

Revision Notes

- ▶ **Motion** : An object which changes its position with respect to a fixed point is said to be in motion.
- ▶ **Motion is a relative term** : An object at rest with respect to one object may also be in motion with respect to another object.
- ▶ **Reference point** : A fixed point with respect to which an object changes its position is known as a reference point.
- ▶ **Distance** : The length of actual path between the initial position and the final position of a moving object or body is known as distance travelled by the particle.
- ▶ **Displacement** : The shortest distance between the initial and final positions of a moving object or body in a direction from initial to the final position of the particle is known as displacement of the particle.
- ▶ **Units of distance and displacement** : SI unit of distance and displacement is metre (m).
- ▶ **Distance** travelled by a body is always positive.
- ▶ **Displacement** of body may be **positive, negative** or **zero**.
- ▶ Ratio of the magnitude of displacement and the distance is equal to less than 1.
- ▶ **Uniform Motion** : The motion of a body is said to be uniform if (i) it moves along a straight line and (ii) it covers equal distance in equal intervals of time, how-so-ever, small these intervals may be.
- ▶ **Non-uniform motion** : The motion of a body is said to be non-uniform if it covers unequal distance in equal intervals of time.
- ▶ **Speed** : The distance travelled by a body in unit time is known as the speed of the body. That is

$$\text{Speed} = \frac{\text{Distance}}{\text{time}}$$

- ▶ **Unit of speed** : SI unit of speed is ms^{-1} .
- ▶ **Uniform speed** : If a moving body covers equal distances in equal intervals of time, the speed of the body is uniform.
- ▶ **Non-Uniform speed** : If a moving body covers unequal distances in equal intervals of time, the speed of the body is non-uniform.
- ▶ **Average speed** : The total distance travelled by a body during non-uniform motion divided by the time taken to travel this distance is called average speed.

$$\text{i.e. Average speed} = \frac{\text{Total distance travelled by body during non – uniform motion}}{\text{Total time taken}}$$

- ▶ **Velocity** : The displacement of the body per unit time is known as the velocity of the body. That is,

$$\text{Velocity} = \frac{\text{Displacement}}{\text{Time}}$$

- ▶ **Unit of velocity** : SI unit of velocity is ms^{-1} .
- ▶ **Uniform velocity** : Velocity of a body is said to be uniform velocity if it covers equal displacements in equal intervals of time.
- ▶ **Non-uniform velocity** : Velocity of a body is said to be non-uniform if it covers unequal displacement in equal intervals of time.
- ▶ **Average velocity** :
$$\frac{\text{Total displacement of the body}}{\text{Total time taken}}$$
- ▶ **Speed** is a scalar quantity, whereas velocity is a vector quantity.
- ▶ **Speed** of a body is always **positive**.
- ▶ **Velocity** of body can be **positive** as well as **negative**.
- ▶ **Acceleration** : Acceleration of a body is defined as the change in velocity per unit time.

i.e.
$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time}}$$

- ▶ **Positive acceleration** : When the velocity of a body increases with time, acceleration of body is said to be positive acceleration.

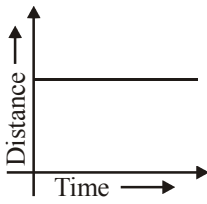
Or When the change in velocity (Δv) of a body takes place in the direction of the motion of the body, then the acceleration of the body positive.

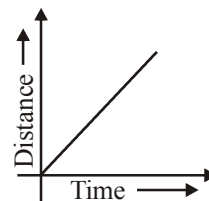
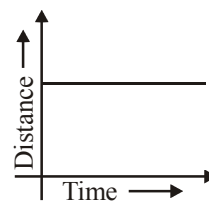
- ▶ **Negative acceleration or retardation or deceleration** : If the velocity of the body decreases with time, then acceleration of body is negative acceleration of retardation.

Or When the change in velocity (Δv) of a body takes place in a direction opposite to the direction of motion of the body, then the acceleration of the body is negative.

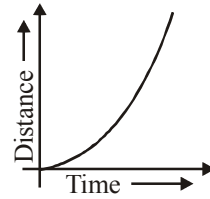
- ▶ **S.I.** unit of acceleration is m/s^2

▶ GRAPH

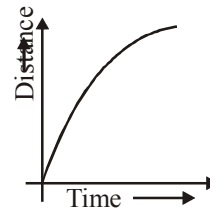
S.No.	State of object /body	Slope of Distance-time graph
1.	Rest or stationary	
2.	Uniform motion	



3. Non-uniform motion (speed is increasing)



4. Non-uniform motion (speed is decreasing)



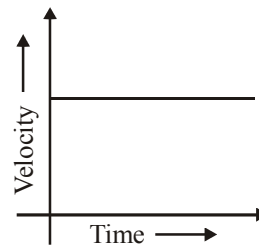
5. Slope or gradient of distance-time graph = speed of body.

6. Area under speed-time graph = distance travelled by a body.

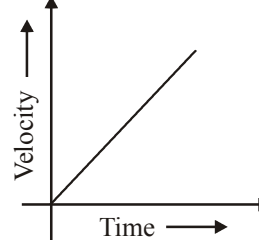
► **Velocity–time graph :**

S.No.	State of object / body	Slope of Velocity-time graph
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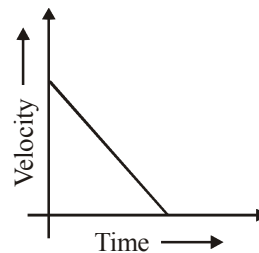
1. Object is moving with constant velocity



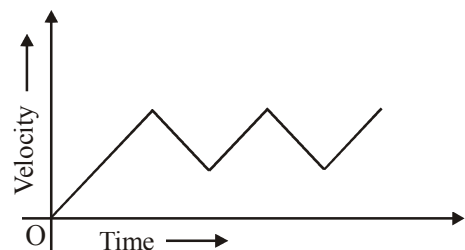
2. Object has uniform motion
(Velocity is increasing at a constant rate)



3. Object has uniform motion
(Velocity is decreasing at a constant rate)



4. Object is moving with non-uniform velocity



- ▶ The slope of velocity–time graph = Acceleration of the body.
- ▶ Area under velocity–time graph = magnitude of the displacement of a body.
- ▶ **Equations of motion :**
 - (i) Velocity of a uniform accelerated body after time t is given by
$$v = u + at$$
 - (ii) Distance travelled by a uniformly accelerated body after time t is given by
$$S = ut + \frac{1}{2} at^2$$
 - (iii) $v^2 - u^2 = 2aS$
- ▶ **Uniform circular motion :** The circular motion of a body having constant speed is known as uniform circular motion.
- ▶ Uniform circular motion is accelerated motion.