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NAAC Accredited at 'A' Grade With CGPA 3.10



Department of Physics

Subject:-PHY111 Mechanics and Properties of Matter

1. Motion

- Definition:- Motion is a change of the position with time
- **Types of Motion**
- Depending on the path followed by an object, there are five types of motion –
 1. translatory
 2. rotatory
 3. circular
 4. oscillatory and
 5. vibratory motion.
- Based on the periodicity, there are two types of motion –
 1. periodic and
 2. non-periodic motion.
- Finally, based on speed, there are two types of motion –
 1. uniform and
 2. non-uniform motion.

A) TRANSLATORY MOTION

If an object moves in a line in such a way that every point of the object moves through the same distance in the same time, then the motion of an object is called the translatory motion.

Eg. 1. An apple falling from a tree,

2. the boy walking on a road,

3. the motion of a box when pushed from one corner of the room to the other.

Translatory motion can be further of two types:

1. Rectilinear or linear motion, and
2. Curvilinear motion.

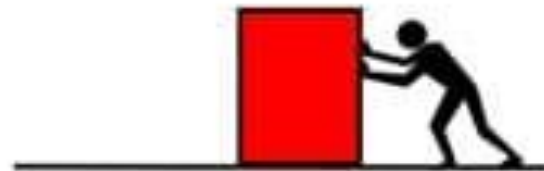
A1) Rectilinear or linear motion

If the translatory motion of a body is along a straight line, it is said to be the rectilinear or linear motion.

Examples of Rectilinear or Linear Motion



An apple falling from a tree



Pushing of box



March past by student on straight path

A₂) Curvilinear motion

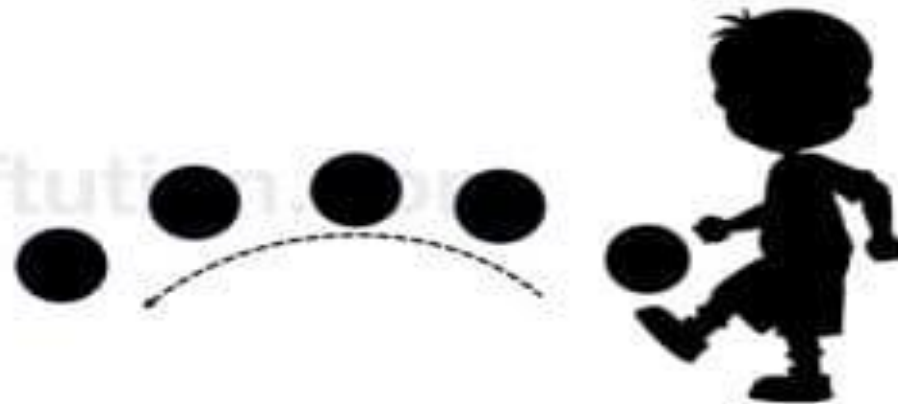
If the translatory motion of a body is along a curved path, it is said to be the curvilinear motion.

Examples of Rectilinear or Linear Motion



A car moving on the curved road

Department of Physics



Ball Kicked by a boy

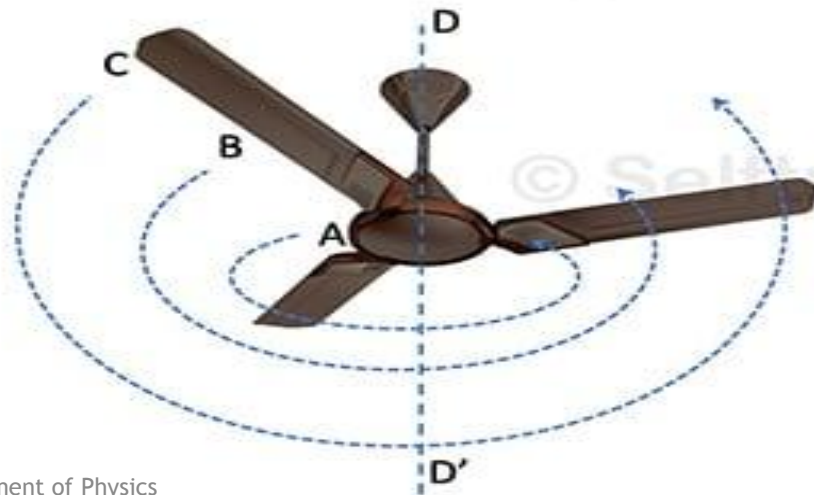
B) ROTATORY MOTION

If an object moves in such a way that every point of the object moves about a fixed axis, then the motion of an object is called the rotatory motion.

