

# Chapter 11

## WORK AND ENERGY

### Energy:

We often come across this term in various forms like electric energy, Nuclear energy, Heat, Mechanical energy, etc.

### What does energy mean?

As per the definition, “It is capacity of doing work”.

Every object having capability of doing work is said to possess energy. When an object does the work it loses energy and the object on which the work is done gains the energy.

Unit of energy is joule.

### Various forms of energy:

As we have seen, there can be many forms of energy like mechanical, electrical, thermal, light energy, etc.

Here, we are discussing about mechanical energy. Mechanical energy can be defined as sum of potential energy and kinetic energy.

$$\text{Mechanical Energy} = \text{P. E} + \text{K. E}$$

### Kinetic Energy:

“The energy possessed by a body by virtue of its motion is called Kinetic Energy (K.E)”.

Which means a moving object can do work, more the speed, more the work.

Ex: Bullet fired from a gun,

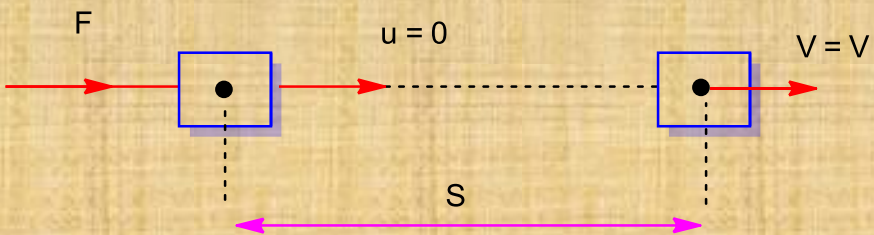
Blowing wind,

Speeding car,

Falling coconut, etc.

### Expression for K.E:

Let us a body which is at rest, when a constant force  $F$  is applied on it, it acquires an acceleration 'a' and reaches a final velocity 'v' after travelling a distance 'S' along the direction of force.



We have an equation of motion,

$$v^2 - u^2 = 2aS$$

From this equation, we get

$$v^2 - 0^2 = 2aS$$

$$\therefore S = \frac{V^2}{2a} \text{-----(1)}$$

Since, K.E is the work done in moving a body

$$K.E = W = F.S$$

$$= ma \times \frac{v^2}{2a}$$

$$\therefore K.E = \frac{1}{2}mv^2$$

This is the expression for Kinetic Energy.

Units of K.E is joules.

**Problem:**

A stone of mass 5 kg is through with a velocity of 20 m/s. Then what is its K.E?

**Sol.**

From the following formula,

$$K.E = \frac{1}{2}mv^2$$

$$= \frac{1}{2} \times 5 \times 20^2$$

$$= \frac{1}{2} \times 5 \times 20 \times 20$$

$$= 1000 \text{ J}$$

$$= 1 \text{ KJ}$$



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