

**Resonance:**

Resonance is the tendency of a system to oscillate with greater amplitude at some frequencies than at others.

It is a phenomenon when the frequency of an externally applied periodic force on a body is equal to its natural frequency, the body readily begins to vibrate with an increased amplitude.

Let,

$f = \text{frequency of ac mains}$

$l = \text{resonating length (length of string between bridges at resonance)}$

$T = \text{Tension on string}$

$\mu = \text{mass per unit length of string}$

Then, fundamental frequency of vibration through string:

$$f = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$$

**Working formula:**

- **For the determination of tension ( $T$ ) on wire:**

If  $M =$  mass of suspended load, then

$$T = Mg$$

- **For the determination of mass per unit length ( $\mu$ ) of wire:**

If  $d =$  diameter of wire

$\rho =$  density of material of wire, then

$$\mu = \frac{\pi d^2}{4} \times \rho$$

If,  $m =$  mass of string

$L =$  total length of string

Then,

$$\mu = \frac{m}{L}$$

- **For the determination of frequency ( $f$ ) of ac mains:**

If  $l =$  length of string between bridges at resonance, then

$$f = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$$

**PROCEDURE:**

1. Place the whole arrangement of sonometer on a table and connect the 3 V (2V to 4V) output of transformer to the sonometer wire (at two ends of the sonometer wire).
2. Suspend a mass of 0.05 Kg to provide tension to the wire.
3. Place a U-shaped magnet (or horseshoe magnet) at the mid-point of the stretched wire (between two bridges) such that the wire passes between the poles of the magnet.
4. Change the position of bridges (start from least separation) until the wire between the bridges vibrate with maximum amplitude. Note down the length (separation) between the bridges (called as resonating length) [See observation table below].
5. Repeat the step 4 for next four times by increasing the suspended mass by 0.05Kg in each step.
6. Use appropriate formula and find the frequency of ac mains.

**OBSERVATIONS:**

Least count of micrometer screw gauge = .....

Instrumental error of micrometer screw gauge = .....

Diameter of the sonometer string,  $d = \dots\dots\dots m.$