Karnatak University's

Karnatak Science College Dharwad

Department of Physics

LABORATORY MANUAL

B.Sc. SECOND SEMESTER

List of Experiments

1. Dielectric Constant
2. Thermoelectric effect
3. LCR series /LCR parallel
4. Capacity by absolute method
5. Helmholtz galvonometer
6. Magnetic field along the axis of coil
7. High resistance by leakage method
8. Method of mixture
9. Anderson Bridge
10. TEC (Peltier/seebeck effect)

B.Sc. - II – SEM
DETERMINATION OF DIELECTRIC CONSTANT OF A LIQUID

AIM: Determine the dielectric constant (K) of a given liquid.

APPARATUS: Op-Amp IC-741, cylindrical capacitor, capacitors, diodes, resistors, Jar containing liquid, dual power supply, signal generator, connecting wires, etc

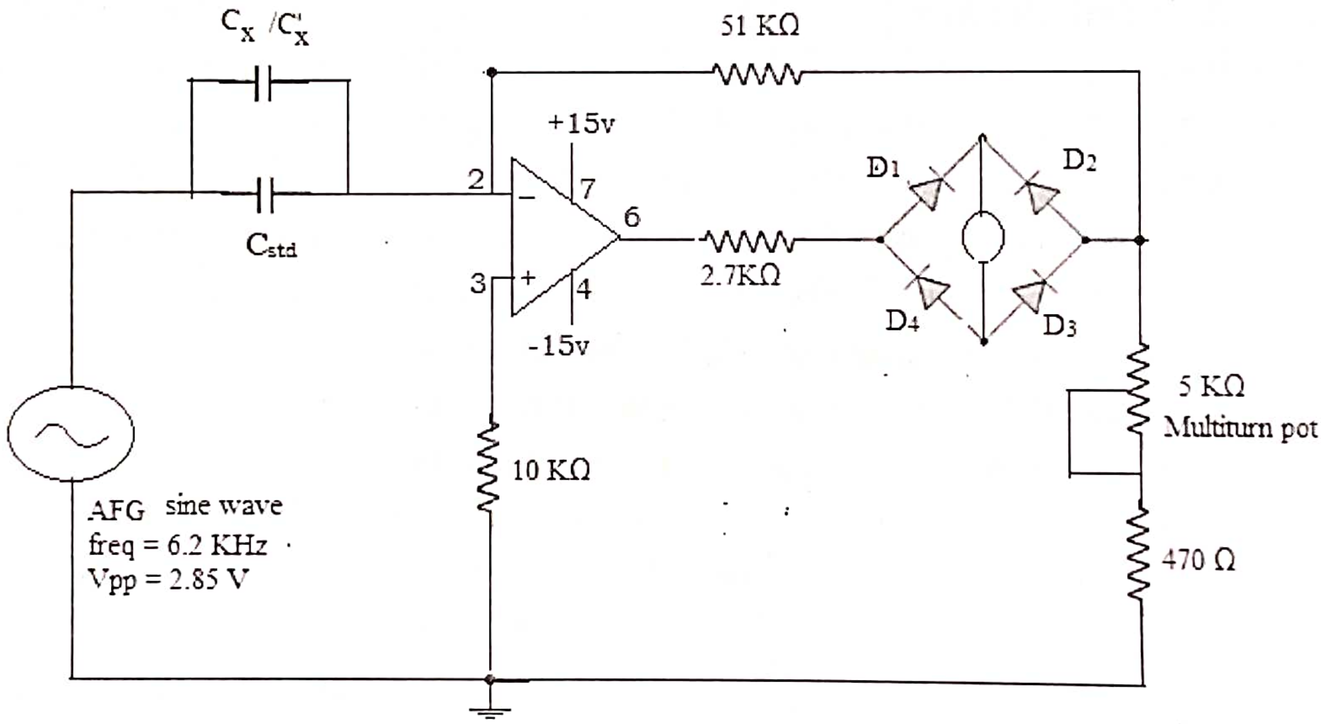
FORMULA:

$$\text{Dielectric constant} = K = \frac{C_x'}{C_x}$$

where C_x - Capacitance of unknown cylindrical capacitor with air as medium

C_x' - Capacitance of unknown cylindrical capacitor with liquid as medium

CIRCUIT DIAGRAM:

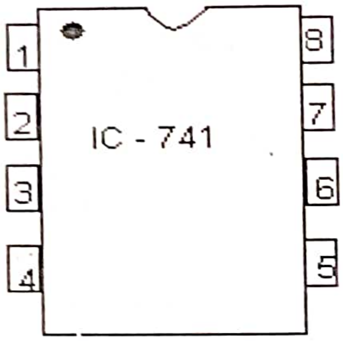


IC - 741- Operational Amplifier, C_{std} - Known capacitance, C_x - unknown Cylindrical capacitor, R- Known Resistances.

B.Sc. - II – SEM

DETERMINATION OF DIELECTRIC CONSTANT OF A LIQUID

PIN DIAGRAM of IC – 741 Op-amp:



1 & 5: offset
2: Inverting
3: Non-inverting
4: -V_{cc}
6: Output
7: + V_{cc}

PRINCIPLE:

The term **dielectric** is used to indicate the energy storing capacity of the material (by means of polarization). A common example of a **dielectric** is the electrically insulating material between the metallic plates of a capacitor. **Dielectric** materials are electrically non-conducting materials such as glass, ebonite, mica, rubber, wood and paper. The difference between a **dielectric** and an insulator lies in their **applications**. If the main **function** of non-conducting material is to provide electrical insulation, then they are called as insulator.

A dielectric material has interesting electrical properties because of the ability of an electric field to polarize the material to create electric dipoles. It is a fundamental experimental result, first discovered by Faraday, that the capacitance of a condenser is increased if the space between the conductors is filled with a dielectric material, in fact the most important property of dielectric is its ability to become polarized under the action of an external electric field.

When potential difference is applied to insulator no electric current flows, even then their behavior in fields is very important because the presence of the field may change behavior of an insulator. The insulators whose behavior gets modified in the electric field are called dielectrics[

An external field influences the atoms and molecules of dielectrics and hence the positive particles are pushed in the direction of the field while the negative particles in the opposite direction from their equilibrium position. Hence dipoles are developed and they produce a field of their own. The process of producing electric dipoles out of neutral atoms and molecules is referred to as polarization.

Dielectric constant (permittivity) is a measure of the ability of material to get polarized in the presence of an applied electric field, in other words dielectric voltage. Materials with high **dielectric constants** are useful in the manufacture of high-value capacitors.

