

Motion and Time

In our daily life routine, we usually see some objects at rest and others in motion like birds fly, fish swimming, planets moving around the sun, etc., are all in motion. When an object changes its position with time, we often perceive an object to be in motion, e.g. when the position of a car changes with time, we say that the car is moving or the car is in motion.

Types of Motion

The motion of all the objects are not of the same type. There are four different types of motion shown by the different objects.

Rectilinear motion: The motion possessed by the body moving along a straight line path, is called rectilinear motion, e.g. the motion of a train on a straight bridge.

Circular motion: The motion possessed by a body when it moves along a circular path, is called circular motion, e.g. the motion of a child in a merry-go-round, motion of the earth around the sun in a circular orbit.

Rotational motion: The motion possessed by a body when it spins about a fixed axis, is called rotational motion, e.g. the motion of the earth about its axis, spinning top, the motion of blades of a fan.

Periodic motion: The motion which repeats itself after regular intervals of time, is called periodic motion, e.g. the motion of the swing, to and fro motion of a simple pendulum.

Slow or Fast Motion

An object which takes a long time to cover a certain distance is known as slow while the other object which takes shorter time to cover the same distance is known as fast, e.g. if your school is at a distance of 5 km from your home and you want to go to school by bicycle, then it may take about 25 min to reach the school and if you go to school by school bus, then the same distance can be covered only in 10 min. It means that a bicycle takes a longer time than the bus.

Thus, the most convenient way to determine which of the two objects is moving faster is to compare the distance moved by them in a unit time which is known as speed.

Speed

The distance travelled by an object per unit time (either in one hour, in one minute or in one second) is known as speed of the object. A slow moving object is said to have a low speed and a fast moving object is said to have high speed. So, if we know the distance covered by two buses in one hour, then we can answer which one is slower. Therefore, the formula for calculating the speed of an object can be given by

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

e.g. If a car travels a distance of 100 km in 2 h, then the speed of this car is given by
 $\text{Speed} = \frac{100\text{km}}{2\text{h}} = 50 \text{ km/h}$

It shows that the car will travel a distance of 50 km in 1 h. It does not matter if a car seldom moves with a constant speed for one hour as it starts moving slowly and then picks up speed. So, when we say that the car is moving with a speed of 50 km/h, then we do not bother whether the car has been moving with a constant speed or not during that hour. Therefore, the speed calculated here is the average speed of the car.

Non-Uniform and Uniform Motions

In everyday life, we seldom find objects moving with a constant speed over long distances or for long durations of time. If the speed of an object moving along a straight line keeps changing, its motion is said to be non-uniform motion.

On the other hand, an object moving along a straight line with a constant speed is said to be in uniform motion. In this case, the average speed is the same as the actual speed.

Units of Speed

The unit of speed depends upon the unit of distance and the unit of time used.

- The metre is the standard unit of distance and second is the standard unit of time. So, the standard unit of speed is metre per second (m/s).
- The large values of speed are expressed in kilometre per hour (km/h) and in this case, the distance travelled is measured in terms of kilometre and time taken is measured in an hour.
- The small values of speed are expressed in centimetre per second (cm/s) and in this case, the distance travelled is measured in terms of centimetre and time taken is measured in second.

If we have to compare the speeds of a number of objects, then we must express the speeds of all those objects in the same unit.

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 fixed time intervals, e.g. they found that the sun rises every day in the morning. So, the time between one sunrise and the next was known as a day. In a similar manner, time from one full moon to the next full moon was called a month.