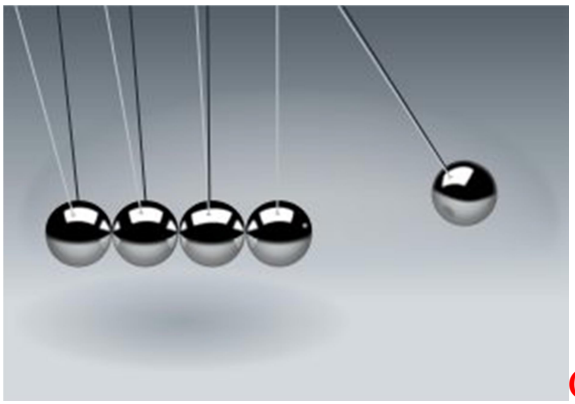

Class - 9th - Science Chapter - 7 - Motion Notes

Rest

A body is said to be at rest , if it does not change its position with respect to time / to the observer

Example - A Chair lying on floor , A book kept on the table ,etc.

Motion

A body is said to be in motion if it changes its position with respect to time / observer

Example - A car moving on the road , Kite flying in air etc.

Types of motion

1. Uniform motion
2. Non uniform motion

Uniform motion

When a body covers equal distances in equal intervals of time is called uniform motion

Non-Uniform motion

When a body covers unequal distances in equal intervals of time is called non-uniform motion

Scalar quantity

Such physical quantity which has only magnitude is called scalar quantity

Example - Distance , Volume , Mass , Work , etc.

Vector quantity

Such physical quantity which has both magnitude and direction is called vector quantity

Example - Displacement , Velocity , Acceleration , etc.

Some important physical quantity

1. Distance
2. Displacement
3. Speed
4. Velocity
5. Acceleration

Distance

- It is the total path length covered by a body
- It is a scalar quantity
- Distance travelled by a body is always positive
- It cannot be zero for a moving body

Displacement

- It is the shortest distance between initial and final position of the body .
- It is vector quantity .
- Displacement of body may be positive or negative or zero .

Speed

- The distance covered by a body per unit time is called speed .
- Speed is a scalar quantity .
- Speed = distance travelled / Time
- v = s/t
- S.I unit = meter / second
- C.G.S unit = centimeter / second

Uniform Speed

When a body covered equal distance in equal intervals of time, howsoever small the time interval may be, then the body is said possess uniform speed .

Non-uniform speed

When a body covered unequal distance in equal time interval, then it is said to possess non-uniform speed .

Average speed

Average speed is the total distance travelled by the body divided by the total time taken .

Average speed = Total distance travelled / Total time taken

Velocity

The distance travelled by a body per unit time in a specified direction is called velocity .

Velocity is a vector quantity .

Velocity = Displacement / time taken

(v) = s/t

Uniform Velocity

A body is said to be moving with uniform velocity if ii moves along a fixed direction and covers equal distances in equal intervals of time, however small these intervals of time may be .

Non-uniform Velocity/Variable velocity

A body is said to be moving with variable velocity if :

1. its speed change but direction does not change .
2. its speed remains the same, but direction of motion change, or
3. both its speed and direction of motion change .

Examples of non-uniform velocity :

1. A stone thrown vertically upwards .
2. A stone dropped from a height .
3. A car moving towards east on a crowded road .

Average velocity

Average velocity is that velocity with which a body would cover the same distance along a particular direction (same displacement) in the same time.

Average velocity(V) = Displacement/Total time taken = S/T

Acceleration:

The rate of change of velocity of a body is called acceleration.

Acceleration= Change in velocity/Time taken for change

Acceleration= V-U/T

The S.I. Unit of acceleration is MS^{-2}.

Retardation:

The negative acceleration is also called retardation .

Equation of motion:

The equation which correlate initial velocity (u), final velocity(v), acceleration(a), time taken(t) and displacement(s) of a body for an activity in which a body has uniform acceleration are called equations of motion.

(1) First equation of motion : We know that acceleration is change in velocity per unit time.

a = v-u/t ∴ at = v-u

∴ V = u + at . . . (

(2) Second equation of motion : We know that Average velocity = Initial velocity + Final velocity / 2

$V_{a\,v} = u + v / 2$

Then, distance covered (s) = Average velocity * Time

∴ s = u + v/ 2 *t

But v = u + at

[First equation of motion]

∴ s = [u+(u + at)] * t/2 = $2ut + at^2$ /2

or **S = u t + 1/2 at^2 . . . (II)**

(3) Third equation of motion : We know that Average velocity = v + u/2

Distance covered (s) = Average velocity * Time

∴ s = (v + u/2)

But v = u + at

∴ t = v-u/a **. . . (III)**

∴ s = (v-u/2) * (v-u/a)

or **$V^2 - U^2 = 2as$** **. . . (IV)**

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READ MORE