

Chapter :- 2

Force and laws of Motion

1) Given,

Before firing

$$\text{Mass of Bullet } (m_1) = 0.02 \text{ kg}$$

$$\text{Mass of gun } (m_2) = 20 \text{ kg}$$

$$\text{initial velocity of the bullet } (u_1) = 0$$

$$\text{initial velocity of the gun} = 0$$

Now,

After firing

$$\text{Mass of Bullet } (m_1) = 0.02 \text{ kg}$$

$$\text{Mass of gun } (m_2) = 20 \text{ kg}$$

$$\text{Final velocity of the gun } (v_2) = ?$$

$$\text{Final velocity of the bullet } (v_1) = 100 \text{ m/s}$$

Total momentum before firing = After firing

$$\Rightarrow m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$$

$$\Rightarrow (0.02)(0) + (20)(0) = (0.02)(100) + (20)(v_2)$$

$$\Rightarrow 0 = 2 + 20 v_2$$

$$\Rightarrow -2 = 20 v_2$$

$$\Rightarrow v_2 = -2 / 20$$

$$\Rightarrow v_2 = -0.5 \text{ m/s}$$

2) According to the law of conservation of linear momentum, when two or more bodies act upon each other their total momentum remains constant provided no external forces are acting. So, momentum is never created or destroyed.