→ If the angle b/w net acc vector and velocity vector is obtuse angle then the particle will slow down.

NOTE: If a_t of the particle is const then we can use eq of motion and (s) will represent total Dist covered and (a) will represent (a_t)

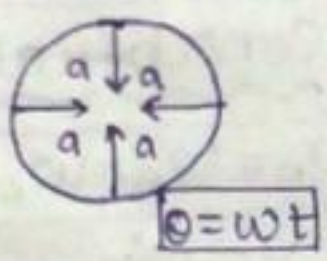
$$v^2 - u^2 = 2a_t s \qquad v = u + a_t t$$
$$s = ut + \frac{1}{2}a_t t^2$$

11) Conceptual Point

★ UNIFORM CIRCULAR MOTION (UCM)

→ speed = const

- $a_t = 0$
- $\alpha = 0 \quad [a_t = r\alpha]$



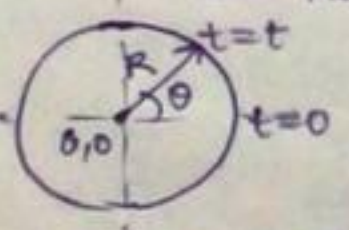
speed const ; $\omega = \text{const}$

$a_{net} = \sqrt{a_t^2 + a_t^2} = a_c$

↳ hamesha towards centre.

$\vec{a} = -\hat{R}$ ke along (direction)

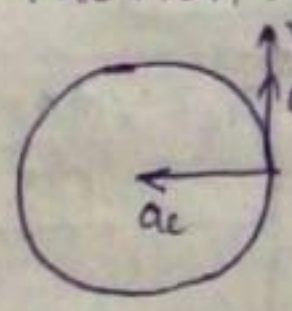
↳ Radius

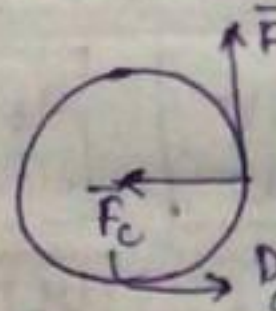


$$\vec{R} = R\cos(\omega t)\hat{i} + R\sin(\omega t)\hat{j}$$

12) Dynamic Circular Motion

- Force on a particle during circular motion.





F_t → Tangential force

F_c → centripetal force.

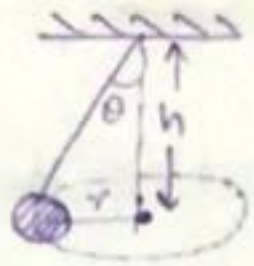
UCM hoya NUCM F_c to hamesha required hoga

UCM → speed const → $a_t = 0$, $F_t = 0$

$$F_c = ma_c = m\frac{v^2}{R} = m\omega^2 r$$

$$F_t = ma_t = mr\alpha = m\frac{dv}{dt}$$

13) Conical Pendulum



$$\tan\theta = \frac{v^2}{rg} = \frac{\omega^2 r}{g}$$

$$v = \sqrt{rg\tan\theta}$$

- 'g' value of a planet using conical pendulum

$$v = \sqrt{Rg\tan\theta} = \frac{2\pi r}{T} \qquad g = \frac{4\pi^2 r}{T^2 \tan\theta}$$

- Time period

$$TP = 2\pi\sqrt{\frac{(l^2 - r^2)^{1/2}}{g}}$$

14) Banking of Road

Case: 1 Rough horizontal Road

Only friction ; No Banking $[\theta = 0^\circ]$

$$v_{max} = \sqrt{\mu Rg} \qquad \omega_{max} = \sqrt{\frac{\mu g}{R}}$$

Case: 2 Smooth banked Road

Only Banking ; No friction

$$v_{max} = \sqrt{Rg\tan\theta} \qquad \mu = 0$$

Case: 3 Rough Banked Road

(Banking + Friction)

$$v_{max} = \sqrt{Rg\left(\frac{\tan\theta + \mu}{1 - \mu\tan\theta}\right)}$$

$$v_{min} = \sqrt{Rg\left(\frac{\tan\theta - \mu}{1 + \mu\tan\theta}\right)}$$

Safe side: $(v_{min} < v < v_{max})$

15) Centrifugal Rotating frame me hi lagega.

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