PROCEDURE:

1. Connect all circuit components as shown in circuit diagram using $C_{std.}$ capacitor with A and C points. (C_{AC} = 500 pF is used).
2. Turn on dual power supply with +15 V and -15V.
3. Turn on AFG. In this unit choose sine function. Set frequency = 6.2 KHz, set input voltage ,V_{rms} = 1V (V_p = 1.425 V or V_{pp} = 2.85 V).

Note: The frequency and voltage settings in this experiment are very critical. Hence it should not be varied once it is set.

Calibration of micrometer: Given micrometer (0-500μA) has θ_{max} = 50 divisions, for full scale deflection. Now in between 500 pF capacitor is used. Adjust the 5 KΩ multiturn pot by carefully turning the knob, till microammeter shows exactly full scale deflection. In this condition θ_{max} =50 divisions corresponds to 1000 pF capacitance. Hençe we can calculate value of capacitance per division on microammeter scale.

Value of capacitance in pF per division = 500/50 =10 pF

Measurement of unknown capacitance C_x in air medium

Now introduce C_{std} = C_{AC} = 500 pF by connecting to points A and C of C_{std} unit to P and Q. Record θ_1 in microammeter. Similarly, introduce C_{AD} =333 pF, C_{AE} = 250 pF, C_{AF} = 200 pF and C_{AG} = 166 pF between P and Q points and record the value of θ_1 in each case. By doing this you can check the linearity of calibration. Now turn off AFG.

Now connect unknown C_x (in air medium) between A and D points. This brings C_x in parallel with C_{AD} . Now connect A and D points to P and Q. Turn ON AFG with same settings. Record θ_2. Calculate the value of total capacitance and hence find C_x. Similarly bring C_x in parallel with C_{AE} , C_{AF} and C_{AG} and in each case connect, combination between P and Q and record corresponding θ_2. Turn OFF AFG. Convert θ_1 and θ_2 into capacitance values in pF. In each case find the value of C_x and average C_x value in pF.

Measurement of unknown capacitance C_x' in dielectric medium

Keep the unknown capacitor in dielectric medium. This capacitance is

DETERMINATION OF DIELECTRIC CONSTANT OF A LIQUID

θ_3 in each case. Now turn off AFG and dual power supply. Convert each θ_3 into capacitance values in pF. Calculate C_x' values in each case and hence calculate average value of C_x' and calculate the dielectric constant K of the given liquid

TABULATION:

Sl no	When P and Q are connected to	Calibration of standard capacitors without connecting any capacitor in parallel		Measurement of C_x in air medium with C_x parallel to C_{std}		Measurement of C_x' in liquid medium with C_x' parallel to C_{std}	
		Deflection θ_1	Value of C_{std} $C_{std} = \theta_1 \times 10$ (pF)	Deflection θ_2	Value of C_x $C_x = (\theta_2 - \theta_1) \times 10$ (pF)	Deflection θ_3	Value of C_x' $C_x' = (\theta_3 - \theta_1) \times 10$ (pF)
1	A – C			---------	----------------	---------	----------------
2	A – D						
3	A – E						
4	A – F						
5	A - G						
				Average C_x = ________ pF		Average C_x' = ________ pF	

Calculation: Dielectric constant = $K = \dfrac{\text{Average value of } C_x'}{\text{Average value of } C_x}$

RESULT: Dielectric constant of given liquid = K = ...

B.Sc. II SEMESTER

MEASUREMENT OF EMF OF A THERMOEMF AND VERIFICATION OF LAW OF THERMOELECTRICITY

AIM: To determine the thermo EMF of a thermocouple and show the variation of any one law of thermoelectric effect.

APPARATUS: Thermocouple, potentiometer, B.G, Regulated power supply, plug key, tap key, jockey, Resistance boxes, connecting wires.

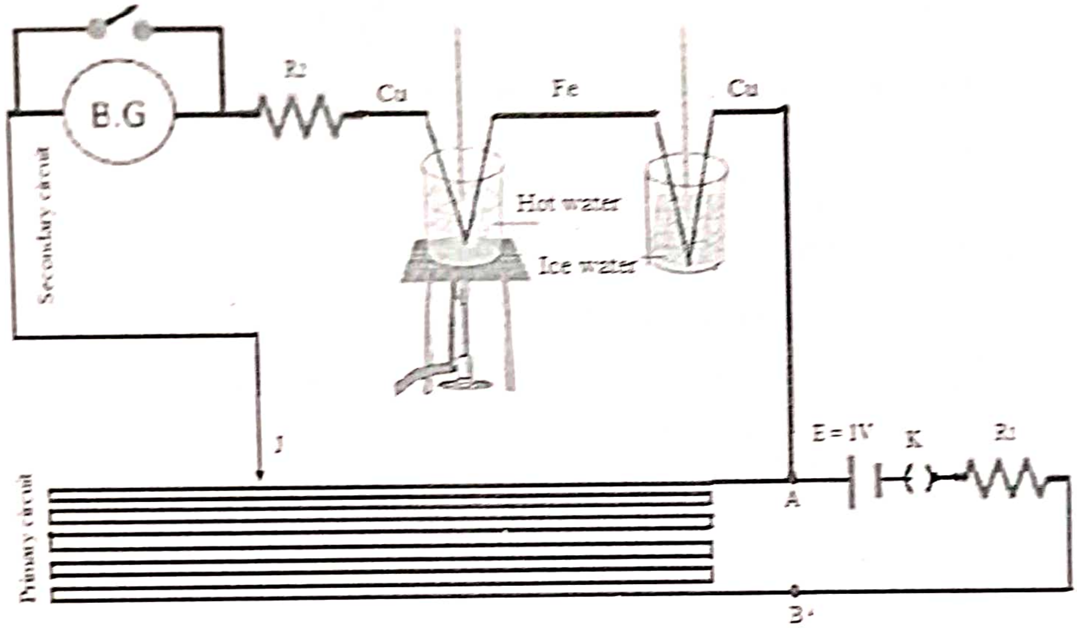
FORMULA: $e_{31} = e_{32} + e_{21}$

Where $e_{31} = e_3 - e_1$

$e_{32} = e_3 - e_2$

$e_{21} = e_2 - e_1$

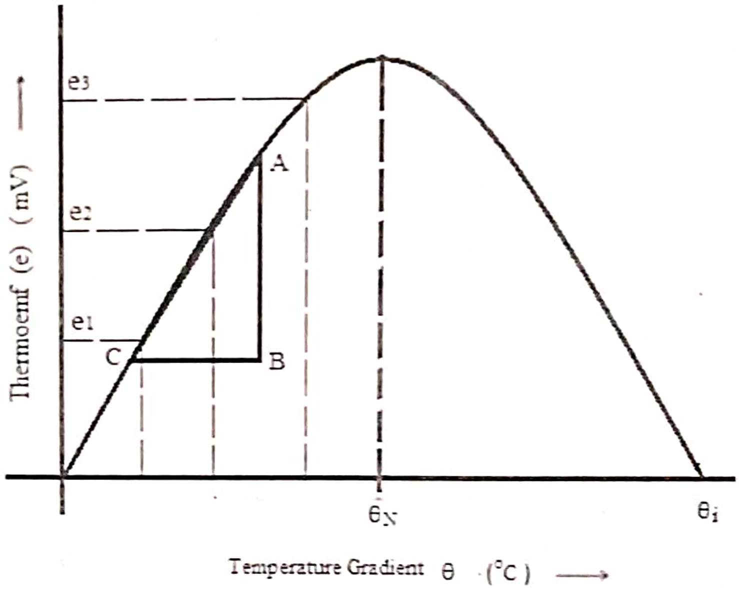
CIRCUIT DIAGRAM:



