B.L.D.E.Associations

S.B.ARTS AND K.C.P.SCIENCE COLLEGE,VIJAYAPUR

DEPARTMENT OF PHYSICS & ELECTRONICS

B.SC-II SEMESTER

RCUB PHYSICS PRATICAL MANUAL

List of Experiments

1.COMPARISION OF CAPACITY BY DE SAUTY'S METHOD

Aim: Determine the capacity of the given condenser using De sauty's A C Bridge given capacity of one condenser

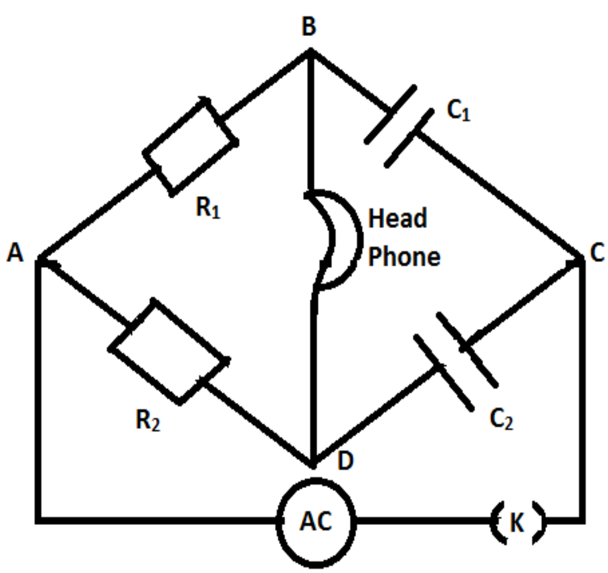
C_1=______________µF

Apparatus: two condensers, two resistance boxes, Headphone, Fixed frequency (1000Hz).

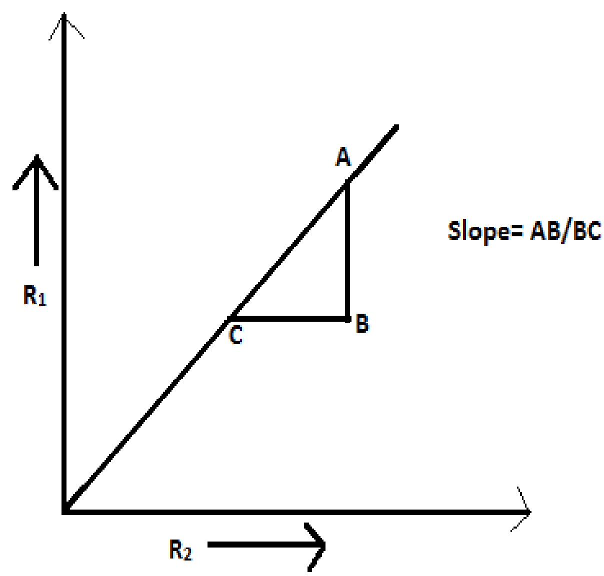
Formula with Units: $\frac{C_1}{C_2} = \frac{R_2}{R_1}$ Condition for balanced bridge

$C_2 = \frac{C_1}{R_2} R_1$ µF = C_1 (Slope)___ µF

Circuit diagram:



Nature of graph:



C_1, C_2: condenser
R_1, R_2: Resistance box
K: plug key

Procedure:

1) Connect the resistor and capacitor as shown in figure and connects the headphone in the center of circuit.
2) Increase the frequency so that we can hear the sound loudly.
3) Now balance the bridge by the value R_1 and R_2 in the balance state the sound through the headphone will be minimum.
4) The value of R_1 and R_2 should be high.
5) The audio frequency should be high.
6) Draw the graph taking R_2 as X-axis vs. R_1 as Y-axis.
7) Note down the slope value.

Tabular column:

Capacity of the condenser C_1=__________µF

Obs. No	**Resistance in R_1 Box R_1 Ω**	**Resistance in R_2 Box R_2 Ω**

Calculation: Capacity of condenser C_2: C_1 (slope) µF

Result: **Capacity of the given condenser is____** µF

2.Determination of High Resistance by Leakage Method

AIM: To determine the value of the given high resistance by leakage method. Given: capacity of the capacitor C =…………..µF

Apparatus: Battery, high resistance, voltmeter, standard capacitor, stop clock, two plug keys, tap key & connecting wires.

Formula with Unit:

$$\textbf{High Resistance}, R = \frac{t}{2.303\ C \log\frac{V_0}{V}}\ \Omega$$

$$R = \frac{t}{2.303\ C\ (slope)}\ \Omega$$

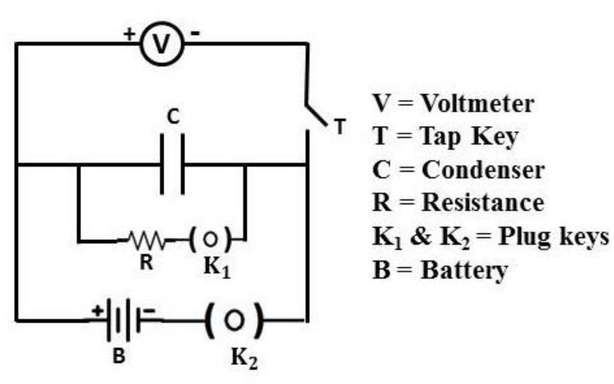
Where, t = leakage time

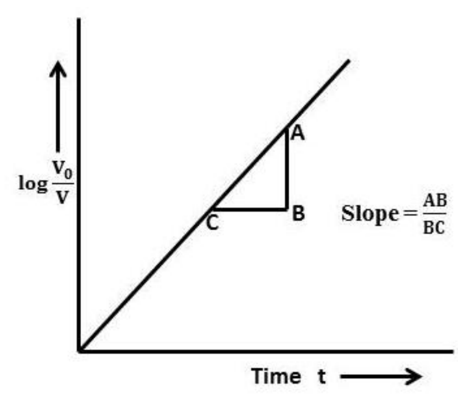
C = capacitance of the Condenser

V_0 = Initial voltage across C

V = Voltage across C after time t sec

Circuit Diagram: **Nature of Graph:**





Observations:

1. Capacity of the Condenser = ………. µF

2. Initial voltage across C (t-=0 sec), V_0 = volt

Tabular Column:

Obs. No	Time t (sec)	Voltage across C V (volt)	$\log\left(\frac{V_0}{V}\right)$
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Calculations:

$$\textbf{High Resistance, R} = \frac{t}{2.303\ C\ (slope)}\quad \Omega$$

Procedure:

1. Make the electrical connections as shown in the circuit diagram.
2. Close K_1 (ii) and press the tap key (K_2), i.e. charge the condenser.
3. Release the tap key K_2 so that the condenser is discharged. Note down the readings.
4. Repeat the procedure of the points (ii) and (iii) several times, i.e. every time charge condenser and then discharge.
5. Closing K_1 (ii) and pressing Morse key K_2, charge the condenser for the same time. Keeping tap key pressed, open K_1 (ii) and close K_1 (i). Start the stop watch.
6. after a measured time t seconds (say 5 or 10 sec.), release tap key and note down the first reading.

Result: High resistance R= ………Ω

3.L C R Series Resonance

Aim : To study the frequency response and to find resonant frequencies of L-C-R series. Also to find the quality factor and band width in L-C-R series Circuit.

Apparatus: A variable non-inductive resistor, a variable capacitor, a variable Inductor, a signal generator, an a.c. milli-ammeter and the connecting wires.

