

Question #64399, Physics / Mechanics | Relativity

A bullet of mass 0.02kg is moving with a speed 10m/s. It can penetrate 10 cm if a given target before coming to rest. If the same target were only 6 cm thick, what will be the speed and kinetic energy of the bullet, when it comes out.

Solution

The kinetic energy of the bullet right before it hits the target:

$$E_k = \frac{mv^2}{2};$$

$$E_{k_i} = \frac{0.02 \times 10^2}{2} = 1\text{J}$$

The change in kinetic energy is equal to the work done by resistive forces.

$$E_{k_i} = W = Fd;$$

$$F = \frac{E_{k_i}}{d};$$

$$F = \frac{1}{0.1} = 10\text{N}$$

The kinetic energy on the bullet when it comes out:

$$E_{k_f} = E_{k_i} - Fd;$$

$$E_k = 1 - 10 \times 0.06 = 0.4\text{J}$$

The final speed of the bullet:

$$v = \sqrt{\frac{2E_k}{m}};$$

$$v_f = \sqrt{\frac{2 \times 0.4}{0.02}} = 6.32\text{ m/s.}$$

Answer: 6.32 m/s; 0.4 J.