Chapter 5 Problem 106

$m = 10.0\,g = 0.0100\,kg$

$v_0 = 350\,m/s$ (to the right)

$\Delta x = 34.0\,cm = 0.340\,m$

Find the magnitude and direction of the retarding force.

Using the kinematic equation (4th)

$$v^2 - v_0^2 = 2a\Delta x$$

$$\Delta x = \frac{v^2 - v_0^2}{2a} \qquad a = \frac{v^2 - v_0^2}{2\Delta x}$$

$$a = \frac{0^2 - (350\,m/s)^2}{2(0.340\,m)}$$

$$a = -1.80 \times 10^5\,m/s^2$$

Using Newton's 2nd Law gives

$$F = m \cdot a = (0.0100\,kg)(-1.80 \times 10^5\,m/s^2)$$

$$= \boxed{-1800\,N}$$

The force will be to the **left** with a magnitude of **1800 N**