Formula : The resonance frequency, $f_o = \frac{1}{2\pi\sqrt{LC}}$ Hz

Where, L= Self inductance , C= Capacitance

Quality factor $Q = \frac{2\pi f_{0} L}{R}$

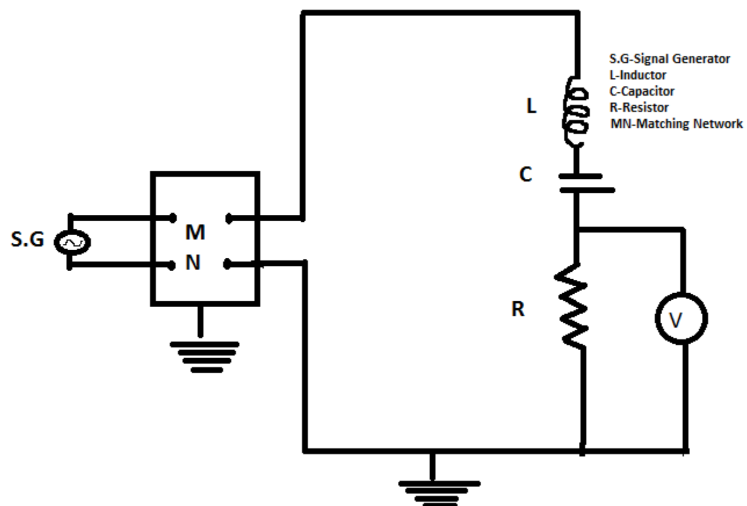
Where, R= Resistance

Band width $= f_2 - f_1$ ....Hz

Also Quality factor $Q = \frac{f_0}{f_2 - f_1}$

Where f_1 and f_2 are the frequencies at the half power points.

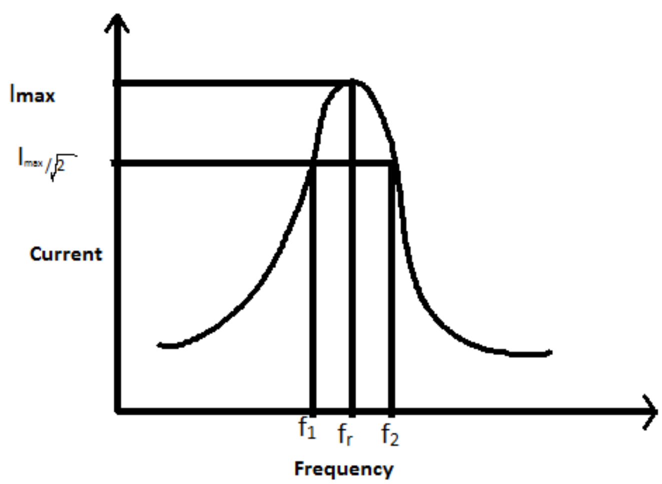
Circuit Diagram:



Procedure:

For L-C-R series, the circuit is connected as shown in the figure-1.The source resistance and the series resistance should be small. The output voltage of the signal generator is adjusted to be around 5V. The frequency of the signal generator is changed in steps and the corresponding current values are noted from the a.c. milliammeter. The readings are tabulated. The current values increase with the increase of frequency, up to the resonant frequency, further increase of frequency causes the decrease of current. The L,C and R values are noted to calculate the resonant frequency f0 and Q- factor, using the above formulae.

Nature Of the Graph:



Graph :- A graph is drawn for current against frequency. The frequency corresponding to minimum current is noted and it is the anti- resonant frequency f_0.

Tabular Coloum:

1)R= Ω **2)R= Ω**

Signal generator voltage,V_S= **Signal generator voltage,$V_{S=}$**

SL.NO	Frequency H_Z	Voltage V_R mV	Current $I=V_R/R$ mA	SL.NO	Frequency H_Z	Voltage V_R mV	Current $I=V_R/R$ mA

Results:

4. Time Constant of RC Circuit

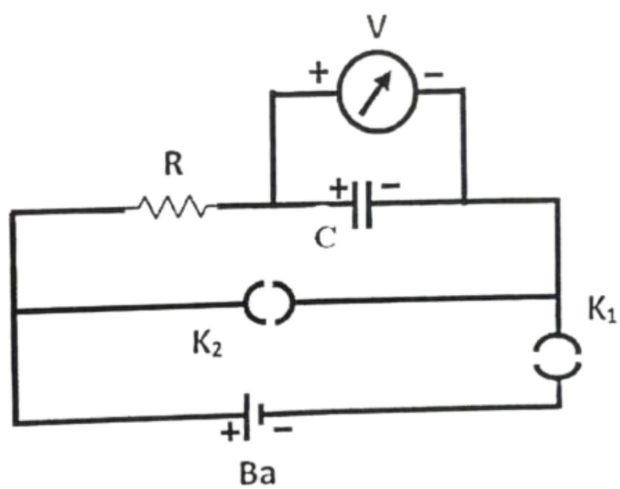
Aim: To determine the time constant for a given RC circuit by plotting instantaneous voltages across the capacitance versus time and to compare with its theoretical value

Given : R=10 kΩ and C=1000 μF

Apparatus: Battery, Capacitor, Register, Voltmeter (0-20 V DC) two plug keys, stop watch.

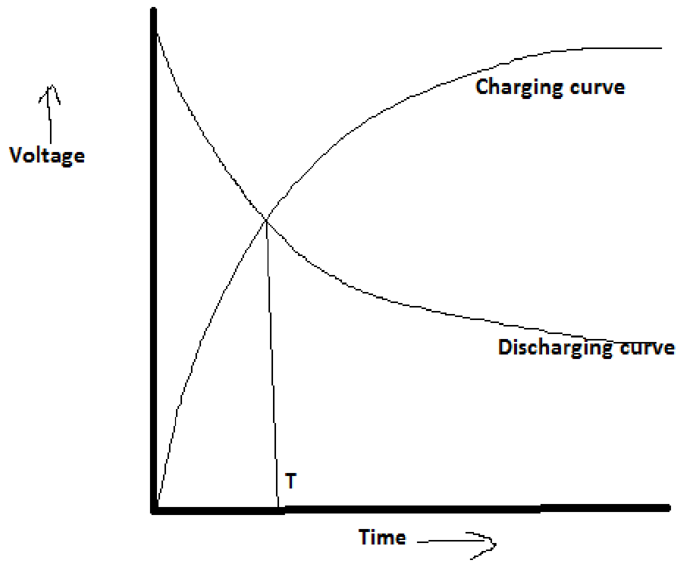
Formulae: Time constant , T = RC (Theoretical)

Circuit Diagram:



Where, V - Voltmeter (0-20 V DC), R - Resistor, C - Capacitor, K_1 & K_2 - Plug keys, Ba – Battery

Nature of the Graph:



Where T is time constant=……….Sec

Tabular Column:

Charging		Discharging	
Time in Sec	Voltmeter reading in V	Time in Sec	Voltmeter reading in V

Procedure:

1. Electrical connections are made as shown in the circuit diagram.
2. K_1 is closed and K_2 is kept open and charging readings are taken till saturation voltage is reached.
3. K_1 is open and K_2 is closed and discharging readings are taken till the voltage becomes almost zero.
4. A graph of V V_S T is plotted and T_1 and T_2 are found.
5. Experiment and theoretical time constant is determined.

Calculations:

Result:

Theoretical time constant, ***T*** = ...***s***

Experimental time constant of RC circuit, ***T* = ... *s***

5. Thevenin's and Norton's Theorems (Ladder Network)

Aim: Establish Thevenin's and Norton's equivalent circuit based on terminal measurements of a resistive ladder network. Hence, show that the equivalence between the two equivalent circuits.

