/s (answer)}$$

(b)  $J = m(v_f - v_i)$

$$J = (0.150 \text{ kg})(-4.65 \text{ m/s} - 6 \text{ m/s})$$

$$J = -1.6 \text{ kg}\cdot\text{m/s (on ball)} \quad \text{(answer)}$$

(c)  $\bar{F} = \frac{-1.6 \text{ kg}\cdot\text{m/s}}{0.0083 \text{ s}} = -193 \text{ N (answer)}$   $J = 1.6 \text{ kg}\cdot\text{m/s (on wall)}$