WORK, POWER AND ENERGY

COLLISIONS

Introduction:

A collision occurs when two objects come in direct contact. It is the event in which two or more bodies exert forces on each other in about a relatively short time. There are two types of collisions, namely:

Elastic Collision

An elastic collision is one where there is no net loss in kinetic energy in the system due to the collision.

Inelastic Collision

An inelastic collision is a type of collision where this is a loss of kinetic energy. The lost kinetic energy is transformed into thermal energy, sound energy, and material deformation.

Elastic Collision

When two bodies collide but there is no loss in the overall kinetic energy, it is called a perfectly elastic collision.

Elastic Collision Definition:

An elastic collision is a collision in which there is no net loss in kinetic energy in the system due to the collision. Both momentum and kinetic energy are conserved in an elastic collision.

Basically in the case of elastic collision, the kinetic energy before and after the collision remains the same and is not converted to any other form of energy.

It can be either one-dimensional or two-dimensional. In the real world, perfectly elastic collision is impossible because there is bound to be some energy conversion, however small.

However, though there is no change in the linear momentum of the whole system, there is a change in the individual momenta of the involved components, which are equal and opposite in magnitude and cancel each other out and the initial energy is conserved.

Elastic Collision Examples

When a ball at a billiard table hits another ball, it is an example of elastic collision.

When you throw a ball on the ground and it bounces back to your hand, there is no net change in the kinetic energy, and hence, it is an elastic collision.

Elastic Collision Formula

The Elastic Collision formula of momentum is given by:

- $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$
- m_1 = Mass of 1st body
- m_2 = Mass of 2nd body
- u_1 =Initial velocity of 1st body
- u_2 = Initial velocity of the second body
- v_1 = Final velocity of the first body
- v_2 = Final velocity of the second body

The Elastic Collision formula of kinetic energy is given by:

$$(1/2)m_1{u_1}^2 + (1/2)m_2u_2^2 = (1/2)m_1v_1^2 + (1/2)m_2{v_2}^2$$

Applications of Elastic Collision

The collision time affects the amount of force an object experiences during a collision. The greater the collision time, the smaller the force acting upon the object. Thus, to maximize the force experienced by an object during a collision, the collision time must be decreased.

Likewise, the collision time must be increased to minimize the force. There are several real-world applications of these phenomena. The airbags in automobiles increase the collapse time and minimize the effect of force on objects during a collision. Airbag accomplishes this by extending the time required to stop the momentum of the passenger and the driver.