CHAPTER – 7 MOTION

Rest:

A body is said to be in a state of rest when its position does not change with respect to a reference point.

Motion:

A body is said to be in a state of motion when its position change continuously with reference to a point.

Scalar quantity:

It is the physical quantity having magnitude but no direction. Example -distance, speed.

Vector quantity:

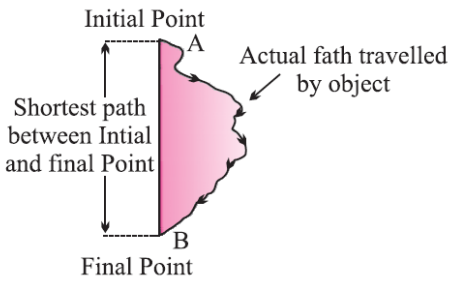
It is the physical quantity having both magnitude and direction. Example - displacement, velocity.

Unit system

1. M.K.S. system (S.I. system) – meter, kilogram, second
2. C.G.S. system – centimeter, gram, second
    - S.I. system – International system of unit

Distance

The actual path of length traveled by an object during its journey from its initial position to its final position is called the distance.



- Distance is a scalar quantity.
- It remains positive, can't be zero or negative.

Displacement

The shortest length between the initial point and far point of an object.

- It is a vector quantity.
- It can be positive (+ve), negative (-ve), or zero.

Uniform Motion:

When a body travels an equal distance in an equal interval of time, then the motion is said to be uniform motion.

Non-uniform Motion:

In this type of motion, the body will travel unequal distances in equal intervals of time.

Speed:

The distance traveled by a body per unit of time is called speed.

$$\boxed{speed = \frac{Distance\ travelled}{Time\ taken}}$$

$$\boxed{v = \frac{d}{t}}$$

- SI unit is m/s (meter/second)
- For non-uniform motion

$$\boxed{\text{average speed} = \frac{\text{total distance traveled}}{\text{total Time is taken}}}$$

Velocity:

It is the speed of a body in a given direction.

$$\boxed{\text{Velocity} = \frac{\text{Displacement}}{time}}$$

SI unit of velocity is m/s

Velocity is a vector quantity.

- For non-uniform motion

$$\boxed{\text{Average Velocity} = \frac{\text{Total Displacement}}{\text{Total time}}}$$

- For uniformly changing velocity

$$\boxed{avg\ velocity = \frac{initial\ velocity + final\ velocity}{2}}$$

$$\boxed{V_{avg} = \frac{u + v}{2}}$$

Where, u = initial velocity, v = final velocity

Acceleration:

Acceleration is seen in non-uniform motion and it can be defined as the rate of change of velocity with time.

$$acceleration = \frac{change\ in\ velocity}{time}$$

$$\boxed{a = \frac{v - u}{t}}$$

Where, v = final velocity, u = initial velocity

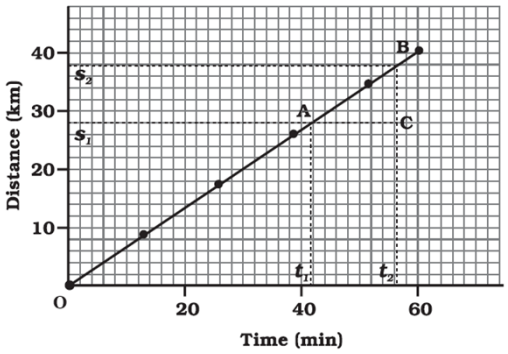
S I unit is meter/second^2

Retardation/Deceleration

Deceleration is seen in non-uniform motion during a decrease in velocity with time. It has the same definition as acceleration. (-a)

Graphical Representation of motion

Distance-time graph of an object moving with uniform speed



Distance-time graph for a car moving with non-uniform speed