Introduction to Motion

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We look many thing around us like a row of, large trees, small plants, people, birds, animals and many others.

Each house in your locality remains at its allotted place. The tree in front of your house remains there itself. Birds keep flying from one place to another. They may sit for a while on a tree top. People may sit or move from one place to another. So, we see there are two different types of objects:

- The objects which do not change their position with time are said to be at rest.
- The objects which change their position with time are said to be in motion.

The same object may be at rest at one moment, and in motion at some other.

The states of rest and motion are relative.

- Nothing is at **absolute rest or in absolute motion** in the universe. Any object said to be in the state of rest or motion is related to a fixed point. Such a fixed point is chosen arbitrarily.
- Let us imagine ourselves to be sitting inside a compartment of a running train.
- Take a situation when everybody in the compartment is sitting at rest. Then, each passenger is at rest relative to the compartment as well as with respect to the other passengers.
- But, if we consider any point outside the compartment, example- platform, as a reference point, then the compartment as well as all the passengers in it are in motion.
- This example shows that the same object maybe at rest with respect to one reference point, and in motion with respect to another at the same time. So, we can see that the motion is actually a relative motion and the states of rest and motion are relative.

Introduction to Time

We see many moving vehicles on the road and in the sky. Some moves faster, while other move. Example: An aeroplane runs faster than a train that train runs faster than a bicycle or so on even while walking some people walk faster than others.

To know how fast and object is moving we ought to know the following two things

- Distance travelled by the object
- Time taken by the object to cover distance

The speed of an object: The distance travelled by an object in unit time is called its **Speed**.

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

Types of Speed:

1. Uniform Speed: When the object travels a fixed distance same time gaps, it is said to have a uniform speed.

2. Non-uniform Speed: When an object covers different distances in different time gaps, it is said to have a non-uniform speed.

3. Average speed: The total distance travelled by an object divided by the total time taken by the object is called its average speed.

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Average Speed = \frac{\text{Total Distance}}{\text{Total Time}}
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The SI unit of speed is metre per second.

The larger values of speed are expressed in kilometre per hour (km/h) whereas the small values of speed are expressed in centimetre per second (cm/s).

Measuring Speed:

Speedometer: It is a device used to measure the speed of a vehicle is Km/hr.

Odometer: It is a device used to measure the distance covered by a vehicle.

Measurement of Time

- A duration or moment in which things occur is known as time. With the help of clocks and watches, we generally measure time. It is very difficult to think that how did the people in ancient time measure times as they did not have clocks or watches.
- In order to measure the time, ancient people used some natural events which repeated regularly after fix time intervals, e.g. they found that the sun rises every day in the morning.
- So, the time between one sunrise and the next I was known as a day. In a similar manner, time from one full moon to the next full moon was called a month.
- A year was fixed as the time taken by the earth to complete one revolution of the sun.
- Many time measuring devices were used in different parts of the world before the pendulum clocks became popular. Sundials water clocks and sand clocks are some examples of such devices.

Note:-

(i) A sundial measures time by the position of the shadow cast by the sun.

(ii) The device which uses the flow of sand from one glass bulb to another in order to measure time is known as a **sand clock.**

(iii) A device which uses the rate at which water drip from one vessel to another measure time interval is known as a **water clock.**

Units of Time

The standard unit of time is second. The unit second is denoted by the letter's'. Bigger units of time are, minute(min), hour(h), day(d), year(y),etc.

Some units to measure time are as follows:

60 seconds = 1 minute

60 minutes = 1 hour

24 hours = 1 day

365 days = 1 year

- The time taken by the earth to complete one rotation about its axis is called a day.
- The time taken by the earth to complete one revolution around its sun is called a year.



(A)

Measuring time interval

- Time interval taken by an event, such as time taken by an athlete to run 200 m is measured by a special type of clock called stopwatch.
- Stopwatch can be started and stopped at any moment by pressing a button (or knob).
- Stopwatch can measure time up to one-tenth of a second.
- Stop watches and stop clocks are used in laboratories for measuring time intervals.