

## Class-6 (Science)

### Chapter-10

#### Motion

Everything around us isn't in same condition. Some are moving and others are not. Here we are going to know about Motion and Rest.

#### #Motion:



**#Definition:** When an object changes its position with time relative to an observer ,then the object is said to be in motion and the object is in a state of motion.

**#Example:** A moving bus, a running person, a flying bird, a rolling football, a fruit falling off the tree etc.

#### #Rest:



**#Definition:** When an object doesn't change its position with time, relative to an observer then the object is at rest.

**#Example:** Suppose you are standing beside the road at a bus stand. The tree beside the road, the houses, the lamp post at the road side and the bus stop all are in rest condition because they aren't changing their position with time that is relative to you.

**#Reference Frame:** The observer relative to whom the rest or motion is determined is called reference frame.

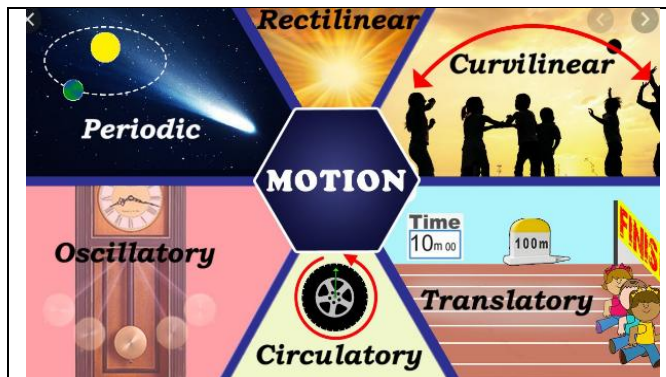
**#Example:** If you want to know the distance of the sun from the earth, then the earth will be reference frame.

**#Rest and motion are relative:**

Rest and motion are relative terms because a body can be in motion with respect to one thing and at the same time it can be at rest to the another thing .For example: While sitting in a moving train your distance from the walls, roof and floor of the compartment do not change. That means with respect to the compartment your position is at rest. But with respect to a man who is standing at platform, you are in motion because your position is changed. So rest and motion are relative terms.

**#The whole universe is in motion:** While lying on bed it seems that we are at rest condition. But it's not true exactly. The earth itself moves round on its own axis. So, at that time we are also in motion.

**#Different kinds of motion:**



Motion can be classified into different kinds:

- Translational motion ———→
  - Rectilinear
  - Curvilinear
- Rotational or Circular motion
- Complex or Transla-rotatory motion
- Periodic motion
- Vibratory or Oscillatory motion

**#Translational motion:** Translational motion is the motion , when an object moves in such a way that all the particles or points of the object traverse the same distance in the same direction taking the same time.

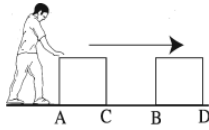


Fig. 10.3: Translational motion

**(a) Rectilinear motion:** When an object travels in a straight line, it is called rectilinear motion.

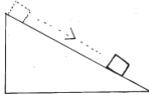


Fig. 10.4: Rectilinear motion

**(b) Curvilinear motion:** When an object travels through curved line, it is called curvilinear motion.



Fig. 10.5: Curvilinear motion

**# Rotational or Circular motion:** If all the points of an object do not follow the same path but every point of the object revolves round the center in a circular path making the same angle with different radius, this motion is called rotational or circular motion.

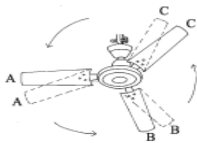


Fig 10.6: Rotational motion

**# Complex or Transla-rotatory motion:** The motion which has both translational and rotational motion, is called complex or transla-rotatory motion.



Fig: Motion of a wheel

**#Periodic motion:** If an object travels a certain distance of its path from the same direction after certain definite intervals of time repeatedly, the motion is called a periodic motion.

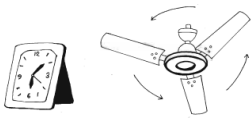


Fig 10.8: Periodic motion

**# Vibratory or Oscillatory motion:** Vibratory or oscillatory motion is the motion, when an object is in to and fro periodic motion of its own position.

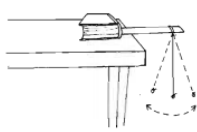


Fig. 10.10 : Oscillatory motion

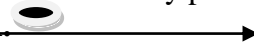
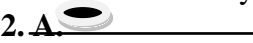
**# Distance and displacement:**

Distance	Displacement
<p>1. <b>Total length</b> travelled by object in <b>any direction.</b></p> <p style="text-align: center;"> </p> <p>2. <b>Distance:</b> 20m+10m=30m</p>	<p>1. Minimum distance between <b>initial and final position</b> in a <b>particular direction.</b></p> <p style="text-align: center;"> </p> <p>2. <b>Displacement:</b> 20m-10m=10m</p>

**# Speed and velocity:**

Speed	Velocity
<p>1. <b>The distance</b> travelled by an object <b>in unit time.</b></p> <p>2. <b>A.</b>  If A travels 10 meters in 2 seconds, the speed of A:</p> <p>Speed= Distance/Time = 10m/2s =5 m/s</p>	<p>1. <b>Speed</b> in a <b>particular direction.</b></p> <p>2. <b>A.</b>  If A travels 10 meters in 2 seconds towards north, the velocity of A: Velocity=displacement/time =(final position-initial position)/ time =10m/2s=5 m/s (towards north)</p>

**# Acceleration and Retardation:**

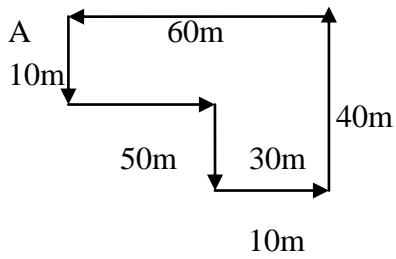
<b>Acceleration</b>	<b>Retardation</b>
<p><b>1.</b> The rate of increase in velocity with time or increase in velocity per second.</p> <p><b>2.</b> </p> <p>Initial velocity= 20 m/s Final velocity= 45m/s Time=5s Acceleration=Total increase in velocity/Time = Final velocity- Initial velocity/Time =(45m/s-20m/s)/5s = 25m/s / 5s = 5 m/s<sup>2</sup></p>	<p><b>1.</b> . The rate of decrease in velocity with time or decrease in velocity per second.</p> <p><b>2.</b> </p> <p>Initial velocity= 45 m/s Final velocity= 20m/s Time=5s Acceleration=Total increase in velocity/Time = Final velocity- Initial velocity/Time =(20m/s-45m/s)/5s = -25m/s / 5s = -5 m/s<sup>2</sup></p>

**# Excessive motion is risk for life:** Sometimes the drivers drive the vehicles with a high speed or excessive motion. It causes road accident and takes away our valuable lives. So, all of us should be very careful about this matter.

**# Questions for self assessment:**

- Complete the whole exercise from text book.
- Answer the following questions:
  - 1) Define Motion and Rest.
  - 2) What is Reference Frame?
  - 3) Create a relationship between Rest and Motion.
  - 4) Explain the condition of you while lying on a bed.
  - 5) How many types of motions are there? Explain each kind with example.
  - 6) Write down the following differences:
    - (i) Distance and Displacement
    - (ii) Speed and Velocity
    - (iii) Acceleration and Retardation
  - 7) Why is excessive motion risk for our lives?

**# Creative question:**



A travels the above direction within 1 minute 15 seconds.

- What is displacement?
- Find the distance and displacement of A after travelling the whole path.
- Calculate the average velocity of A.
- Is the motion of A translational or periodical or both?

Give logical explanation on it.