

NEWTON'S THIRD LAW OF MOTION

This law states that "*to every action there is equal and opposite reaction*"

Example

The recoil effect when a bullet is fired from a gun

ILLUSTRATION

Mass of Bullet \times Muzzle Vel. = Mass of gun \times Recoil Vel.

$$M_b \times V_b = M_g V_c$$

An important principle arising out of 1st and 2nd Newton's Laws of motion is known as:

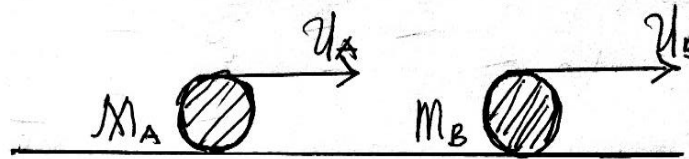
PRINCIPLE OF CONSERVATION OF LINEAR MOMENTUM (P C L M)

This principle states that *"for a system of interacting bodies the total momentum before collision is equal to the total momentum after collision provided no external forces are acting"*

P C L M gives

Momentum before Collision = Momentum after Collision

BEFORE COLLISION



Total momentum before collision

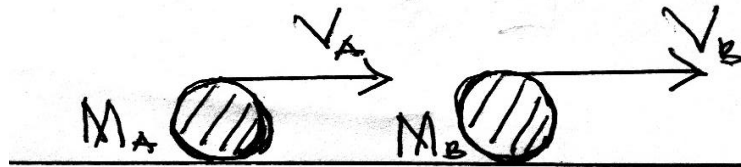
$$M_A U_A + M_B U_B$$

DURING COLLISION



Total momentum during collision = 0

AFTER COLLISION



Total momentum after collision

$$M_A V_A + M_B V_B$$

P C L M gives $M_A U_A + M_B U_B = M_A V_A + M_B V_B$

NEWTONIAN COLLISION

1. ELASTIC COLLISION

2. PERFECTLY ELASTIC COLLISION

3. COMPLETELY INELASTIC COLLISION

For Elastic Collision

1. Total momentum is conserved
2. Total Kinetic Energy is conserved

For Inelastic Collision

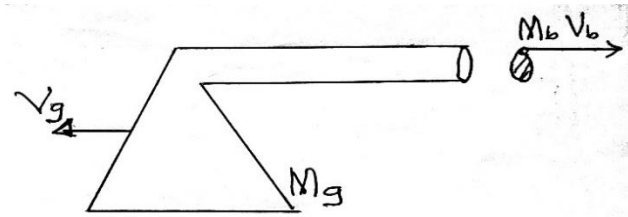
1. Total momentum is conserved
2. Total Kinetic Energy is not conserved

Note: For completely inelastic collision,

$$V_A = V_B = V \text{ is Common Velocity}$$

P C L M gives: $M_A U_A + M_B U_B = (M_A + M_B) V$

MOMENTUM AND EXPLOSIVE FORCE



The momentum before firing = 0

The momentum after firing

$$M_b V_b - M_g V_g$$

P C L M gives $0 = M_b V_b - M_g V_g$

$$M_b V_b = M_g V_g$$

End of Lesson Three