E = Regulated power supply; K= plug key; R_1= 2 KΩ; R_2= 100 KΩ ; A to B= 10m wire of potentiometer; J= jockey; B.G= Ballistic Galvanometer

NOTE: DO NOT TOUCH JOCKEY AT POINT 'B' OF POTENTIOMETER.

NATURE OF GRAPH:



Note: With the existing laboratory facility it is difficult to reach neutral temperature θ_N, (θ_N for Cu-Fe Thermocouple is 270°C) and inversion temperature is $2\theta_N$. Therefore only initial part of the nature of graph is observed

OBSERVATIONS: Battery voltage = 1volt

Resistance R_1= 2 KΩ

Resistance R_2= 100 KΩ (optimize)

Voltage across AB in primary circuit =____________

CALIBRATION OF POTENTIOMETER WIRE:

$$\text{Calibration constant} = K = \frac{\text{voltage across AB in primary circuit}}{\text{Total length of the wire in mm}}$$

K = __________ μv/ mm.

TABULAR COLUMN:

Temperature of hot junction t_2 (^0C)	Temperature of cold junction t_1 (^0C)	Temperature gradient $\theta = t_2 - t_1$ (^0C)	Balancing length L (mm)	EMF of Thermocouple $e = L.K$ (μV)
85				
80				
75				
70				
.				
.				
.				
50				

CALCULATIONS:

1. Seebeck Coefficient = $slope = \frac{AB}{BC}$ = _______ $\mu V/^0C$
2. Law of intermediate temperature using graph

RESULT:

The law of intermediate temperature is verified and the Seebeck Coefficient obtained is = ____________ $\mu V/^0C$

LCR SERIES RESONANCE CIRCUITS

AIM: Set up LCR series circuit, study its resonance and determine the resonant frequency of the circuit. Determine the quality factor 'Q' for two different values of resistance.

APPARATUS: Inductance box, Capacitance box, resistance box, AC milliammeter, signal generator, plug key.

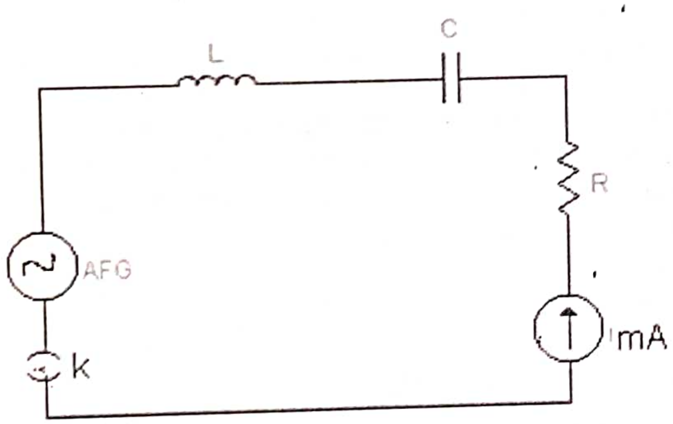
FORMULA:

1. Resonant frequency $f_r = \dfrac{1}{2\pi\sqrt{LC}}$
2. Band width(from graph) = $f_H - f_L$

3. Quality factor $Q = \dfrac{f_r}{f_H - f_L}$

Where f_r = resonance frequency.
f_H = higher cut off frequency
f_L = Lower cutoff frequency

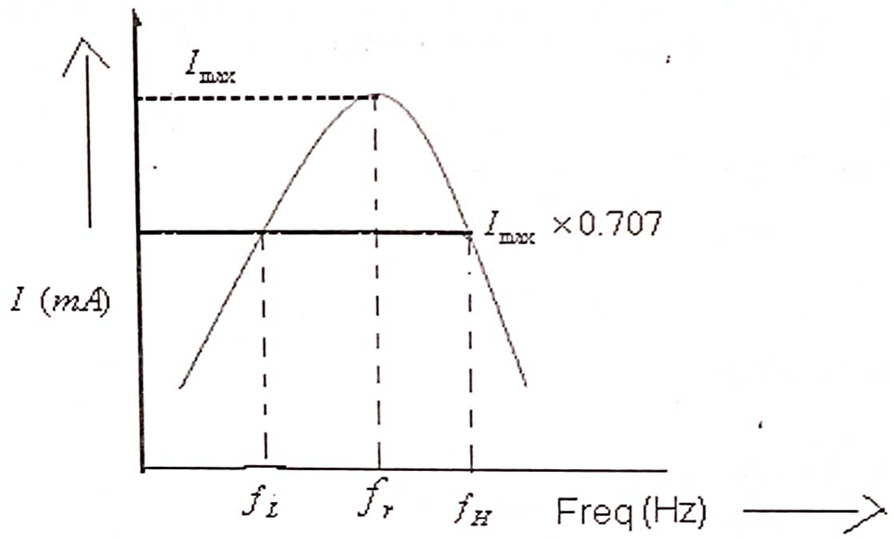
DIAGRAM:



AFG: Audio Frequency Generator L: Inductance box C: Capacitance box R: Resistance box mA: Digital multimeter K: Plug key

LCR SERIES RESONANCE CIRCUITS

NATURE OF GRAPH:



PRINCIPLE:

Electrical resonance is said to take place in a series LCR circuit, when the circuit allows maximum current for a given frequency of the source of alternating voltage supply, for which capacitive reactance becomes equal to the inductive reactance.