Eg. The spinning of a top on its axis.

The rotation of the earth on its axis.

Example of Rotatory Motion



When a ceiling fan moves around its axis DD' . Then point A on the body of the fan, point B at middle of the blade of the fan and the point C at the end of the blade also moves around the axis DD' .

This type of motion is called a rotatory motion.

c) CIRCULAR MOTION

- ▶ The motion of the body along a circular path is called circular motion. Circular motion is a special type of curvilinear motion in which the distance of a moving object from a fixed point (called the center) does not change.



- ▶ ***Example of circulatory Motion – The motion of a satellite around the earth.***

D) OSCILLATORY MOTION

- ▶ To and fro motion of a body from its rest position (or mean position) is called oscillatory motion

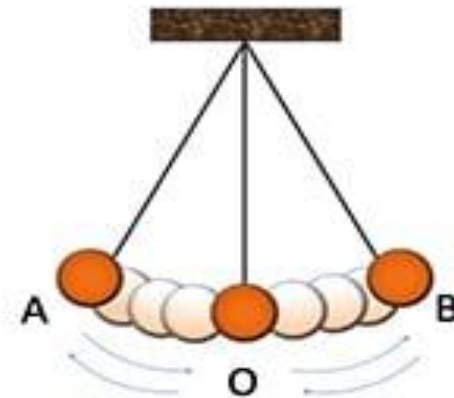
Example of Oscillatory Motion



Pendulum of a Clock at its mean position 'O'

In oscillatory motion, the bob of pendulum moves from its rest position **O** to one side **A**, comes back to rest position **O** and then moves to the other side **B** and then come back to **O**. This process is continuously repeated. Thus, oscillatory motion is repetitive after a regular interval of time.

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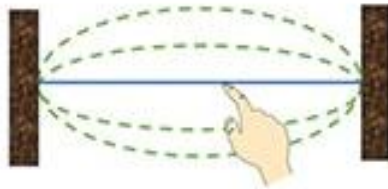


Oscillatory Motion of Pendulum of a Clock

E) VIBRATORY MOTION

- ▶ The vibratory motion is a type of oscillatory motion with a slight difference. In vibratory motion, a part of the body always remains fixed and the rest part moves to and fro about its mean position. During vibratory motion, the shape and size of the object changes.

Examples of Vibratory Motion



A wire stretched between two fixed points when plucked, it start vibrating to and fro



Most of the musical instrument like guitar, sitar, violin, etc have strings attached to them to produce music by creating vibratory motion

PERIODIC MOTION

The periodic motion is the type of motion that gets repeated after a regular interval of time.

Eg.

- ▶ The earth completes one round around the sun in $356\frac{1}{4}$ days and this motion gets repeated after every $356\frac{1}{4}$ days. Thus, it is a periodic motion.
- ▶ The moon revolves around the earth and completes one revolution in 27 days and then repeats its motion.
- ▶ The pendulum of the clock repeats its motion every 2 seconds.

NON-PERIODIC MOTION

The non-periodic motion is the type of motion that does not repeat itself after a regular interval of time.

For examples,

- ▶ The motion of footballer during a match.
- ▶ A ball rolling down the ground gradually slows down and finally stops,
- ▶ The motion of sea waves, etc.

UNIFORM MOTION

If a moving body travels the equal distance in an equal interval of time, its motion is said to be uniform. Thus, for the uniform motion, the speed of the moving body remains constant.

NON- UNIFORM MOTION

If a moving body travels the unequal distance in an equal interval of time or equal distance in unequal time intervals, its motion is said to be non-uniform. Thus, for the non-uniform motion, the speed of the moving body does not remain constant.