Answer on Question #44502, Physics, Other

A 12 g bullet is accelerated from rest to speed of 700m/s as it travels 20cm in a gun barrel. Assuming acceleration to be constant, how large was the accelerating force ?

Solution:

Given:

$m = 12 \cdot 10^{-3}$ kg,

$v_0 = 0$,

$v = 700$ m/s,

$d = 0.2$ m,

$F = ?$

Newton's Second Law

$$F = ma$$

Kinematics equation

$$2ad = v^2 - v_0^2$$

where a is acceleration, d is distance, v_0 is initial velocity and v is final velocity.

Thus,

$$a = \frac{v^2 - v_0^2}{2d}$$

So,

$$F = m \frac{v^2 - v_0^2}{2d}$$

Substituting,

$$F = 12 \cdot 10^{-3} \frac{700^2 - 0^2}{2 \cdot 0.2} = 14700 \text{ N}$$

Answer: $F = 14700$ N.