Apparatus: Cell 1.3 V (2No), DC voltmeter (0-3 V), DC Ammeter (0-100 mA), Connecting wires, Plug key etc.

Specifications: V =2.6 Volt, R_1= Ω, R_2= Ω, R_3= Ω, R_4= Ω.

Formula: **1) Thevenin's resistance**

$$R_{TH} = \frac{V_{TH} - V_L}{V_L} \times R_L \; \ldots\ldots \; \Omega$$

Where V_{TH} = Open circuit (Thevenin's) voltage

V_L = Voltage across the load

R_L = Load resistance

2) Norton's resistance

$$R_N = \frac{I_L}{I_{SC} - I_L} \times R_L \; \ldots\ldots \; \Omega$$

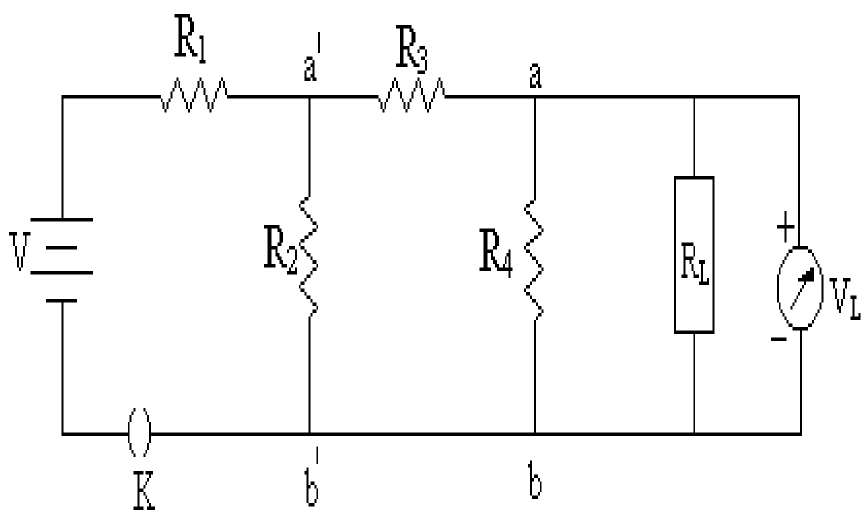
Where I_{SC} = Short circuit (Norton's) current

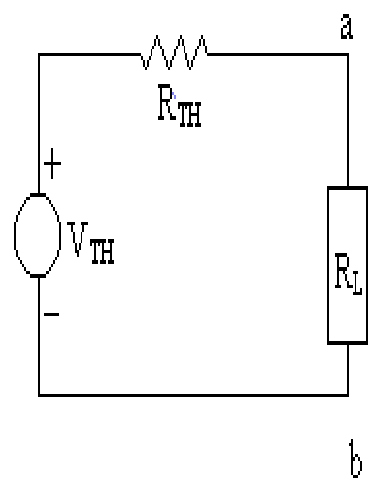
V_L = Voltage across the load

R_L = Load resistance

1) Thevenin's Theorem

Circuit Diagram **Equivalent Circuit**





Observations:

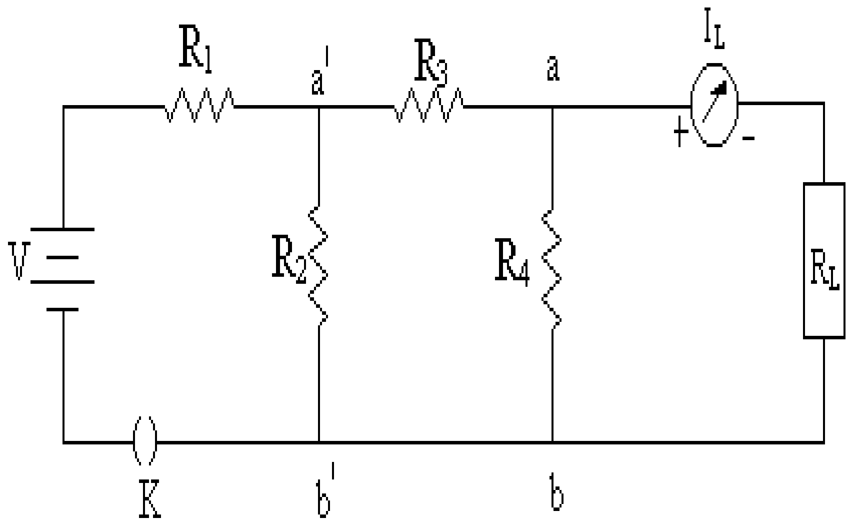
Open circuit voltage (when $R_{L} = \infty$) ,V_{TH} = -------------- Volt

Tabular Column:

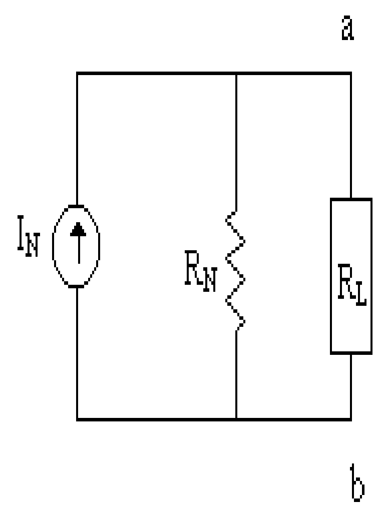
Sl. No.	Resistance R_L Ω	Voltage V_L Volt	$R_{TH} = \frac{V_{TH} - V_L}{V_L} \times R_L$ Ω	Mean R_{TH} Ω

2) Norton's theorem

Circuit Diagram



Equivalent Circuit



Observations:

Short circuit current (When R_L =0), I_N = ------------- mA

Tabular Column:

Sl. No.	Resistance R_L Ω	Current I_L mA	$R_N = \frac{I_L}{I_{SC} - I_L} \times R_L$ Ω	Mean R_N Ω

Calculations: $\mathbf{V_{TH}/R_{TH} = \quad I_N}$

i.e., from Thevenin's equivalent circuit we can find Norton's current

$$\mathbf{I_N \times R_N = V_{TH}}$$

i.e., from Norton's equivalent circuit we can find Thevenin's voltage.

Results: The ratio V_{TH}/R_{TH} is approximately equal to I_N and the ratio $I_N \times R_N$ is approximately equal to V_{TH}. Hence the two circuits are equivalent.

6.Thevenin's and Norton's Theorems
(Unbalanced Wheatstone's bridge)

Aim: Establish Thevenin's and Norton's equivalent circuit based on terminal measurements of an unbalanced wheat stone's bridge network. Hence, show that the equivalence between the two equivalent circuits.

Apparatus: Battery (2.6 V), Resistance box, Plug key, DC Voltmeter (0-3V), DC Ammeter (0-100 mA), Connecting wires etc.

Specifications: V =2.6 volt, R_1= Ω, R_2= Ω, R_3= Ω, R_4= Ω.

