

Foucault's Pendulum

✓ Foucault pendulum → It is a device that provides direct evidence of the ~~earth~~ earth's rotation by showing that its plane of oscillation appears to change over time. It is a long, heavy pendulum suspended from a single pivot, allowing it to swing freely in any direction. As the earth rotates beneath it, the pendulum's swing plane appears to slowly rotate with the effect being greatest at the poles and non-existent at the equator.

✓ Formula for the period of rotation → The pendulum's plane to complete one full rotation in the time T is given by ^{mula} $T = 24 \text{ hours} / \sin(\theta)$.

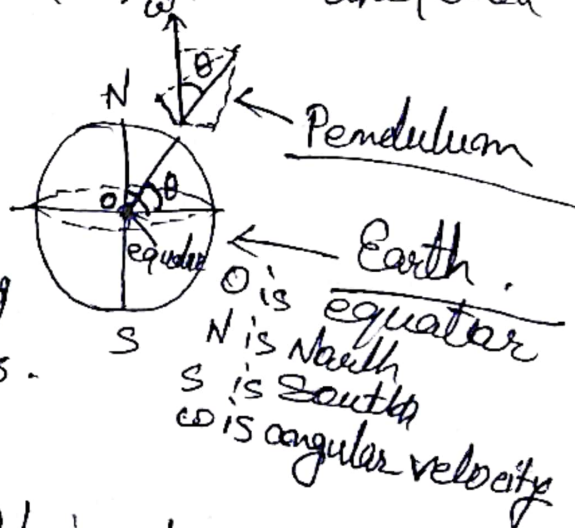
Where θ is the latitude

→ At the North pole, $\theta = 90^\circ$, $\sin(90^\circ) = 1$ So the period is 24 hours.

→ At the equator $\theta = 0^\circ$

$\sin(0^\circ) = 0$ and

the period is infinite, meaning the plane never rotates.



✓ How Foucault's Pendulum works →

(a) Fixed plane of swing → It is designed to swing in a fixed plane, a property governed by its initial motion and inertia

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(b) > Earth rotates underneath $\rightarrow$ While the pendulum continues to swing in its original plane.
 $\hookrightarrow$ Apparent rotation $\rightarrow$ From the perspective of an observer on earth, the pendulum's plane of swing seems to change, or "rotate" over time.

(c) > Rate of rotation depends on latitude $\rightarrow$ The rate at which the plane appears to rotate depends on the pendulum's latitude. The full rotation period is 24 hours at the poles but takes longer and lower ~~latitudes~~ latitudes. At the equator, there is no apparent rotation at all.

Foucault's original experiment in 1851 used a pin on the bob to trace a line in a circle of sand below it, which showed a clear, intersecting line after an hour, providing simple, direct evidence of Earth's rotation.