OBSERVATIONS:

1. Value of inductance L = 100 mH
2. Value of capacitor C = __________μF
3. Value of resistance R = 100 Ω

LCR SERIES RESONANCE CIRCUITS

TABULATION

Input Voltage V_{in} = ________ V constant

Sl.No.	Frequency (Hz)	I (mA)

CALCULATION:

Resonant frequency $f_r = \frac{1}{2\pi\sqrt{LC}}$ =----------Hz

Quality factor Q=(1/R)(L/C)$^{(1/2)}$

Band width $\Delta f = f_r/Q$=----------Hz

Higher cut off frequency $f_H = f_r + \Delta f/2$ =----------Hz

Lower cut off frequency $f_L = f_H - \Delta f$=----------Hz

RESULT:

	Resonant Frequency	Quality Factor	Higher Cut off Frequency	Lower Cut off Frequency	Band width
Theorotical value					
Experimental Value					

B.Sc. II Semester

LCR PARALLEL RESONANCE CIRCUITS

AIM: Set up LCR parallel circuit, study its resonance and determine the resonant frequency of the circuit. Determine the quality factor 'Q' for two different values of resistance.

APPARATUS: Inductance box, Capacitance box, resistance box, AC milliammeter, signal generator, plug key.

FORMULA:

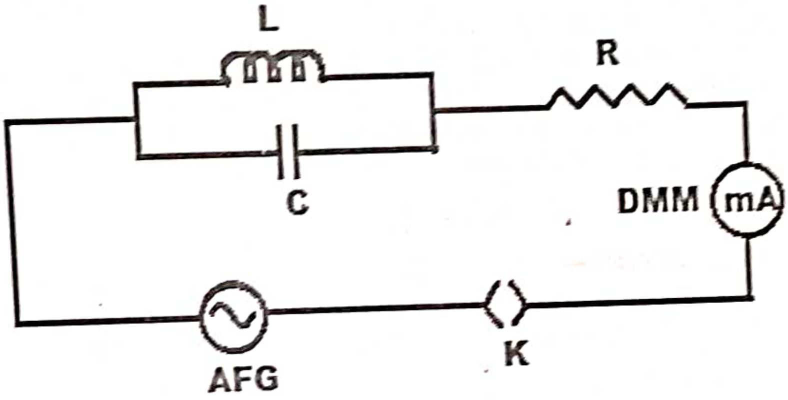
1. Resonant frequency $f_r = \frac{1}{2\pi\sqrt{LC}}$

2. Quality factor $Q = \frac{f_r}{f_H - f_L}$

Where f_r = resonance frequency.
f_H = higher cut off frequency
f_L = Lower cutoff frequency

3. Band width = $f_H - f_L$

DIAGRAM:



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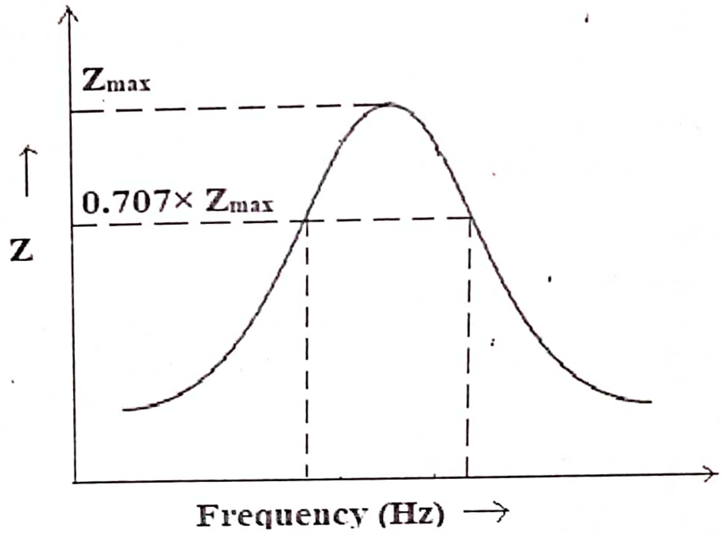
LCR PARALLEL RESONANCE CIRCUITS



Note: Make use of loglog graph

PRINCIPLE:

In the parallel LCR circuit, current throqugh each branch is determined by the reactance of that particular branch. With an increase in the applied freqency, current through inductor decreases and that the current through capacitor increases. At a particular frequency, the current in the inductive branch of a parallel circuit will be equal to that in the capacitive branch, but oppositely directed. LCR parallel circuit is said to be in resonance, when the current is minimum and is in phase with the applied voltage

OBSERVATIONS:

1. Chosen resonant frequency = ____________Hz
2. Value of inductance L = 100 mH
3. Value of capacitor C= ___________µF
4. Value of Resistor R = 100 Ω

LCR PARALLEL RESONANCE CIRCUITS

TABULATION

Constant Input voltage V_{in} = ______ V

R = 100 Ω		
Frequency (Hz)	**I (mA)**	**Impedance $Z = V_{in}/I$ (in Ω)**

CALCULATION:

Resonant frequency $f_r = \frac{1}{2\pi\sqrt{LC}}$ =----------Hz

Quality factor $Q=(1/R)(L/C)^{(1/2)}=R/(2\pi L)$

Band width $\Delta f = f_r/Q$=----------Hz

Higher cut off frequency $f_H = f_r + \Delta f/2$ =----------Hz

Lower cut off frequency $f_L = f_H - \Delta f$=----------Hz

RESULT:

	Resonant Frequency	Quality Factor	Higher Cut off Frequency	Lower Cut off Frequency	Band width
Theoretical value					
Experimental Value					

B.Sc. II Semester

MEASUREMENT OF CAPACITY BY ABSOLUTE METHOD USING BALLISTIC GALVANOMETER (B.G.)

AIM: To determine the capacity of the given capacitor by absolute method using B.G.

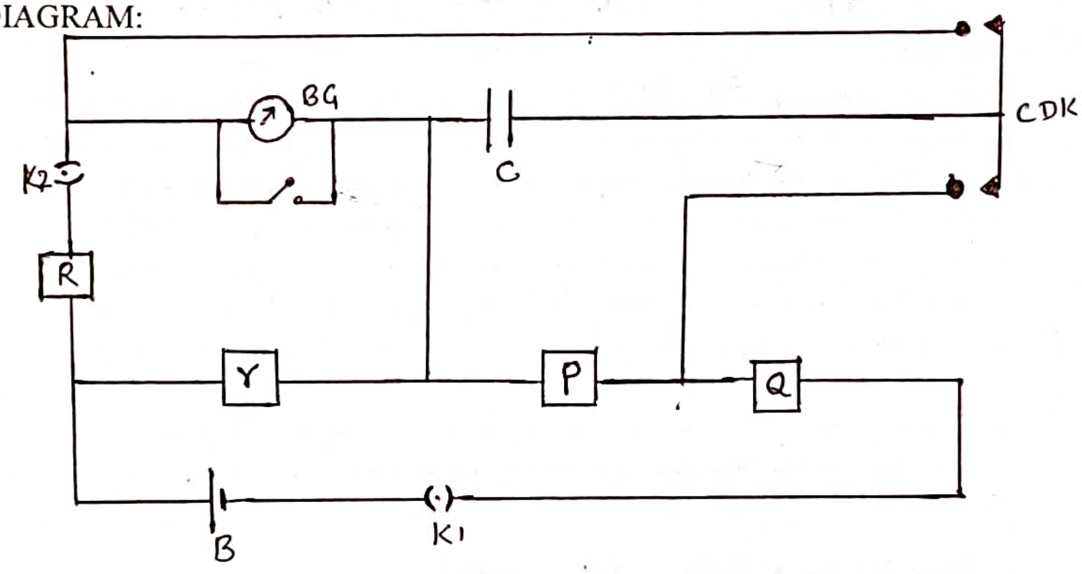
APPARATUS: Ballistic galvanometer, power supply, capacitor, charging and discharging key, tap key, plug key, lamp and scale arrangement, connecting wires.