Formula: **1) Thevenin's resistance**

$$R_{TH} = \frac{V_{TH} - V_L}{V_L} \times R_L \quad \ldots\ldots\ \Omega$$

Where V_{TH} = Open circuit (Thevenin's) voltage
V_L = Voltage across the load
R_L = Load resistance

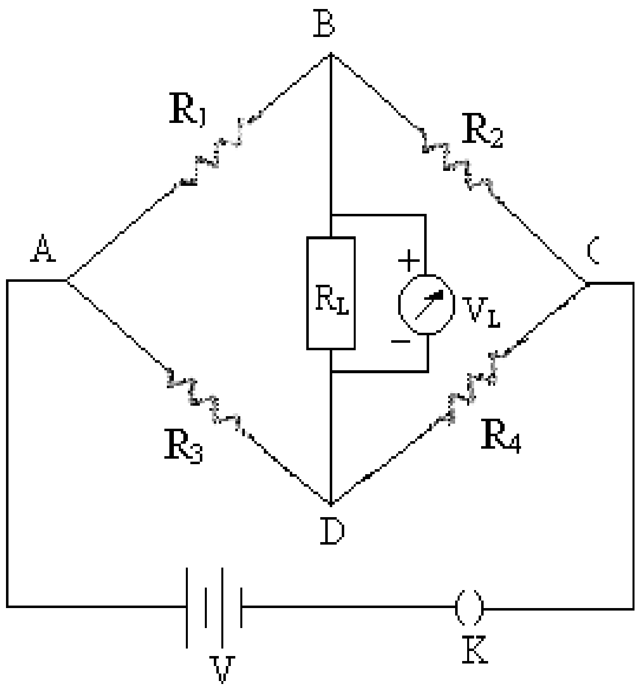
2) Norton's resistance

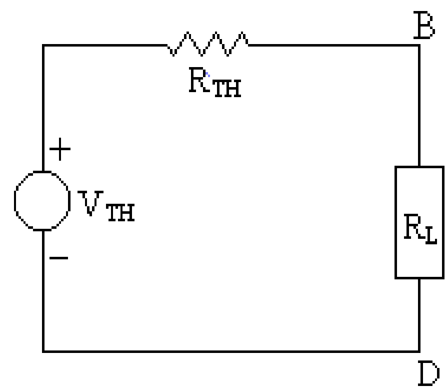
$$R_N = \frac{I_L}{I_{SC} - I_L} \times R_L \quad \ldots\ldots\ldots\ \Omega$$

Where I_{SC} = Short circuit (Norton's) current
V_L = Voltage across the load
R_L = Load resistance

1) Thevenin's Theorem

Circuit Diagram **Equivalent Circuit**





Observation:

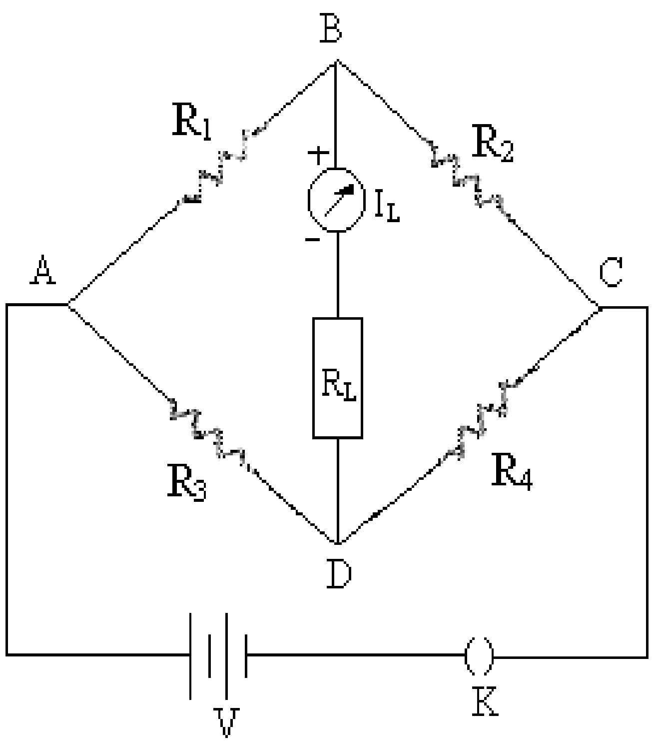
Open circuit voltage ($R_{L} = \infty$), V_{TH} = -- Volt

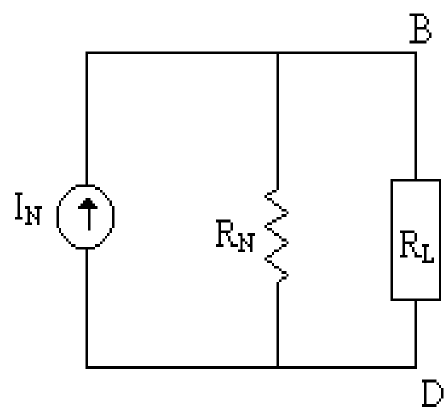
Tabular Column:

Sl. No.	Resistance R_L Ω	Voltage V_L Volts	$R_{TH} = \frac{V_{TH} - V_L}{V_L} \times R_L$ Ω	Mean R_{TH} Ω

2) Norton's Theorem

Circuit Diagram **Equivalent Circuit**





Observation:

Short circuit current (R_L =0), I_N = ------------- mA

Tabular Column:

Sl. No.	Resistance R_L Ω	Current I_L mA	$R_N = \frac{I_L}{I_{SC} - I_L} \times R_L$ Ω	Mean R_N Ω

Calculations: $V_{TH}/R_{TH} = I_N$

i.e., from Thevenin's equivalent circuit we can find Norton's current

$$I_N \times R_N = V_{TH}$$

i.e., from Norton's equivalent circuit we can find Thevenin's voltage.

Results: The ratio V_{TH}/R_{TH} is approximately equal to I_N and the ratio $I_N \times R_N$ is approximately equal to V_{TH}. Hence the two circuits are equivalent.

7.HELMHOLTZ GALVANOMETER

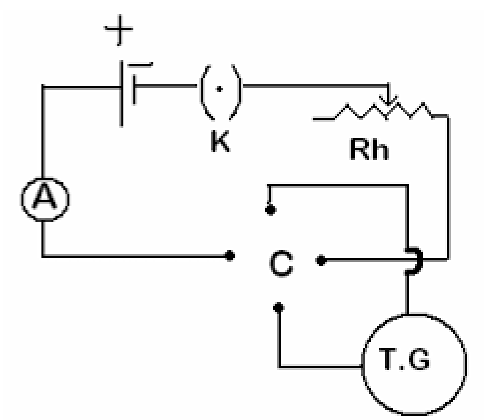
Aim: Using Helmholtz galvanometer, calibrate the two given ammeter. Plot the calibration curves.

Apparatus: Helmholtz Galvanometer, battery, plug key, ammeter (0-100mA) Rheostat, Commutator, connecting wires, thread and meter scale.

Formula with Units: Current as measured by the Helmholtz Galvanometer,

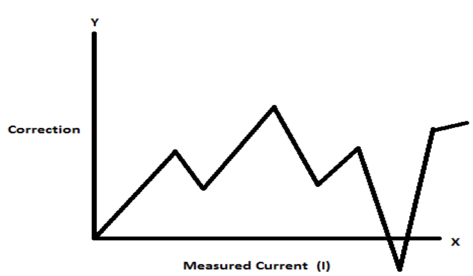
$$I = \frac{5\sqrt{5} r B_H \tan}{8 \mu_0 n} \text{ amp}$$

Circuit diagram:



B; Battery
C; Commutator
Rh; Rheostat
mA; milli ammeter
HG; Helmholtz Galvanometer

Nature of graph:



Observation and tabulation

1. Number of turns used, n=--------

2. Horizontal components of earth magnetic field, $B_{H} = 0.36 \times 10^{-4}$ tesla

3. Circumference of the coil, r= L/2 = ---------- m

Radius of the coil, r= L/2 =---------------m

Tabular Column;

Ammeter used	Obs No.	Measured current I	Deflections θ in degrees				Mean Θ degrees	tanθ	I' mA	Correction δ = I-I' mA
			Direct		Reverse					
			Θ_1	Θ_2	Θ_3	Θ_4				

Calculations: $I = \frac{5\sqrt{5} r B_H \tan}{8 \mu_0 n}$ amp

Procedure:

1. Connect the apparatus as shown in the circuit diagram. Do not keep the ammeters and rheostat near the galvanometer.
2. Level the galvanometer using a spirit level and leveling screws
   .
3. Rotate the compass box until the pointer reads o-o.
4. Keeping the resistance of the rheostat maximum close the circuit.
5. Adjust the rheostat slowly until the deflection in the galvanometer is about 30^0.
6. Note the ammeter reading A and take the readings for the deflection in the galvanometer.

