

**Answer on Question#37763 - Physics – Mechanics**

A BULLET OF MASS 50 G MOVING WITH INITIAL VELOCITY 100M/S STRIKES A WOODEN BLOCK AND COMES TO REST AFTER TRAVELING A DISTANCE OF 2CM. FIND THE RETARDATION

**Solution:**

$V_1 = 100 \frac{\text{m}}{\text{s}}$  – the initial velocity of the bullet;

$V_2 = 0$  – final velocity of the bullet;

$D = 0.02\text{m}$  – thickness of the block that stops the bullet;

$a$  – acceleration inside the block.

$t$  – total time that the bullet is in contact with the board

Assuming constant acceleration we can use the rate equation and motion equation to find the acceleration inside the block. Rate equation along the Y axis:

$$0 = V_1 - at$$

$$t = \frac{V_1}{a} \quad (1)$$

Motion equation along the Y axis:

$$D = V_1 t - \frac{at^2}{2} \quad (2)$$

(1)in(2):

$$D = V_1 \left( \frac{V_1}{a} \right) - \frac{a \left( \frac{V_1}{a} \right)^2}{2}$$

$$2a D = V_1^2$$

$$a = \frac{V_1^2}{2D} = \frac{\left( 100 \frac{\text{m}}{\text{s}} \right)^2}{2 \cdot 0.02\text{m}} = 250000 \frac{\text{m}}{\text{s}^2}$$

**Answer:** retardation of the bullet is equal to  $250000 \frac{\text{m}}{\text{s}^2}$ .

