Ch- FORCE
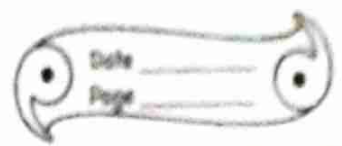
HOME ASSIGNMENT

1. A 20kg bullet can fire 10 bullets per second. Mass of each bullet 0.2 kg. The muzzle speed of the bullet is 150m/s. What is the recoil velocity of the gun? How much force is required to hold the gun?

Ans) Mass of the ~~bullet~~ Gun (M) = 20kg

Mass of the bullet (m) = 0.2kg = $\frac{2}{10}$ kg.

velocity of the bullet is = 150m/s

No. of bullets can be fired per second = 10

∴ Velocity of recoil the gun = $\frac{mu}{M} = \frac{\frac{2}{10} \times 150}{20}$

= $\frac{2 \times 15}{\frac{20}{10}}$ = 1.5 m/s

∴ Force required to hold the gun = nmu = $10 \times \frac{2}{10} \times 150$

= $2 \times 150 = 300$ N

2. State and prove law of Conservation of linear momentum.

Ans) Let after firing; the velocity of bullet (of mass m) = u

The velocity of the gun (of Mass M) = v

By conservation of linear momentum; Mv + mu = 0

⇒ v = $\frac{mu}{M}$ = recoil velocity of gun

If n bullets are fired per second,

then n interactions time between gun and each

bullet $= \left(\dfrac{1}{n} \right) s$

So, the magnitude of force between gun and each bullet $= \left[\dfrac{mu}{\frac{1}{n}} \right] = \left[nmu \right] = \left[nMv \right]$

3. A bomb explodes into several parts. Why these parts fly off in different directions.

Ans) Due to law of conservation of momentum. Momentum before explosion is equal to momentum after explosion as no external force is acting, so a bomb explodes into several parts, these parts fly off in different directions.

4. An object of mass 15kg travelling in a straight line with a velocity of 8m/s collides with a wooden block of mass 5kg resting on a floor. The object sticks with wooden block after collision and both move together in a straight line.

→ The total momentum after collision is :-

(3) 7.5 kg m/s

→ The velocity of the combination of these objects after collision is

(3) 1.15 m/s