Result: calibration for the given ammeter is as shown in the calibration curve

8.Use of CRO

Aim: 1) Measure the output voltage of the signal generator with help of CRO (two different voltages with two different attenuation setting for each voltage)..

2) Measure the frequency of the AC signal obtained from signal generator(two frequencies using two time base setting in each case).

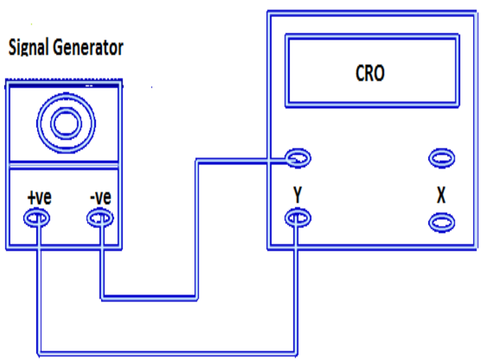
3) Measure the phase shift produced by a phase shift RC network. Take observations for two values of resistance.

Apparatus: CRO, Signal generator, connecting wires, Condenser (0.1 μf), Resistors 1K, 2K & 3K.

Formula: Phase shift (Theoretical), $\theta = \tan^{-1}(1/2\pi fCR)$

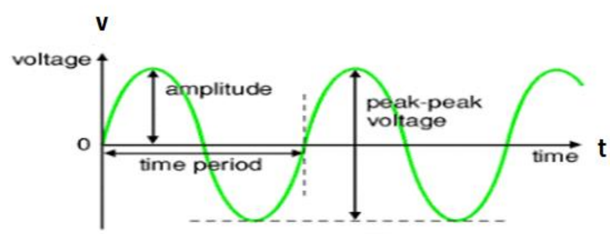
Phase shift (Practical), $\theta = \sin^{-1}(B/A)$

Circuit diagram



Nature Of graph:

1) To measure unknown voltage:



Observation:

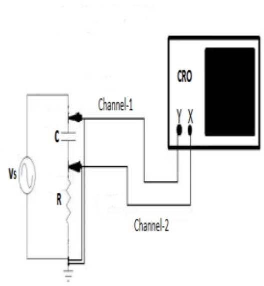
Voltage	Obs. No.	Attenuator Setting 'S' volt/div	Distance between Two Vertical Peaks 'd' div	V_{pp} = Sxd in volt	$V_p = V_{pp}/2$ in Volt	$V_{rms}=V_p/\sqrt{2}$	Mean V_{rms} In Volt
V_1	1 2						
V_2	1 2						

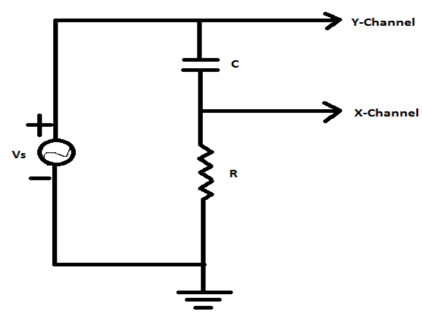
2) To measure unknown frequency:

Observation:

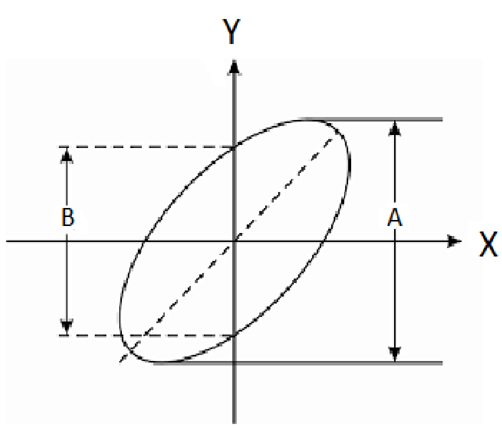
Frequency 'f' in H_z	Obs. No.	Time base Setting 't' sec/div	Dist. Between Two horizontal peaks 'λ' div	Period $T=\lambda x t$ in sec	Frequency f=1/T in H_z	Mean 'f' in H_z
f1	1 2					
f2	1 2					

Circuit Diagram to measure Phase shift





Nature of graph



Observation

Obs. No.	Resistance 'R' in ohm	A in div	B in div	Practical $\theta = \sin^{-1}(B/A)$	Theoretical $\theta = \tan^{-1}(1/2\pi fCR)$

Procedure:

To measure Voltage:

1. Connect the CRO wires to Signal generator as shown in the diagram
2. Set the main voltage and then set the attenuator setting for two different volts as V1 in volt/div
3. Again set the attenuator setting for two different volts as V2 in volt/div
4. Measure the Distance between two peaks(Vertical height)
5. Calculate V_{pp} by multiplying attenuator setting and dist. b/n peak to peak
6. Calculate V_p by dividing $V_{pp}/2$
7. Finally calculate V_{rms} and mean V_{rms}.

To measure Frequency:

1. From signal generator set the desired frequency
2. Set the Time base setting for one value and measure the distance(horizontal) from peak to peak
3. Again set the time base setting for another value and measure the distance
4. Calculate the time-period by multiplying wavelength and time
5. Then calculate value of **f** on dividing **1/T**
6. Finally calculate mean **f**
7. Repeat the same procedure for another frequency

To measure Phase shift:

1. First set the R-C circuit to CRO as shown in diagram.
2. Press the SWP button on CRO then Lissageous figure appears on CRO.
3. For different values of resistance note down the A and B distances in lissageous figure as shown in nature of graph.
4. After taking the values of A and B calculate the Practical theta value and Theoretical theta value.
5. Finally draw the graph.

Result : Frequency and Voltage are measured and Verified using CRO.

Expt.No:

Date:

SONOMETER

Aim : To determine the velocity of sound through wire using the sonometer. Plot a graph of f versus 1/L, where f – frequency of tuning fork and L is the resonating length.

Apparatus : Sonometer, slotted weights with weight hanger, tuning forks, metre scale, rubber pad and paper rider.

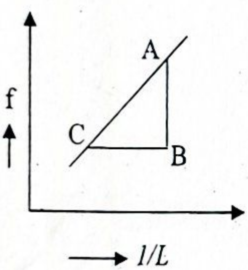
Procedure : Keeping tension T and mass per unit length of wire, m constant, measure resonating length, L for tuning forks of different frequencies. Plot the graph of frequency, f versus 1/L. We get a straight line. The velocity of sound through the material of wire can be calculated using the formula.

