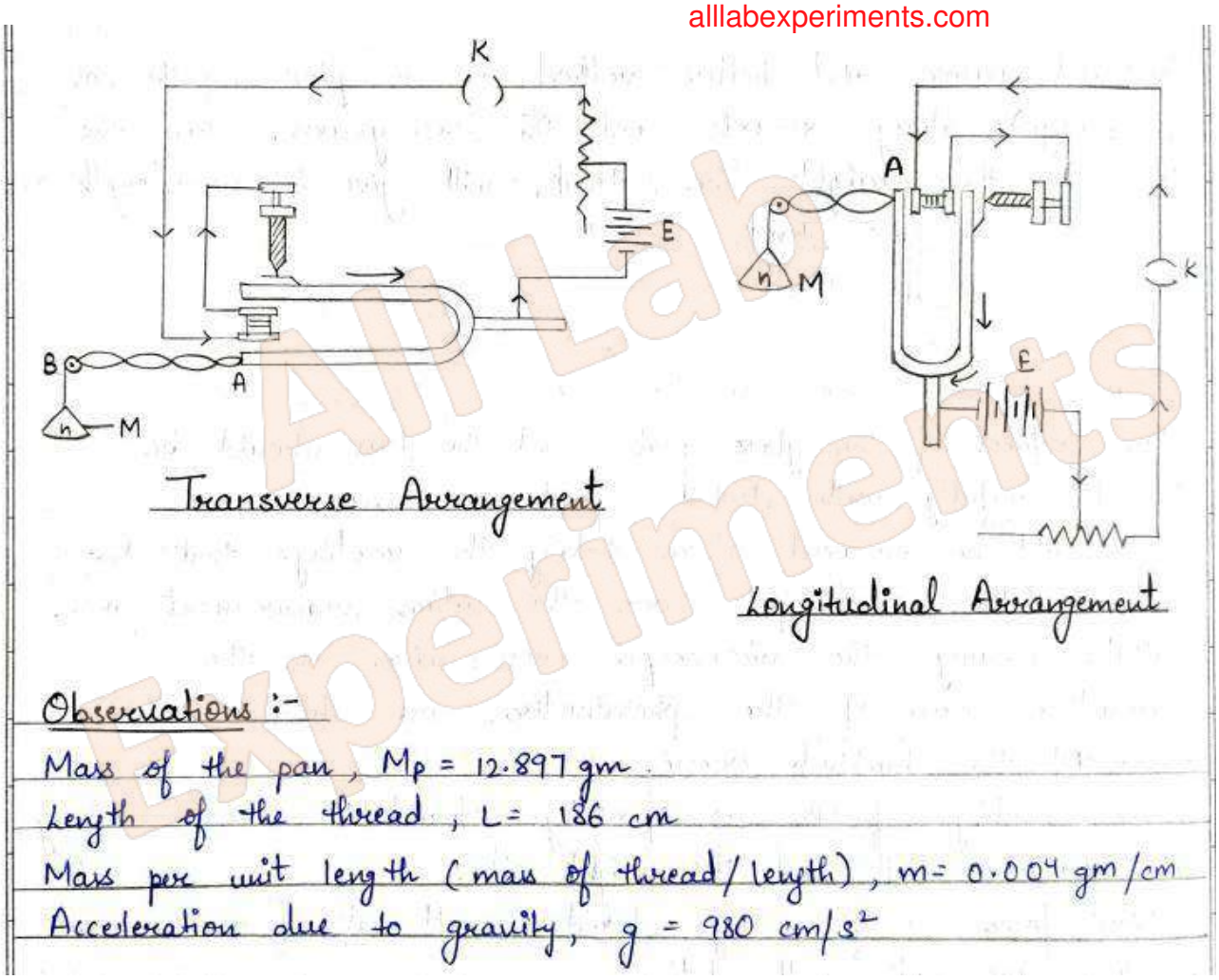
Aim - To determine the frequency of an electrically maintained tuning fork by Melde's Experiment.



Transverse Arrangement

Longitudinal Arrangement

Observations :-

Mass of the pan, M_p = 12.897 gm

Length of the thread, L = 186 cm

Mass per unit length (mass of thread / length), m = 0.004 gm/cm

Acceleration due to gravity, g = 980 cm/s^2

Aim :- To determine the frequency of an electrically maintained tuning fork by Melde's experiment.

Apparatus :- Electrically maintained tuning fork, stand with clamp, balance, weight box, cotton string, metre scale, battery, a rheostat and connecting wires.