FORMULA:
Capacity of the given condenser

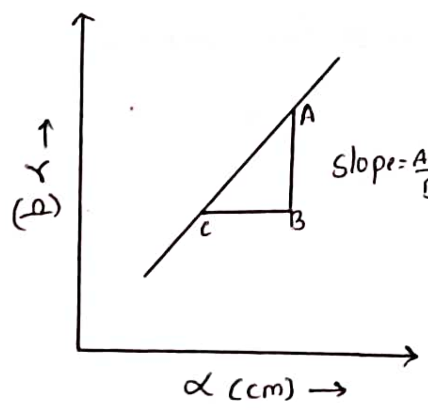
$$C = \frac{T}{2\pi} \frac{1}{(R+G)} \left(\frac{r}{\alpha}\right)_{mean} \left(\frac{\theta}{P}\right)_{mean}$$

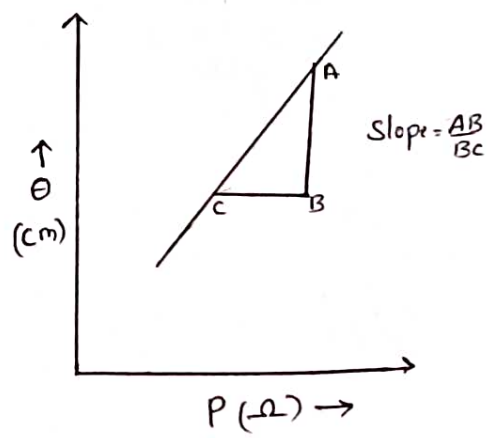
T: time period of B.G
R, r, and P: Resistance
G: Resistance of the B.G
α: steady deflection in the B.G
θ: deflection in the B.G for given resistance

CIRCUIT DIAGRAM:



NATURE OF GRAPH:





B.Sc. II Semester

MEASUREMENT OF CAPACITY BY ABSOLUTE METHOD USING BALLISTIC GALVANOMETER (B.G.)

OBSERVATIONS:

1. E.M.F. of the cell (E) = --------------(V)
2. High Resistance = R = ------------(Ω)
3. Resistance of the B.G.= G = ------------(Ω)
4. Resistance P+Q = ----------(Ω)

TABULATION:

Sl. No	Resistance P (Ω)	Throws (cm)		$\theta = \theta_1\left(\frac{\theta_1}{\theta_3}\right)^{\frac{1}{4}}$ (cm)	Steady Deflection Readings			$\frac{\vartheta}{P}$ (cm/Ω)
					Resistance r (Ω)	Steady deflection α (cm)	$\frac{r}{\alpha}$ (Ω /cm)	
		θ_1	θ_3					
						Mean		

Time Period of Ballistic Galvanometer:

Time for 20 oscillations: t (s)	i:	ii:	iii:	Mean:
Time period T=t/20 (s)				

B.Sc. II Semester

MEASUREMENT OF CAPACITY BY ABSOLUTE METHOD USING BALLISTIC GALVANOMETER (B.G.)

CALCULATIONS:

From the graph of **r vs.** α and θ **vs.** P
Slope1= m= ------------Ω/cm
Slope2= m= ------------ cm /Ω

Capacity of the given condenser by graph:

$$C = \frac{T}{2\pi}\frac{1}{(R+G)} \times slope1 \times slope2$$

From calculation, Capacity of the given condenser is given as

$$C = \frac{T}{2\pi}\frac{1}{(R+G)}\left(\frac{r}{\alpha}\right)_{mean}\left(\frac{\theta}{P}\right)_{mean}$$

RESULT:

1. The value of the capacitance of the given capacitor determined by absolute method is C= ----------- μF (from graph)
2. The value of the capacitance of the given capacitor determined by absolute method is C= ----------- μF (from calculations)

HELMHOLTZ GALVANOMETER

AIM: To calibrate the given ammeter using Helmholtz galvanometer

APPARATUS: Helmholtz galvanometer, power supply, rheostat, commutator, plug key, connecting wires.

FORMULA:

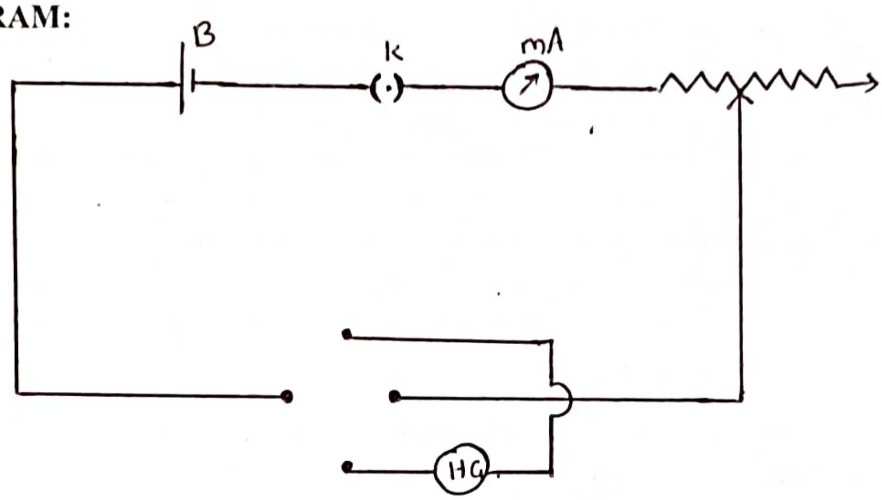
Current produced in Helmholtz galvanometer due to magnetic field $I = K \tan \theta$