Formula: Frequency, $f = \frac{V}{2L}$ Hz

Velocity of sound through wire, V = 2 x slope ms^{-1}

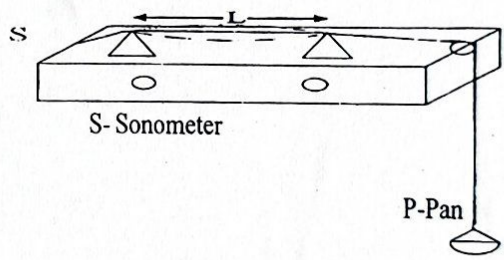
where, f – frequency, L – resonating length, V – velocity of sound through the wire

Nature of graph :



$$\text{Slope} = \frac{AB}{BC} = \frac{V}{2}$$

Figure:



Observations:

Tension, T = constant

Mass per unit length, m = constant

Obs No	Frequency f Hz	Resonating Length L(m)		Mean L(m)	1/L m^{-1}
		i	i		
1					
2					
3					
4					
5					

Calculations: V = 2 × slope = ____________ ms^{-1}

Result : Velocity of sound through the material of wire, V=..................ms^{-1}

Expt.No:

Date:

FREQUENCY OF A. C. BY SONOMETER

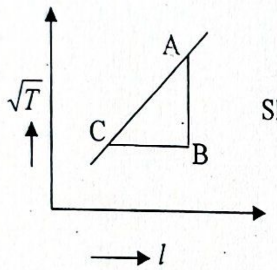
Aim : Determine the frequency of A.C source, using Sonometer. Take at least five readings.

Apparatus : Magnet, Sonometer, weight box, transformer, Rheostat, A.C ammeter, Plug key, thread metre scale & connecting wires.

Procedure : Measure mass and length of the specimen wire, calculate its mass per unit length. Connections are made as shown in figure. Closing the circuit, measure the resonating length, l for various tensions, T.

Plot the graph of $\sqrt{T}$ versus l. We get a straight line. The frequency of A.C can be calculated using the formula.

Nature of Graph :



Slope =AB /BC

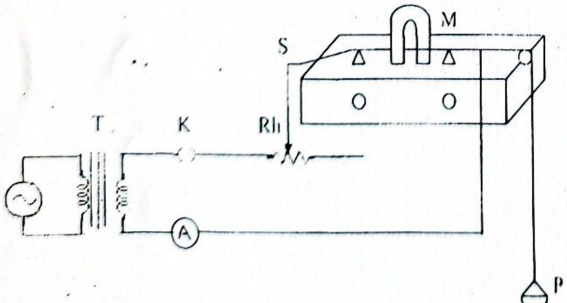
Formula : Frequency of AC source , $n = \frac{1}{2\sqrt{m}}\left(\frac{\sqrt{T}}{l}\right) = \frac{1}{2\sqrt{m}} XSlope$

Where, m – mass per unit length of the wire

T – tension in the wire

l – resonating length

Circuit diagram :



M – Magnet S – Sonometer

Rh – Rheostat T – Transformer

P – Pan K – Plug key

A – Ammeter (a.c)

Observations:

1. Length of the given wire, L = m
2. Mass of the given wire, M = kg
3. Mass per unit length of the wire, m = M/L = kgm^{-1}
4. Mass of the pan, m_1 = kg
5. Acceleration due to gravity, g = 9.8 ms^{-2}

Obs No	Mass in the Pan m_2 kg	Tension $T=(m_1+m_2)g$ newton	Resonating length l m	$\sqrt{T}$ (newton)$^{1/2}$
1				
2				
3				
4				
5				

Calculation :

Frequency, $n = \frac{1}{2\sqrt{m}} X Slope$

Result : Frequency of AC source, n = Hz

Note : Vary weights in the pan in steps of 5gm.

HELMHOLTZ RESONATOR

Expt.No:

Date:

Aim : Obtain experimentally the volume V of air in resonator that would resonate with each of the five tuning forks of different frequencies(N) Plot a graph of V against $1/N^2$ and hence determine the frequency of the unknown tuning fork, the neck correction and natural frequency of resonator.

Apparatus : Resonator, tuning forks, measuring cylinders , Rubber pad & stand.

Procedure : Measure the volume of the neck and complete volume of the resonator. Fill the resonator with water up to the neck. Find the resonating volume for various tuning forks of known frequencies & one tuning fork of unknown frequency. Plot the graph of resonating Volume, $V \rightarrow \frac{1}{N^2}$, we get a straight line. Using the graph determine unknown frequency of tuning fork, natural frequency of resonator & neck correction.

Nature of graph :

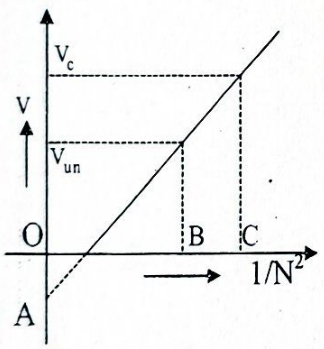
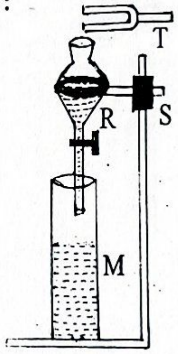


Figure :



T - Tuning fork
R - Resonator
S - Stand
M - Measuring cylinder

Formula: Unknown frequency , $n_x = \frac{1}{\sqrt{OB}}$ Hz

Natural frequency $N = \frac{1}{\sqrt{OC}}$ Hz

Neck correction $= \frac{\text{Intercept on - ve Y axis}}{\text{Volume of neck}}$

Observations :

1. Volume of the neck, V_0=________ m^3

2. Complete volume of the resonator [filled up to neck] V_c =________ m^3

Obs	Frequency of tuning fork N Hz	Volume of water collected in measuring cylinder				N^2 Hz^2	$1/N^2$ Hz^{-2}
		1	2	3	Mean volume V m^3		
1							
2							
3							
4							
5							
6	n_x (unknown)				V_{un} =		

Calculation:

Unknown frequency $n_x = \frac{1}{\sqrt{OB}}$ = _______ Hz

Natural frequency $N = \frac{1}{\sqrt{OC}}$ = ________ Hz

Neck correction $= \frac{\text{Intercept on - ve Y axis}}{\text{Volume of neck}}$

= _________

Result:

Unknown frequency, n_x = ______ Hz

Natural frequency, N = _______ Hz

Neck correction =

Expt.No:

DISPERSION CURVE AND DISPERSIVE POWER

Date:

Aim : Obtain the dispersion curve for the given prism. Calculate the dispersive power with respect to following wave lengths (i) ------------nm (ii) ----------------nm

Apparatus : Spectrometer, leveling tube, prism, magnifying glass & Hg source.

Formula : (1) Refractive index, $n = \dfrac{\sin\dfrac{(A+D)}{2}}{\sin A/2}$

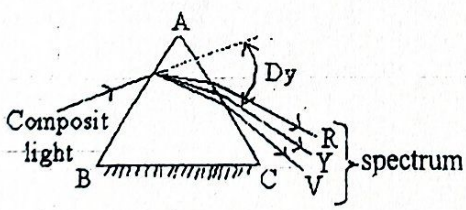
Where A is angle of prism
D is angle of minimum deviation

(2) Dispersive power, $\omega = \dfrac{\text{angular dispersion}}{\text{mean deviation}}$

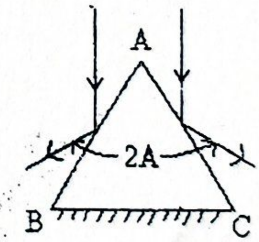
$$\omega = \frac{n_1 \sim n_2}{n-1} \qquad \text{where} \quad n = \frac{n_1 + n_2}{2}$$

Ray diagram

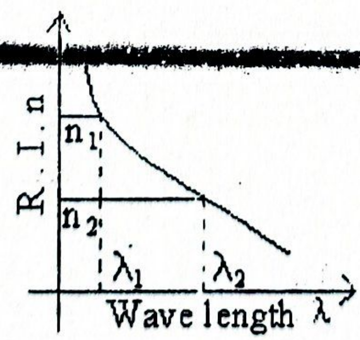
(I) Minimum deviation



(II) Angle of prism



Nature of graph :



