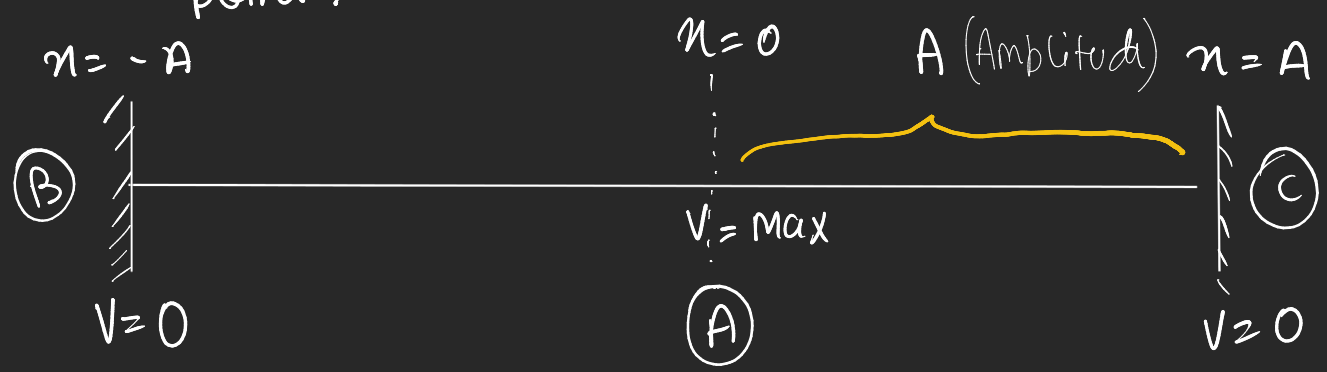
SIMPLE HARMONIC MOTION

Periodic Motion : Rebition of a path by a particle at fixed time intervals.

Oscillatory Motion : Particle moves to-and-fro about a fixed point.



MEAN

Ⓐ → Ⓒ → Ⓐ → Ⓑ → Ⓐ : One oscilation

Condition of SHM :

$F_{res} \propto -x^n$ → Odd : 1, 3, 5, 7

↓ Restoring force

$[F_{res} \propto -x^1]$

⇓

Simple Harmonic Motion

✡ $F_{res} = -kx$ → force constant

KINEMATICS OF SHM

$$F = -kx \Rightarrow ma = -kx \Rightarrow a = -\frac{k}{m}x$$

Let $\omega^2 = \frac{k}{m} \Rightarrow$ $\boxed{\omega = \sqrt{\frac{k}{m}}}$; $\boxed{a = -\omega^2 x}$

$$\boxed{T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{m}{k}}}$$

$$a = \frac{v\,dv}{dx} = -\omega^2 x \Rightarrow \int_{V=0}^{V=V} v\,dv = \int_{x=A}^{x=x} -\omega^2\,dx$$

$$\hookrightarrow \boxed{V = \pm\omega\sqrt{A^2 - x^2}}$$