CHAPTER-13

MOTION AND TIME

NOTES:

- **Motion:** if an object keeps on changing its position with time, it is said to be moving or in motion.
- **Motion can be of different types:**
- Linear or straight in which the object travels in a straight line.
- Circular in which the object travels along a circular path.
- Periodic or oscillatory in which the object moves to and fro in a regular interval of time.
- **Slow and fast motion:** if an object covers a particular distance in less time and another covers the same distance in more time then the first object is said to be moving slowing while the second object is said to be moving faster.
- **The speed of an object:** The distance covered by an object in unit time is called its speed.
- **Types of speed of an object:**
- Non uniform motion: if the speed of an object moving along a straight line keeps changing its motion is said to be non-uniform.
- Uniform motion: An object moving along a straight line with a constant speed is said to be in uniform motion.
- Average speed: The total distance travelled by an object divided by the total time taken by the object is called its average speed.

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

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

Distance= speed x time

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

- **Measuring time:** There are many event in nature that repeats after a time interval.:
- Morning: The rising of the sun

- Day and night: The time between the sunrise and sunset.
- Month: The time between two new moons.
- Year: The time the earth takes to complete its one revolution.

➢ **Time measuring devices or clocks:** clocks use the concept of periodic motion to measure time. It means that it uses motion that repeats itself in equal amounts of time. There are different types of time measuring devices used before the invention of pendulum clocks like, sundial, water clocks, sand clocks etc. Then, came the pendulum clock and the Quartz clock. The Quartz clocks have an electric circuit that works with the help of cells (dry celled). They provide accurate time.

➢ **Periodic motion of a simple pendulum:** a simple pendulum contains a bob which is a metallic ball or a stone which is suspended from a rigid stand with the help of a thread.

➢ **Osciallatory:** it is the to and fro motion of the pendulum.

➢ **Oscillation:** The pendulum is said to have completed one oscillation when its bob moves from its centre (mean position) to its extreme ends.

➢ **Time period of a pendulum:** the time taken by the pendulum to complete one oscillation.

➢ **Units to measure Time and Speed:**

- Time: the basic unit of time second (s). Larger units of time are minutes (min) and hours (hr).
- Speed: the basic unit of speed is metre per second, i.e. m/s since speed is distance/time. Others units, are m/min or km/hr.
- Speedometer: it is a device which is used in vehicles such as cars and trucks which measures the speed in kilometre per hour.
- Odometer: it is a device which measures the distance travelled by a vehicle in metres or kilometres.

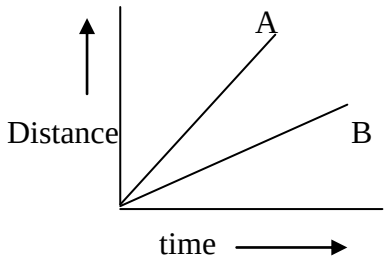
The symbols of all units are written in singular.

➢ **Distance time graph:** a graph which represents the distance travelled by an object with respect to time is called a distance time graph.

➢ **To find the speed of the distance time graph:**

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{\text{(final position of object – initial position of object)}}{\text{time taken by object}}$$

The speed of the distance time graph can be calculated by the slope of a graph. The steeper the slope of the graph, the more in the speed of the object.



For example, in the graph given above object A has a steeper slope. This means that object A is moving at a higher speed than object B.