Reduction factor K

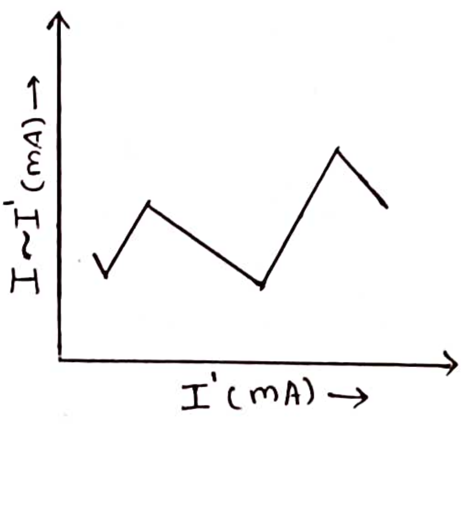
$$K = \frac{5\sqrt{5}\, r\, B_H}{8\mu_0 n}$$

μ_0: Permittivity of free space = $4\pi \times 10^{-7}$ Hm^{-1}
n: number of turns of the coil through which current is passed
r: Radius of the coil in meters
B_H: Horizontal component of earth's magnetic field = 3.5×10^{-5} T
θ: Mean deflection in the compass

CIRCUIT DIAGRAM:



NATURE OF GRAPH:



B.Sc. II Semester

HELMHOLTZ GALVANOMETER

OBSERVATIONS:

1. Number of turns in the coil through which current is passed =------
2. Circumference of the coil $=2\pi r$ =-----------------(m)
3. Radius of the coil = r =-----------------(m)

TABULATION

Sl. No.	Ammeter reading I'	Deflection					tan θ	I=K tan θ	I~I'
		Direct		Reverse		Mean			
		θ_1	θ_2	θ_3	θ_4	θ			

Result:

DETERMINATION OF MAGNETIC FIELD ALONG THE AXIS OF THE COIL

AIM: To determine the magnetic field along the axis of the coil and hence determine the horizontal component of earth's magnetic field.

APPARATUS: Stewart and Gee's galvanometer, power supply, rheostat, commutator, plug key, connecting wires.

FORMULA:

Magnetic field along the axis of coil is

$$B = \frac{\mu_0}{4\pi} \frac{2\pi n r^2 I}{(r^2 + x^2)^{\frac{3}{2}}}$$

μ_0: Permittivity of free space

$\frac{\mu_0}{4\pi} = 10^{-7}\,Hm^{-1}$

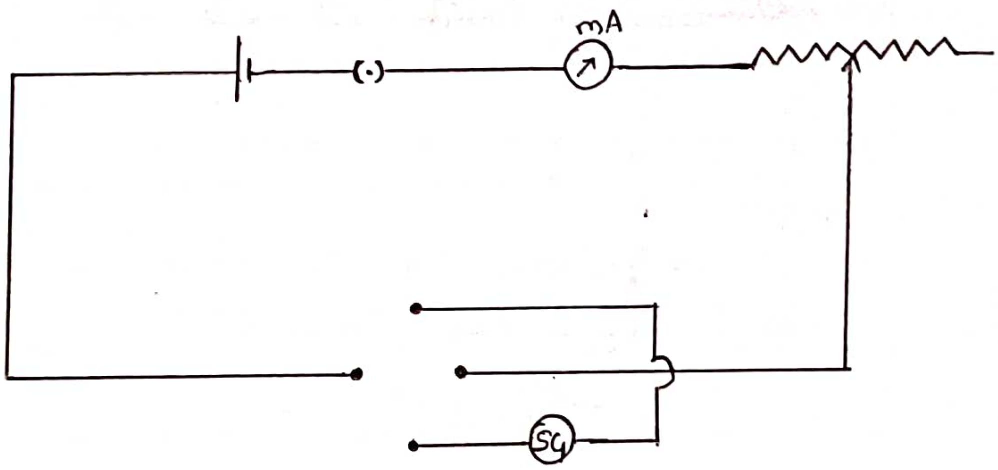
n: number of turns of the coil through which current is passed

r: Radius of the coil (m)

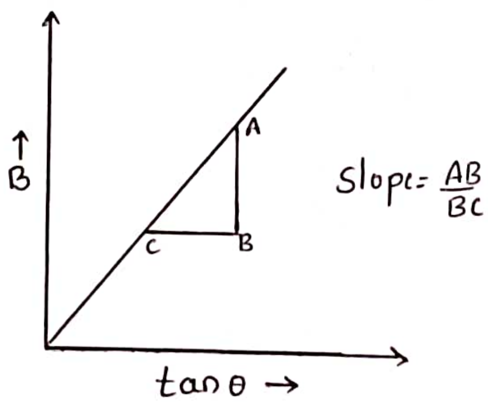
x: Distance of the compass from the axis of the coil (m)

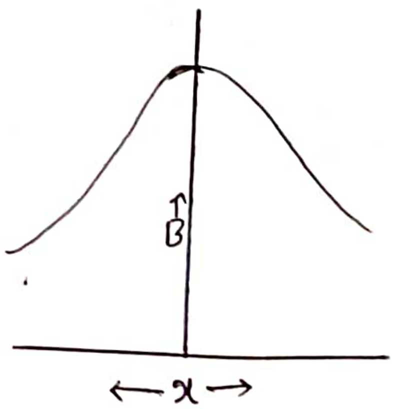
I: Current through the coil (A)

CIRCUIT DIAGRAM:



NATURE OF GRAPH:





B.Sc. II Semester

DETERMINATION OF MAGNETIC FIELD ALONG THE AXIS OF THE COIL

OBSERVATIONS:

1. Number of turns in the coil trough which current is passed =----------
2. Circumference of the coil =$2\pi r$ =-----------------(m)
3. Radius of the coil = r =-----------------(m)
4. Current passed through the coil (I) =---------------(mA)

TABULATION

Sl. No.	Side	Distance of the compass from the center of the coil x (10^{-2} m)	Deflection					tan θ	Magnetic field B (T)
			Direct		Reverse		Mean		
	Left	0	θ_1	θ_2	θ_3	θ_4	θ		
		2							
		4							
		6							
		8							
	Right	0							
		2							
		4							
		6							
		8							

DETERMINATION OF HIGH RESISTANCE BY LEAKAGE METHOD

AIM: To determine the high resistance by leakage method using B.G.

APPARATUS: Ballistic galvanometer, power supply, resistor having high value of resistance, charging and discharging key, tap key, plug key, lamp and scale arrangement, capacitor, connecting wires.

