

# PHYSICS PRACTICAL SHEET

Date: .....

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Object of the Experiment (Block Letter)

Experiment No: 1

Group: .....

Sub.: .....

Set: .....

## TO USE SONOMETER TO DETERMINE THE FREQUENCY OF AC MAINS

### Apparatus Required

- i. Sonometer with steel wire.
- ii. A horse shoe magnet.
- iii. A step down transformer
- iv. Weight box/slotted weight
- v. Screw gauge

### THEORY

If a sonometer wire of length  $l$  is stretched between two bridges under a tension  $T$  and note of fundamental frequency  $f$  Hz is given by:

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

where,  $\mu$  is mass per unit length of sonometer wire.



## OBSERVATIONS.

Least count of screw gauge = 0.01 mm.

Zero error =  $+5 \times 0.01 = +5.05 \text{ mm}$

Zero correction = -0.05 mm

Table no 1: Diameter of sonometer wire.

No. of obs.	M.S.R	V.S.R.	Total reading = M.S.R + V.S.R.	Mean. Diameter	Corrected. Diameter.
1	0	50	$50 \times 0.01 = 0.5$	$\frac{0.5+0}{2} = 0.5 \text{ mm}$	0.406 mm
2	0	40	$40 \times 0.01 = 0.4$	0.4 mm	-
3	0	47	$47 \times 0.01 = 0.47$	0.7 mm	$4.06 \times 10^{-4} \text{ m}$

Density of the sonometer wire ( $\rho$ ) from physical table  $8500 \text{ kg/m}^3$

Mass per unit length of wire ( $\mu$ )

$$= \frac{\pi d^2 \times \rho}{4} = \frac{\pi \times (4.06 \times 10^{-4})^2 \times 8500}{4} = 1.45 \times 10^{-3} \text{ kg/m}$$

Table no 2: frequency of a.c. mains

No. of obs	Load on the. Scale pan (kg)	Tension. in Newton	Resonating length (l in m)	$f = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$	Mean f (Hz)
1	0.2 kg	$0.2 \times 10 = 2 \text{ N}$	$69.5 - 31 = 0.385 \text{ m}$		48.25 Hz
2	0.4 kg	$0.4 \times 10 = 4 \text{ N}$	$78.5 - 24.5 = 0.54 \text{ m}$		48.64 Hz
3	0.6 kg	$0.6 \times 10 = 6 \text{ N}$	$87 - 23 = 0.64 \text{ m}$		50.27 Hz
4	0.8 kg	$0.8 \times 10 = 8 \text{ N}$	$87.5 - 17 = 0.705 \text{ m}$		52.27 Hz
5	1 kg	$1 \times 10 = 10 \text{ N}$	$87.5 - 7.5 = 0.8 \text{ m}$		52.08 Hz

$$\text{Mean frequency} = \frac{\sum f}{5} = \frac{48.25 + 48.64 + 50.27 + 52.27 + 52.08}{5}$$

$$= \underline{\underline{50.388 \text{ Hz}}}$$



### RESULT

The frequency of A.C mains is found to be 50.388 Hz.

### PERCENTAGE ERROR:

Standard value (S.V) = 50 Hz

Observed value (O.V) = 50.388 Hz

$$\% \text{ Error} = \left| \frac{S.V - O.V}{S.V} \right| \times 100 \%$$

$$= \left| \frac{50 - 50.388}{50} \right| \times 100 \%$$

$$= 0.776 \%$$

### CONCLUSION

Hence the frequency of AC main is calculated and found to be 0.77% error by sonometer.

### SOURCE OF ERROR

- \* Kinks present in the wire.
- \* Friction in the wire.
- \* Carelessness of the experiment

### PRECAUTIONS

1. The wire should be stretched horizontally.
2. The wire should be free from kinks.
3. The electrical connection should be made carefully.