Observations : (1) Smallest diviation on main scale, = --------------- min

(2) Total number of divisions on V.S = ----------------

(3) Least count, L.C = $\dfrac{\text{Smallest div on M.S}}{\text{Total no. of div on V.S}}$ = -------------------- min

(I) **Observations for angle of minimum deviation :**

Direct Readings:

ver X, X' =

ver Y, Y' = ----------

colour of the line	wave length of the line nm	Spectrometer reading		Angle of minimum deviation		Mean deviation	R.I
		ver X	ver Y	$X - X' = D_1$	$Y - Y' = D_2$	$D = \frac{D_1 + D_2}{2}$	$n = \frac{\sin\frac{A+D}{2}}{\sin A/2}$
YellowI	579.1						
YellowII	577.1						
Green	546.1						
G-Blue	491.6						
Blue	435.8						
strong violet	404.7						

(II) **Observations for the measurement of angle of prism :**

Spectrometer reading when telescope is focused to the reflected image of the slit				2A		mean 2A	Angle of prism
one face		another face					
ver X x	ver Y y	ver X x'	ver Y y'	x ~ x'	y ~ y'		$A = \frac{\text{mean}2A}{2}$

Calculation : Dispersive Power, $\omega = \frac{n_1 \sim n_2}{n-1}$ where $n = \frac{n_1 + n_2}{2}$

=

Result : (1) Angle of prism A = -----------.

(2) Dispersive Power ω = -----------.

Expt.No:

Resolving power of a Telescope

Date:

Aim : Determine the resolving power of a given telescope using two gratings/two distances for one grating. Compare it with theoretical values.
Given wave length λ = - - - - - - - -

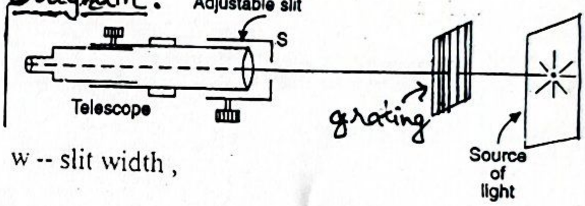
Apparatus : Telescope, wire gauge, auxiliary slit, source of light (sodium), travelling microscope.

Formulae : Theoretical R.P = $\frac{\lambda}{w}$ - - - -

Practical R.P = $\frac{d}{D}$

Where, λ is wave length, w -- slit width,
d -- grating element
D -- Distance between wire gauge & Telescope

Diagram:



Observations & Tabulation :

L.C of microscope = - - - - - - - - - - - mm

I. Determination of Grating Element (d) :

element number	microscope reading (mm)	Distance bet'n 5 wires, b (mm)	Grating element, d=b/5 (mm)	Mean d (mm)
0	x_1	$x_2 \sim x_1$		
5	x_2	$x_3 \sim x_2$		
10	x_3	$x_4 \sim x_3$		
15	x_4	-----		

$\therefore$ d = - - - - - - - $\times 10^{-3}$ m

II. Reading for slit width (w) :

Dist. bet'n wire gauge & Telescope D	Microscope readings for width of the slit when the vertical wires						Mean width of the slit $w = \frac{w_1 + w_2}{2}$ (m)
	disappear			appear			
	one edge x mm	other edge y mm	width $w_1 = x \sim y$ mm	one edge x_1 mm	other edge y_1 mm	width $w_2 = x_1 \sim y_1$ mm	
1) D_1 = - - - - -							
2) D_2 = - - - - -							

Calculations :

I. $D_1 = \ldots$

Practical R.P. =

Theoretical R.P. =

II. $D_2 = \ldots$

Practical R.P. =

Theoretical R.P. =

Result :

I. $D_1 = \ldots$

$(R.P.)_P$ =

$(R.P.)_T$ =

II $D_2 = \ldots$

$(R.P.)_P$ =

$(R.P.)_T$ =

Expt.No:

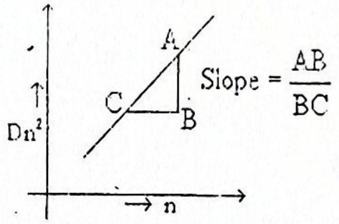
Newton's Rings

Date:

Aim : Obtain distinct Newton's rings using Sodium source of light. Determine the Wavelengthof Sodium light by plotting a graph of square of the diameter of the rings against number of rings.

Apparatus : Travelling microscope, plane glass plates, plano-convex lens, convex lens, sodium source.

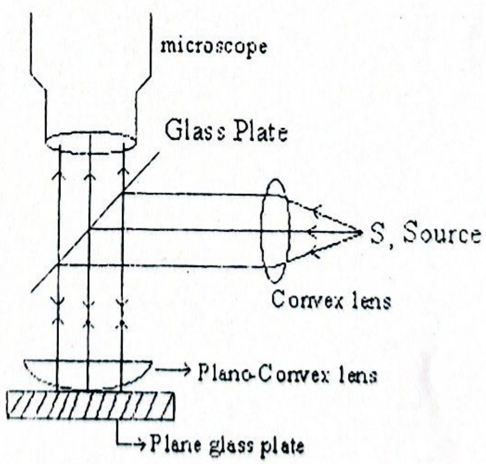
Nature of graph :



Formulae & Unit :

Wavelength of Sodium light, $\lambda = \frac{1}{4R} X Slope$ ………………….nm

Ray diagram :



Observations & Tabulation :

1) Wave length of the source = $\lambda = 5893 \times 10^{-10}$ m
2) Least count of the travelling microscope = LC

= ----------------- mm

Ring No n	Microscope Reading		Diameter Dn in meter	Dn^2
	Left mm	Right mm		
16	a_1	b_1	$a_1 \sim b_1$	
14	a_2	b_2	$a_2 \sim b_2$	
12	.	.	.	
10	.	.	.	
8	.	.	.	
6				

Calculations :

Result: Wavelength of Sodium light, λ=…………….nm

Expt.No:

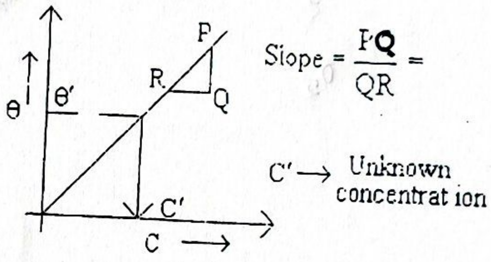
Date:

Polarimeter

Aim : Determine the specific rotation of sugar solution using Laurent's half shade polarimeter. Also determine the concentration of given solution.

Apparatus : Polar meter, Sodium source of light, measuring cylinder, Balance, sugar, distilled water etc.