Theory : If l is the length between two consecutive nodes then the wavelength

$$\lambda = 2l = 2L/P \qquad L = \text{Length of } P \text{ loops}$$

In transverse arrangement

$$\frac{\lambda^2}{T} = \frac{1}{n^2 m} = C_1 \text{ (constant)}$$

In longitudinal arrangement

$$\frac{\lambda^2}{T} = \frac{4}{n^2 m} = C_2 \text{ (constant)}$$

Precautions and Sources of Errors :-

1. The alignment of the thread and the prongs of the tuning fork is important. In the transverse arrangement, the thread should be stretched in a line with the length of the prongs so that the vibrations of the tip of the prong are perpendicular to it. In the longitudinal arrangement the thread should be at right angles to the length of the prongs so that the vibrations of the

No. of loops P	Length of one loop $\ell = L/P$	Load M	Tension $(M+M_p)g$	Wavelength $\lambda = 2L/P$	λ^2
15	12.4	0	12.64×10^3	24.8	615.04
13	14.3	5	17.54×10^3	28.6	817.96
11	16.9	10	22.44×10^3	33.8	1142.44
10	18.6	15	27.34×10^3	37.2	1383.84
9	20.67	25	37.14×10^3	41.34	1708.99
8	23.25	30	42.04×10^3	46.5	2162.25
7	26.571	55	66.54×10^3	53.142	2824.07
6	31	75	86.14×10^3	62	3844
5	37.2	120	130.2×10^3	74.4	5535.36
4	46.5	160	169.4×10^3	93	8649
3	62	190	198.8×10^3	124	15376

No. of loops P	Length of one loop $\ell = L/P$	Load M	Tension $(M+M_p)g$	Wavelength $\lambda = \frac{2L}{P}$	λ^2
8	23.25	0	12.64×10^3	46.5	2162.25
6	31	10	22.44×10^3	62	3844
5	37.2	20	32.24×10^3	74.4	5535.36
4	46.5	35	46.94×10^3	93	8649
3	62	65	76.34×10^3	124	15376

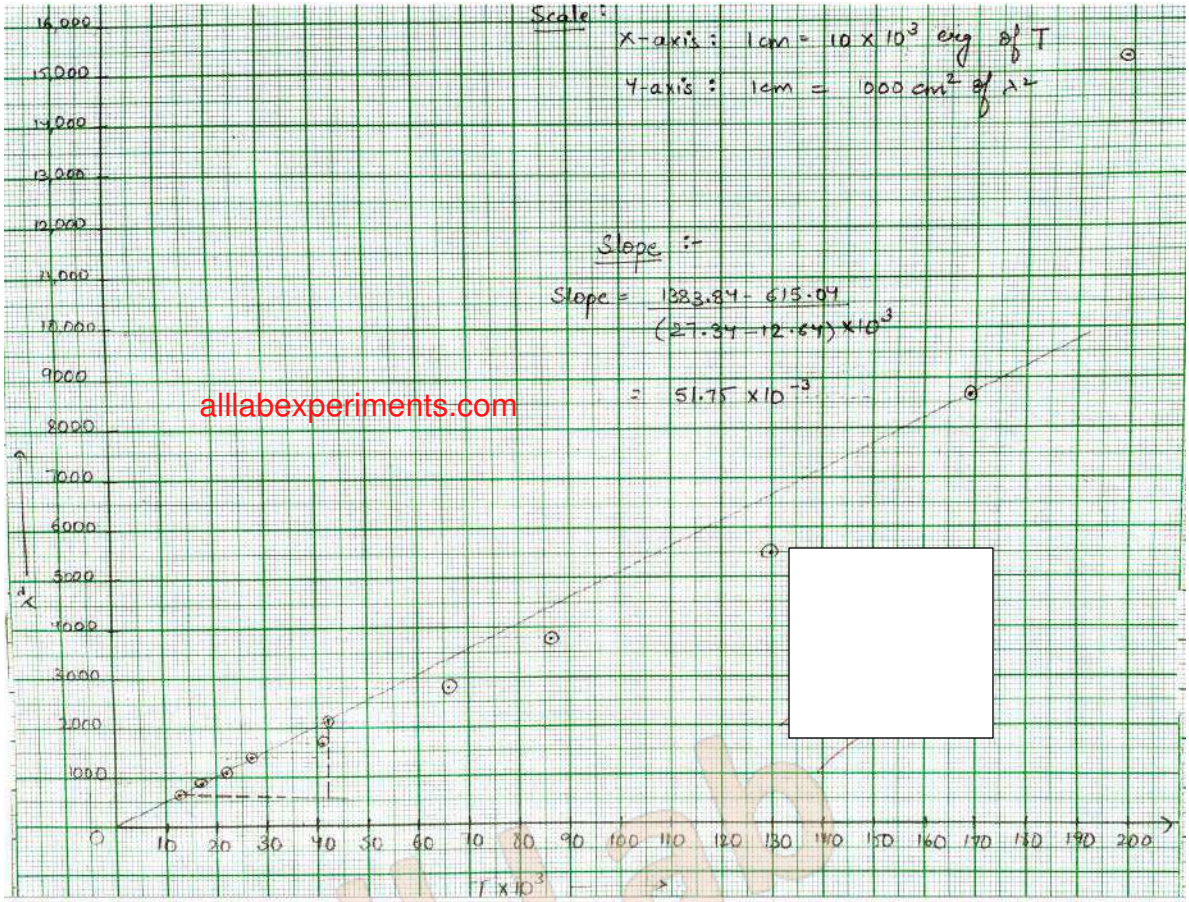
Calculations :- i) Transverse arrangement

