FORCE AND LAWS OF MOTION

CHAPTER NO.9

SUB: PHYSICS
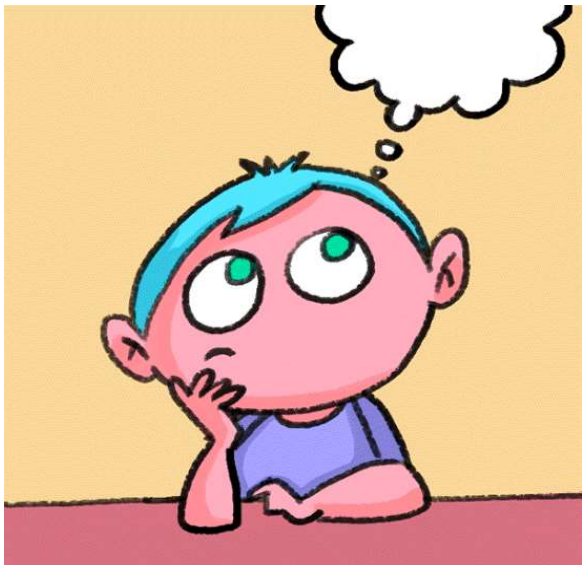
FORCE AND LAWS OF MOTION

LEARNING OBJECTIVE

Students will be able to

- State the Law of conservation of linear momentum
- Application of Law of conservation of linear momentum

Conservation of Momentum

As per the law of conservation of momentum, the sum of momenta of two objects before the collision and after collision remains the same given that no external unbalanced force acts upon them. In another way, collision conserves the total momentum of two objects
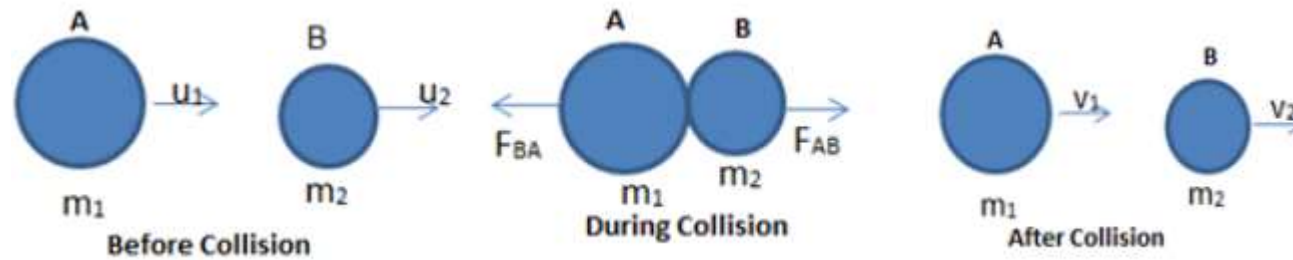
Consider the figure given above. Two balls A and B having a certain initial velocities collide with each other. Conditions before the collision-

There is no unbalanced force acting upon them

The initial velocity of A is greater than initial velocity of B

The figure below explains how the momentum of the balls is conserved after the collision.

The momentum of ball A before collision = $m_A u_A$	According to third law of motion
The momentum of ball A after collision = $m_A v_A$	$F_{AB} = - F_{BA}$ [-ve sign shows opposite force]
The momentum of ball B before collision = $m_B u_B$	$m_A(v_A - u_A)/t = - m_B(v_B - u_B)/t$
The momentum of ball B after collision = $m_B u_B$	$m_A v_A - m_A u_A = - m_B v_B + m_B u_B$
Rate of change of momentum of ball A $= m_A(v_A - u_A)/t$	$m_A v_A + m_B v_B = m_A u_A + m_B u_B$
= Force of action F_{AB}	or
Rate of change of momentum of ball B $= m_B(v_B - u_B)/t$	$m_A u_A + m_B u_B = m_A v_A + m_B v_B$
= Force of reaction F_{BA}	Momentum before collision = Momentum after collision

HOME ASSIGNMENT

Q1.From a rifle of mass 4 kg, a bullet of mass 50 g is fired with an initial velocity of 35 m s^{-1} . Calculate the initial recoil velocity of the rifle.

Q2.state the law of conservation of momentum.

THANKING YOU
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