Date
01/02/2025

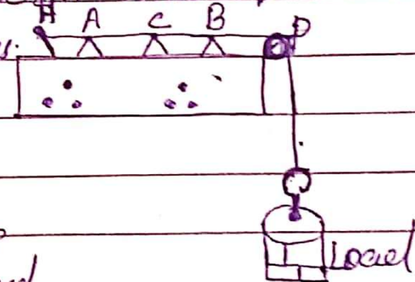
Sem - II

MIC (P)

Q → What is a Sonometer? →

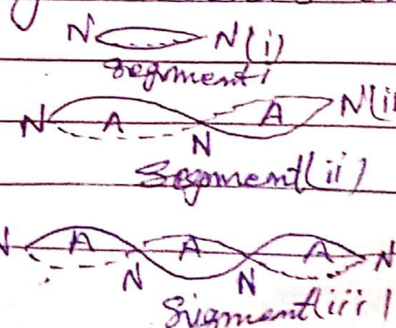
Ans. Sonometer →

Sonometers have been used as demonstration experiments for a very long time: The monochord was created by pythagoras in the seventh century B.C. A French instrument maker Albert marloye improve the monochord in the middle of the nineteenth century and the result was the differential sonometer. The scientific instrument that measures the frequency of waves.



Used of sonometer →

A Sonometer is a long hallow wooden box, having two fixed edges A and B and Movable Knife-edges C. A wire has its one end tied to a hook H, and other end passes over a smooth frictionless pulley P and carries a load. If C be removed and the wire pressed at the middle and let go it vibrates as a whole in one segment with nodes at A and B and an antinode midway between them. If the wire is held at the middle and one segment passed and let go, it vibrates in two segments if held at the one-third and the shorter segment passed, it vibrates in three segments and so on



Now $n = \frac{v}{\lambda}$

Also for a stretched string $v = \sqrt{T/m}$

Where T is the also tension on it and
m = mass of 1 cm. of wire.

$$\therefore n = \frac{1}{\lambda}\sqrt{\frac{T}{m}} \quad \text{--- (1)}$$

or, generally $n = \frac{p}{2l}\sqrt{\frac{T}{m}}$, 1, 2, 3, 4 - - -

by fig(i) the length of wire,

$l = \frac{\lambda}{2}$ that is $\lambda = 2l$; $n_1 = \frac{1}{2l}\sqrt{\frac{T}{m}}$

fig(ii) → $l' = \lambda'$ $\quad n_2 = \frac{2}{2l}\sqrt{\frac{T}{m}}$

fig(iii) → $l = \frac{3\lambda''}{2}$, $n_3 = \frac{3}{2l}\sqrt{\frac{T}{m}}$

A wire actually vibrates in a complex manner. The complex vibration can be resolved into the above-mentioned simple modes of vibration and sound of frequencies 2n, 3n, 4n are, therefore emitted by the vibrating string along with the loudest sound of frequency, n. The first sound of ~~freq~~ frequency n is called fundamental and it is the loudest. Its frequency is easily determined using the relation

$$n = \frac{1}{2l}\sqrt{\frac{T}{m}}, \text{ T being in dynes} \quad \text{--- (2)}$$

Laws of strings by eqn (2)

(i) If T and m are constant $n \propto \frac{1}{l}$ or nl = constant and its graph will straight line (graph of n & $\frac{1}{l}$)

(ii) If n and m are constant $l \propto \sqrt{T}$ or, T/l^2 is a constant and graph of l^2 and T will be a straight line.