MOTION IN A PLANE

UNIFORM CIRCULAR MOTION

Circular Motion

Circular motion is the movement of an object in a circular path.



Uniform Circular Motion

This motion refers to the circular motion if the magnitude of the velocity of the particle in circular motion remains constant. The non-uniform circular motion refers to the circular motion when the magnitude of the velocity of the object is not constant. Another special kind of circular motion is when an object rotates around itself also known by spinning motion.



CLASS 11

Variables in Circular Motion

Angular Displacement

The angle which is subtended by the position vector at the center of the circular path refers to the angular displacement.

Angular Displacement $(\Delta \theta) = (\Delta S/r)$

Where Δ 's refers to the linear displacement while r is the radius. Radian is the unit of Angular Displacement.

Angular Acceleration

It refers to the rate of time of change of angular velocity $(d\tilde{\omega})$.

Angular acceleration (α) = $d\tilde{\omega}/dt = d2\theta / dt2$

Its unit is r_{ad}/s_2 and dimensional formula [T]-2. The relation between linear acceleration

(a) and angular acceleration (α)

 $A = r\alpha$, where r is the radius.

Angular Velocity

It refers to the time rate change of angular displacement (d $\tilde{\omega}$).

Angular Velocity ($\tilde{\omega}$) = $\Delta \theta / \Delta t$

Angular Velocity is a vector quantity. Its unit is rad/s. The relation between the linear velocity (v) and angular velocity ($\tilde{\omega}$) is

 $v = r\tilde{\omega}$

Centripetal Acceleration

It refers to an acceleration that acts on the body in circular motion whose direction is always towards the center of the path

Centripetal Acceleration (α) = $v_2/r = r\tilde{\omega}_2$.

The magnitude of this acceleration by comparing ratios of velocity and position around the circle. Since the particle is traveling in a circular path, the ratio of the change in velocity to velocity will be the same as the ratio of the change in position to position. It is also known as radial acceleration as it acts along the radius of the circle. Centripetal Acceleration is a vector quantity and the unit is in m/s₂.