Nature of graph :



Formulae & units :

$$\text{Specific rotation, } S = \frac{\theta}{LC} \times \frac{\pi}{180} \quad \text{rad-m}^2\,\text{kg}^{-1}$$

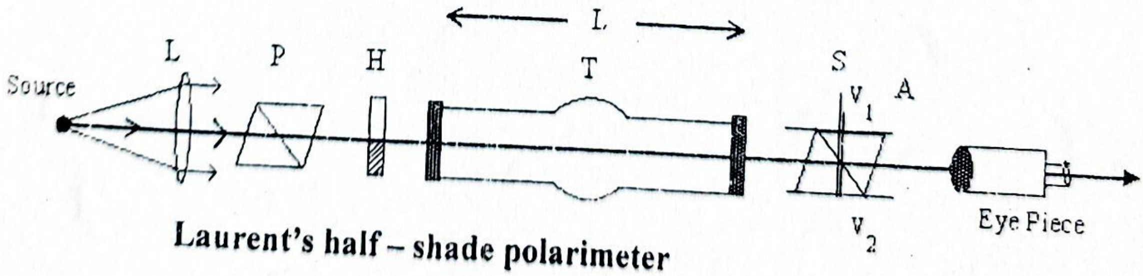
$$= \frac{\pi}{180} \times \frac{1}{L} \times \text{Slope} \quad \text{rad-m}^2\,\text{kg}^{-1}$$

Where, L – Length of the tube in mt's

θ - Rotation of plane of polarization in degrees

C - concentration of the solution

Schematic Diagram :



Laurent's half – shade polarimeter

P, A – Nicol prisms, polariser & analyser respectively

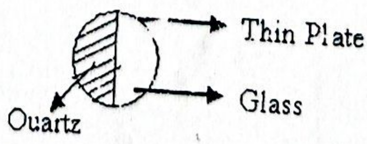
T – Glass tube

H – Half shade device

S – circular main scale

V_1, V_2 – vernier scales

L – Lens



Observations & Tabulations: LC of vernier of polarimeter = $\frac{\text{Value of 1msd}}{\text{Total no.of vsd}}$ = -------------min

Length of the polarimeter tube = L=---------------m

Ob No	concentration in C kg m⁻³	Vernier readings of the analyser		Amount of rotation of plane of polarization in degrees		Mean (degree)
		Direct	When rotated through 180°	θ'	θ''	
1	Distilled water	θ_1	θ_2	-	-	-
2	100	θ_3	θ_4	$\theta_3 \sim \theta_1$	$\theta_4 \sim \theta_2$	
3	50	θ_5	θ_6			
4	25					
5	12.5					
6	6.25					
7	Unknown					

Calculations : Specific rotation, $S = \frac{\theta}{LC} \times \frac{\pi}{180}$ rad-m² kg⁻¹

$$= \frac{\pi}{180} \times \frac{1}{L} \times \text{Slope} \quad \text{rad-m}^2\ \text{kg}^{-1}$$

Results : **Specific rotation , S = --------**

Unknown concentration, C′ = ------

Expt. No. –

Date –

MELDE'S EXPERIMENT

Aim: Determination of frequency of tuning fork by transverse vibration using Melde's apparatus.

(Given: Length of thread, L= 2m   Mass of the thread, M= 0.07×10^{-3} Kg).

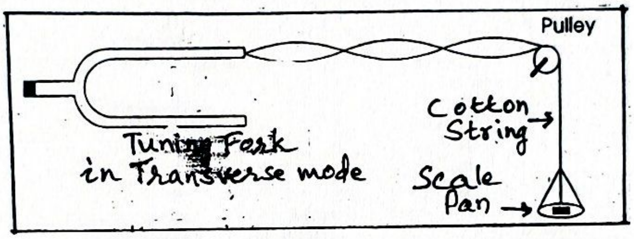
Apparatus: Tuning fork with rigid base, Hammer, Frictionless pulley, Scale pan, Weight box, Cotton string.

Formula and units:

Frequency of the tuning fork in transvers arrangement, $n = \frac{1}{2l}\sqrt{\frac{T}{m}}$ ......Hz

Where, T=Tension of the string, m= Mass per unit length of the string, l= Length of one loop.

Diagram:



Observations: Mass of the pan, Mp = ... Kg

Length of the thread = ... m

Mass of the thread = ... Kg

Mass per unit length of the thread, m = ... Kg/m

Acceleration due to gravity, g = 9.8 ms^{-2}

Tabulation:

S. NO	No. of loops, P	Length of the thread between P loops, L (m)	Length of one loop, l=L/P (m)	Load, M (Kg)	Tension, $T=(M+M_P)g$ (Newton)	Frequency, n (Hertz)
1						
2						
3						
4						

Mean, n = - - - - -

Calculation:

Frequency of the tuning fork in transvers arrangement, $n = \frac{1}{2l}\sqrt{\frac{T}{m}}$

$=$

Result: Frequency of the given tuning fork, **n** = ... Hz.

....

Expt.No:

Date:

STUDY OF LISSAJOUS FIGURE

Aim : Obtain Lissajous pattern on C.R.O screen by feeding two sine wave voltages from two signal generators (take at least three different number of loops). Hence measure two unknown frequencies.

Apparatus : Dual trace C.R.O, Signal generators (2 No's), and connecting wires. wires.

Procedure : Connect the circuit as shown in figure (a).Set the CRO in XY Mode, feed two sine waves, one of unknown frequency, f_x another of variable frequency, f_y to two channels X & Y respectively. Observe the Lissajous pattern on the screen. Adjust variable frequency such that a well defined pattern is observed on the screen. Note number of tangential points on X & Y axis, n_x & n_y respectively. then unknown frequency f_x can be calculated using the formula.

Repeat the experiment for another frequency.

Formula : Unknown frequency, $f_x = (n_y / n_x) f_y$

Unit = Hz

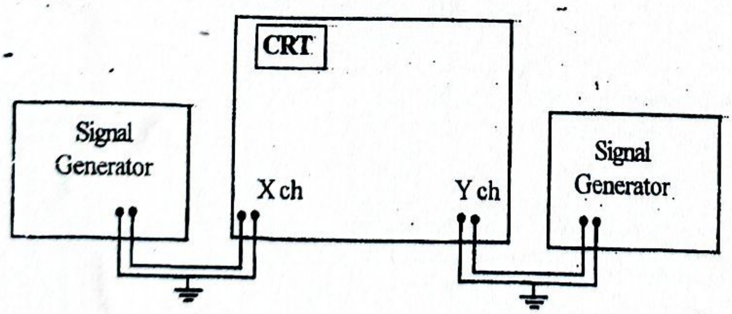
f_x – Unknown frequency

f_y – Known frequency

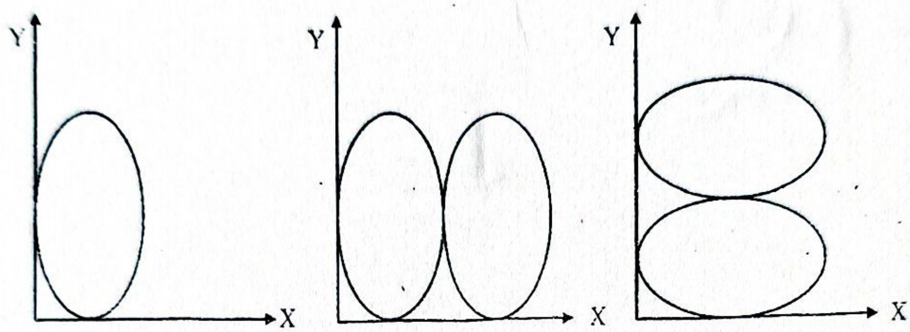
n_y – number of tangential points on Y – axis

n_x – number of tangential points on X – axis

Circuit Diagram :



Lissajous Pattern :



$n_x : n_y = 1:1$ $n_x : n_y = 2:1$ $n_x : n_y = 1:2$

Observations :

To measure unknown frequency from Lissajous Pattern.

Unknown frequency f_x Hz	Obs No	Known frequency f_y Hz	No. of tangetial points on X-axis n_x	No. of tangetial points on Y-axis n_y	Unknown frequency $f_x = (n_y/n_x) f_y$ Hz	Mean f_x Hz
f_{x_1}	1					f_{x_1} =
	2					
	3					
f_{x_2}	1					f_{x_2} =
	2					
	3					

Result : Unknown frequency f_{x_1} = ________ Hz, f_{x_2} = ________ Hz.