Science Class 9 Notes – Work and Energy

1. Work : In physics work is defined if force applied on object displaces the object in direc¬tion of force. Hei-e all three terms force, dis¬placement and direction of force are important W= Force x displacement (force in direction of displacement)
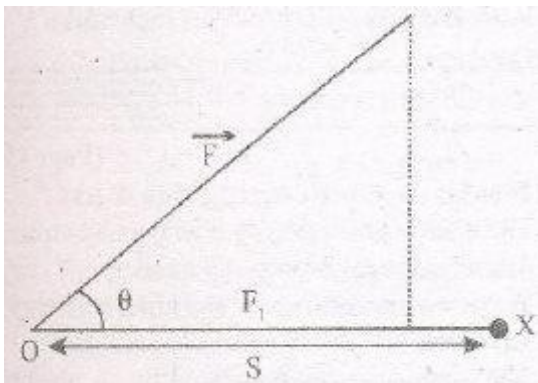
Unit of work

1 Joule = 1 Newton. 1 metre

1 J= 1 Nm

When a force of 1 Newton moves a body through a distance of 1 metre in its own direction the work done is 1 Joule.

Other units of work
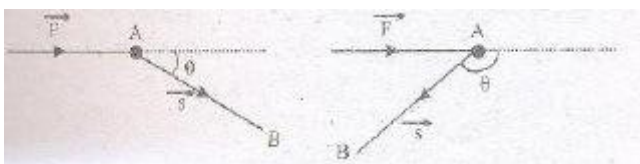
1 joule = 1 N x lm = 10^5 dyne x 10^2cm = 10^7 erg

2. Work done by a force applied at an angle

W = component of force in the direction of displacement *, magnitude of displacement W = Fcos0 S
Work done by a force can be positive or negative according as the value of cos 0 is positive or negative.

(therefore, F and s, being magnitudes, are always positive)

W = +ve for 0 = acute angle W = —ve for 0 = obtuse angle

work done by the force does not depend on the time taken in the displacement of point of action.

3. Energy : The energy may be defined as the capacity of a body to do work. –

The SI unit of energy is joule (J).

or 1 kJ = 1000 J

Forms of energy : The various forms include potential energy, kinetic energy, heat energy, chemical energy, and light energy.

4. Kinetic Energy : Energy possessed by a body by virtue of its state of motion is called Kinetic energy. Kinetic energy is always positive and is a scalar. The fact, that moving bodies carry energy with them is proved by some, of the several happenings in day to day life.

Kinetic Energy, $K = 1/mv^2$, when m is the mass and v is the velocity of body.

5. Potential energy : Potential energy is energy. due to position. If .a body is in a position such that if it were released it would begin to move, it has potential energy. There are two common forms of potential energy, gravitational and elastic.

(i) Gravitational Potential Energy : When an object is allowed to fall from one level to a lower level it gains speed due. to gravitational pull, i.e. it gains kinetic energy. Therefore, in possessing height, a body has the ability to convert its height into kinetic energy, i.e. it" possesses potential energy. If a mass m is at a height h above a lower level the P.E. possessed by the mass is (mg) (h).

(ii) Elastic Potential energy : Same work has to be done to change the shape of a body. This work gets stored in the deformed body in the form of elastic potential energy. Elastic potential energy is never negative whether due to extension or to compression.

6. Law of Conservation of Energy : According to this law, energy can only be converted from one form to another: it can neither be created or de-stroyed. The total energy before and after the transformation remains the same. The law of conservation of energy is valid in all situations and for all kinds of transformations.

7. Power : The time rate of doing work is defined as power (P). More quickly work is done; power will be more.

Power= work/time

8. Unit of power : The unit of power is the joule per second and this is called the Watt (W). When large amounts of power are involved, a more convenient unit is the kilowatt (kW) where 1 kW = 1000W.
1 Megawatt = 10^6 watt

1 horse power = 746 watt

The unit kilowatt-hour means one kilowatt of power supplied for one hour. It is, therefore, the unit of energy.

1 KWh = (1000 J/s) x 60 x 60s = 3.6×10^6J