FORMULA:

High resistance of the resistor R is

$$R = \frac{t}{2.303 \times C \times log\left(\frac{\theta_1}{\theta_2}\right)}.$$

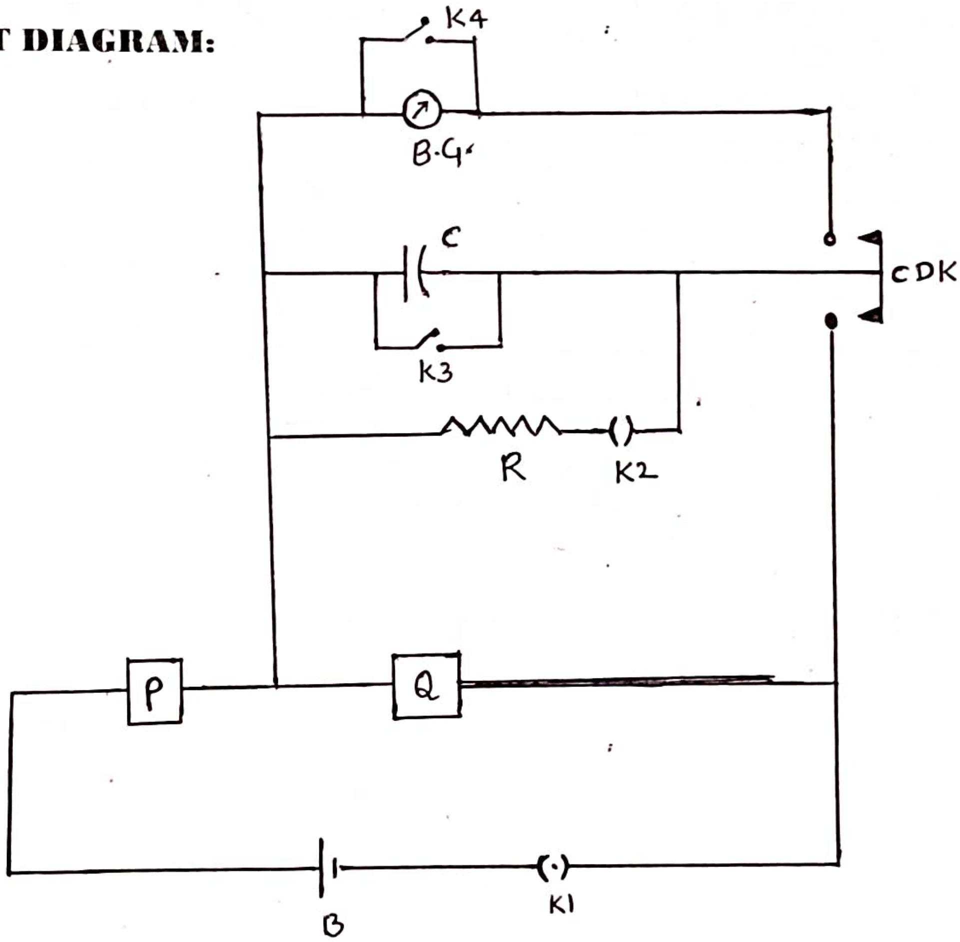
t: leakage time

C: Capacitance of the capacitor

θ_1: Corrected throw when capacitor is immediately discharged

θ_2: Corrected throw when capacitor is discharged after leakage through high resistance for time t

CIRCUIT DIAGRAM:



B.Sc. II Semester

DETERMINATION OF HIGH RESISTANCE BY LEAKAGE METHOD

OBSERVATIONS:

1. E.M.F. of the cell (E) = 6 V
2. Resistance = P= 39500 Ω
3. Resistance = Q= 500 Ω
4. Capacitance of capacitor= C= ---------μF

TABULATION

Sl. No.	Throw obtained by discharging the fully charged capacitor through B.G. immediately after charging (cm)			Time t	Throw obtained by discharging the fully charged capacitor through B.G. immediately after charging (cm)			High Resistance R (Ω)
	θ'_1	θ'_3	$\theta_1 = \theta'_1\left(\frac{\theta'_1}{\theta'_3}\right)^{\frac{1}{4}}$		θ''_1	θ''_3	$\theta_2 = \theta''_1\left(\frac{\theta''_1}{\theta''_3}\right)^{\frac{1}{4}}$	
								Mean R= Ω

RESULT:

High resistance of the resistor R is ------------ Ω

B.Sc. II Semester

MEASUREMENT OF CAPACITY BY METHOD OF MIXTURE

AIM: To determine the capacitance of the unknown capacitor by measuring the ratio of resistance using B.G.

APPARATUS: Ballistic galvanometer, power supply, resistance box, tap key, plug key, lamp and scale arrangement, capacitors, connecting wires.

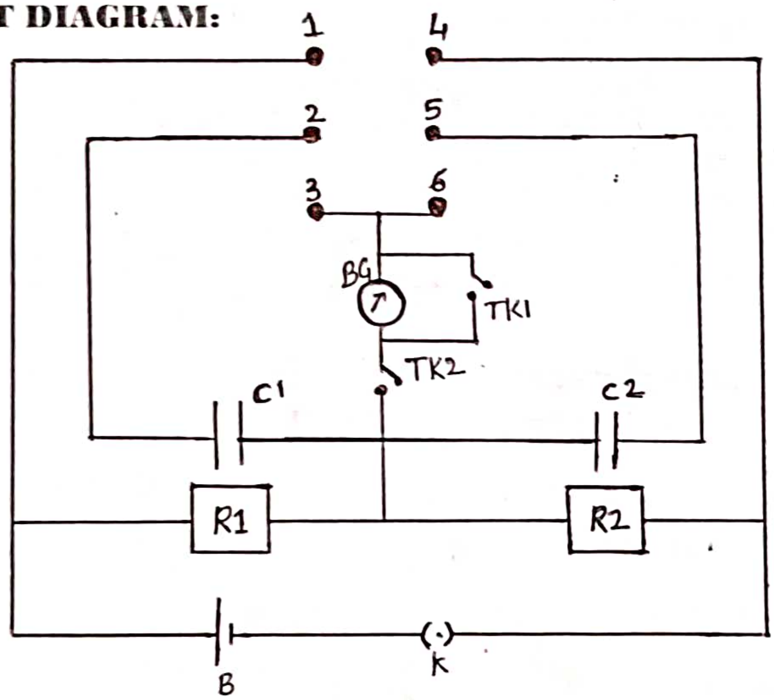
FORMULA:

$$R_1C_1 = R_2C_2$$

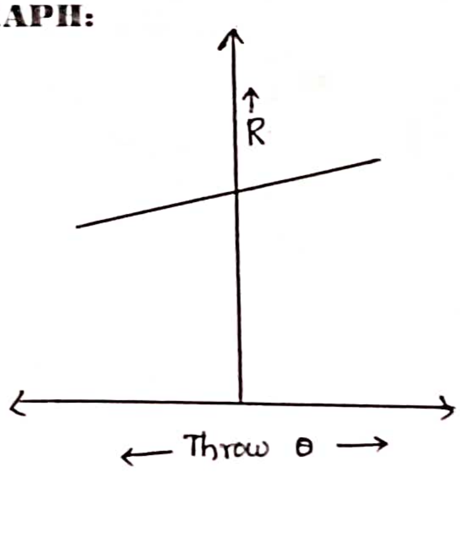
$$C_1 = (R_2C_2)/ R_1$$

C_1: Unknown capacitance of the capacitor
C_2: Known capacitance of the capacitor
R_1 and R_2: Resistance of the resistor

