



## Types of Work Done

- 1. Positive Work done:** Work done is said to be positive if force and displacement are in the same direction.
- 2. Negative Work done:** Work done is said to be negative if force and displacement are in opposite directions.
- 3. Zero Work done:** Work done is said to be zero if force and displacement are perpendicular to each other.

## Energy

- The ability or capacity of an object to do work is called energy.
- It is a scalar Quantity.
- S.I Unit of energy - Joules
- The object which does work loses energy and the object on which work is done gains energy.

## Work

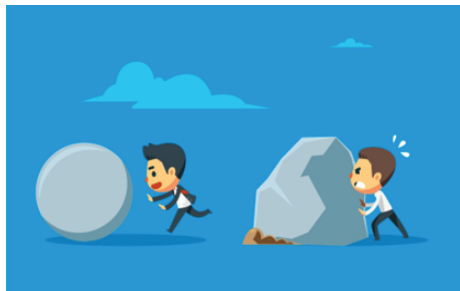
- Work is said to be done when force is applied on an object and it gets displaced due to the application of force.
- It is a scalar quantity.
- Mathematically, work done is a product of force and displacement.
- $\text{Work} = \text{Force} \times \text{Displacement}$
- S.I Unit of Work = Joules (J)
- $1 \text{ J} = 1 \text{ N} \times 1 \text{ m}$

## Commercial Unit of Energy

- It is defined as energy consumed by an appliance of 1kW when it is used for one hour.
- $1 \text{ Kilowatt hour} = 1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$ .
- $1 \text{ kWh} = 1 \text{ Unit of energy}$ .

## Power

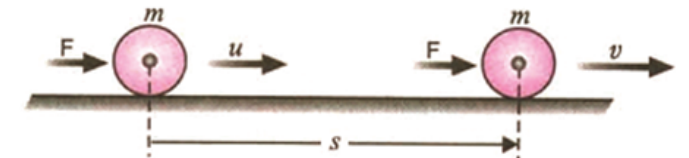
- The rate of doing work is called Power or the work done per unit time is called power.
- Mathematically,  $\text{Power} = (\text{Work} / \text{Time})$
- S.I unit of power is Watt (W) or (Joule / sec)



# Work and Energy

## Kinetic Energy

- The energy possessed by an object due to its motion is called kinetic energy.
- $\text{K.E} = \frac{1}{2} mv^2$



- $\text{Work done} = \text{Change in Kinetic Energy}$   
 $= \text{K.E}_f - \text{K.E}_i$   
 $= \frac{1}{2} mv^2 - \frac{1}{2} mu^2$

## Potential Energy

- The energy possessed by an object due to its position or configuration is called potential energy.

## Law of Conservation of Energy

- According to the law of conservation of energy, energy can neither be created nor destroyed. It can only be converted from one form to another.
- The total energy before and after the transformation remains the same.

## Conservation of energy for a freely falling body

At maximum height

$$\text{P.E} = \text{Maximum}, \text{K.E} = 0$$

At Mid Point

$$\text{P.E} = \text{K.E}$$

At just before touching the ground

$$\text{P.E} = 0$$

$$\text{K.E} = \text{max}$$

## Gravitational Potential Energy

- The gravitational potential energy of an object at a point above the ground is defined as the work done in raising it from the ground to that point against gravity.

$$\text{P.E} = \text{Work done} = m \times g \times h$$

