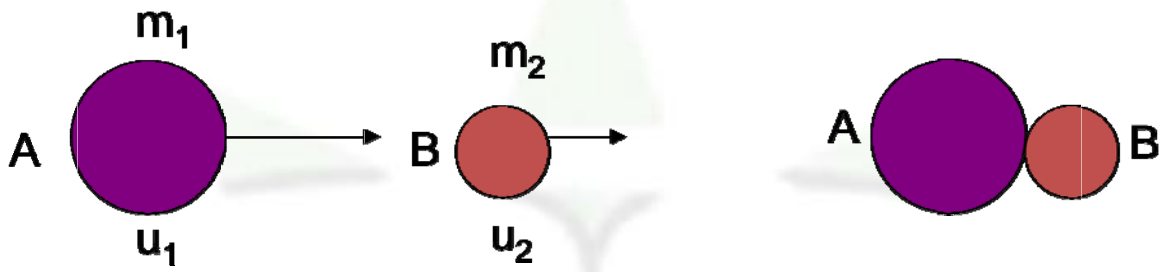
Conservation of linear momentum:

Statement: If no external force acts on a system of particles then the total linear momentum of the system remains conserved due to collision i.e. the total linear momentum of the system before and after collision remain same.



Let us consider two bodies A & B of mass m_1 and m_2 moving with velocities u_1 and u_2 respectively. In course of their motion they collide with one another. During collision the two bodies remain in contact for a certain time interval after which they get separated again.

Let F12 average force of collision exerted by body A on B

F21 average force of collision exerted by body B on A

Since these two forces F12 and F21 are action reaction pair of forces

F12 = F21

The total change in momentum of the body A due to collision

$$\Delta \vec{P}_A = \int_{t_1}^{t_2} \vec{F}_{21}\, dt = \vec{F}_{21}\, \Delta t \quad \text{Where } \Delta t = t_2 - t_1$$

The total change in momentum of the body B due to the collision is

$$\Delta \vec{P}_B = \int_{t_1}^{t_2} \vec{F}_{12}\, dt = \vec{F}_{12}\, \Delta t \quad \text{Where } \Delta t = t_2 - t_1$$

The total change in momentum of the system due to collision

$$\Delta \vec{P}_A + \Delta \vec{P}_B = \vec{F}_{12}\, \Delta t + \vec{F}_{21}\, \Delta t$$

$$\text{but } \vec{F}_{12} = -\vec{F}_{21}$$

$$\therefore \Delta \vec{P}_A + \Delta \vec{P}_B = 0$$

Thus total change in momentum due to the collision is zero i.e. total momentum of the system after collision remains same as that before collision i.e. momentum is conserved.