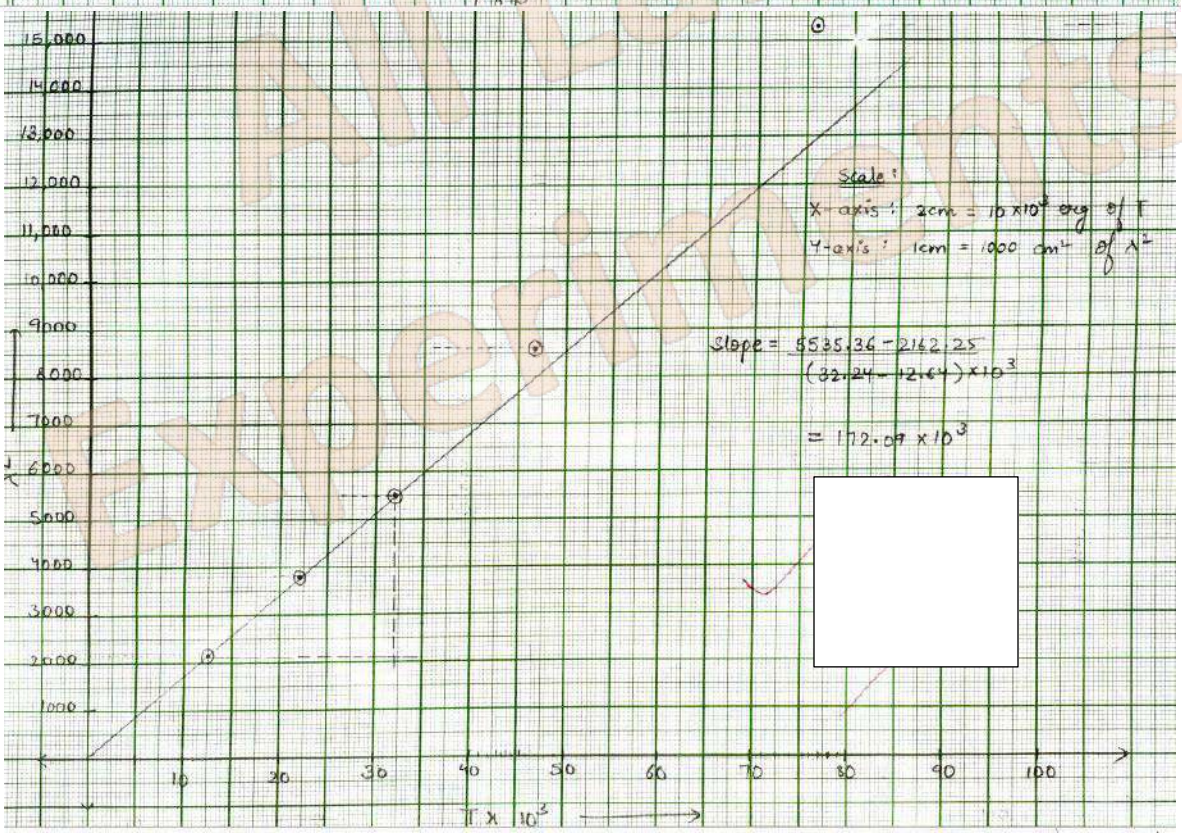
Slope $= 51.75 \times 10^{-3}$ $\Rightarrow n^2 = 1/(m \times \text{slope}) = 4830.92$

$\Rightarrow n = 69.5$

ii) Longitudinal arrangement

Slope $= 172.09 \times 10^{-3}$ $\Rightarrow n^2 = 5818.91$ $\Rightarrow n = 76$


Scale :
X-axis : 1cm = 10 x 10^3 erg of T
Y-axis : 1cm = 1000 cm^2 of A^2
Slope :-
Slope = 1383.84 - 615.04 / (27.34 - 12.64) x 10^3
= 51.75 x 10^-3
alllabexperiments.com
A^2
T x 10^3


Scale :
X-axis : 2cm = 10 x 10^3 erg of T
Y-axis : 1cm = 1000 cm^2 of A^2
Slope = 5535.36 - 2162.25 / (32.24 - 12.64) x 10^3
= 172.09 x 10^3
T x 10^3

tip of the prong are in line with it.
2. The plane of vibrations of the thread should not rotate.
3. Well defined nodes should be obtained by adding fractional weights in the pan.
4. For the measurement of the distance between the consecutive nodes (l), the nodes at the corners should be neglected as they have some motion.

Result :- i) In transverse arrangement,
Frequency of tuning fork = 69.5 Hz
ii) In longitudinal arrangement
Frequency of tuning fork = 76 Hz.

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