Question #36240

A bullet of mass 0.01 kg travelling horizontally at 100 m/s penetrates a fixed block of wood and comes to rest in 0.02 s.Calculate (a) the distance of penetration of the bullet into the wood and (b) the average retarding force exerted by the wood on the bullet.

Solution:

Let

$m = 0.01\ kg$

$v_0 = 100\ m/s$

$t = 0.02\ s$

$S = ?, F = ?$

On the equally decelerated movement

$S = v_0 t - \frac{1}{2} a t^2$ where a is the deceleration

$v = v_0 - at$ such as the final velocity is equal to zero

$v_0 = at$

$a = \frac{v_0}{t}$

According to the second Newton's law

$F = ma$

The final equations are

$$\boldsymbol{F = m\frac{v_0}{t}}$$

$$\boldsymbol{S = \frac{1}{2} v_0 t}$$

$$\boldsymbol{F = 0.01\frac{100}{0.02} = 50\ N}$$

$$\boldsymbol{S = \frac{1}{2} 100 * 0.02 = 1\ m}$$

Answers:

a) 1 m,

b) 50 N.