CIRCUIT DIAGRAM:



NATURE OF GRAPH:



B.Sc. II Semester

MEASUREMENT OF CAPACITY BY METHOD OF MIXTURE

OBSERVATIONS:

1. E.M.F. of the cell (E) = 6 V
2. Resistance = R_1=-------- Ω
3. Resistance = R_2=-------- Ω
4. Capacitance of known capacitor= C= ---------μF

TABULATION:

Sl. No.	Constant Resistance (Ω)	Variable Resistance (Ω)	Throw θ (cm)

CALCULATIONS:

From graph, R_2 = --------- Ω

$$\frac{R_1}{R_2} = \frac{C_1}{C_2}$$

Capacitance of unknown capacitor = $C_1 = \frac{R_1}{R_2} \times C_2$

RESULT:

1. Capacitance of unknown capacitor = C_1 = --------- F

Self Inductance of coil by Anderson Bridge

Aim : To determine self inductance of a Inductor coil using Anderson's Bridge

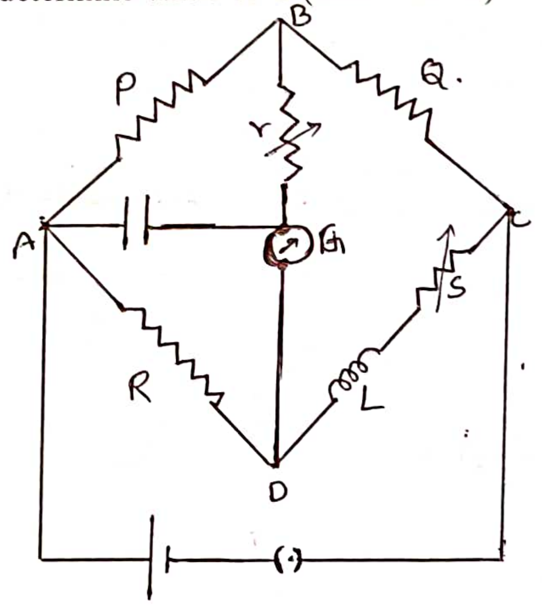
Apparatus: Capacitor, Resistance box, Inductance box, Galvanometer, DC source, AC source, Head Phone

Formula:

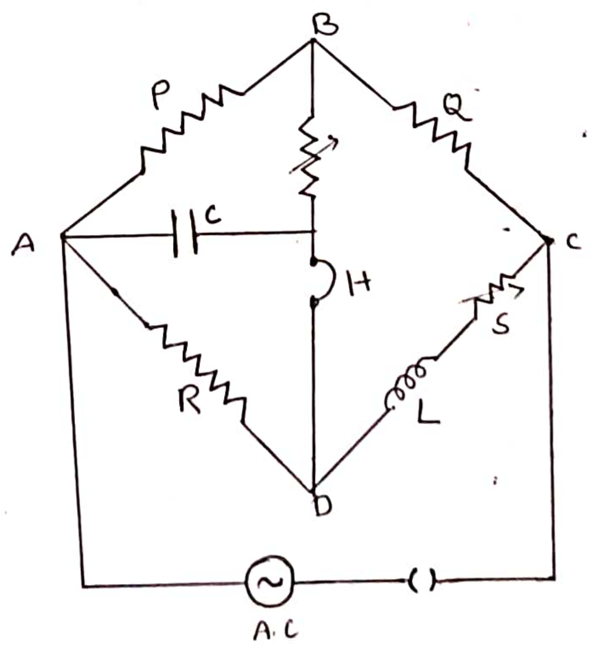
$$L=CR(P+2r)$$

where C: capacitance of capacitor, R and P resistance and r resistance for minimum sound

Circuit Diagram to determine value of S (D.C. Circuit)



Circuit Diagram to determine value of r (A.C. Circuit)



Self Inductance of coil by Anderson Bridge

Observations:

Value of resistor P =Q= Ω

Value of resistance R= Ω

Value of S (when DC source is used) when galvanometer shows zero deflection

i. Ω ii. Ω iii. Ω mean S= Ω

To determine value of r

Capacitor C (μF)	Value of r when sound in head phone is minimum (Ω)	Self Inductance L (mH)

Mean L = mH

Result: Self Inductance of a given Coil is mH

B.Sc. II semester

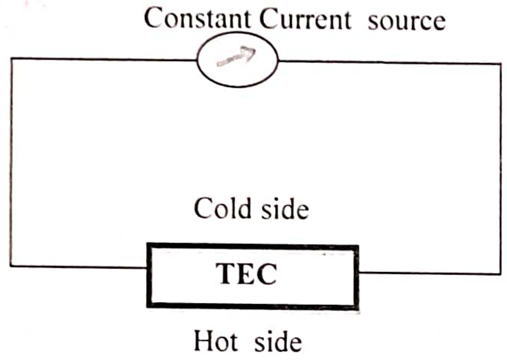
STUDY OF PELTIER EFFECT USING THERMOELECTRIC COOLER

AIM: Set up thermoelectric cooler (TEC) to study the peltier effect.

APPARATUS: TEC, power supply, milli voltmeter, milliammeter.

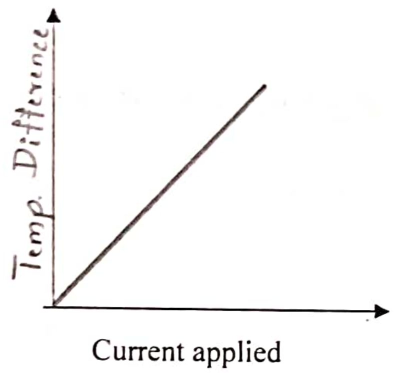
CIRCUTE DIAGRAM:

To study Peltier effect



NATURE OF GRAPH:

To study Peltier effect



STUDY OF PELTIER EFFECT USING THERMOELECTRIC COOLER

OBSERVATIONS:

1. Room temperature T :

TABULATION

To study Peltier effect

Sl.No.	Current passed through TEC I (A)	Temperature of hot junction T1	Temperature of cold junction T2	Difference in temperature $\Delta T = T1-T2$ (^{o}C)

RESULT:

B.Sc. II semester

STUDY OF SEEBECK EFFECT AND PELTIER EFFECT USING THERMOELECTRIC COOLER

AIM: Set up thermoelectric cooler (TEC) to study the peltier effect and seebeck effect and hence find the seebeck coefficient.

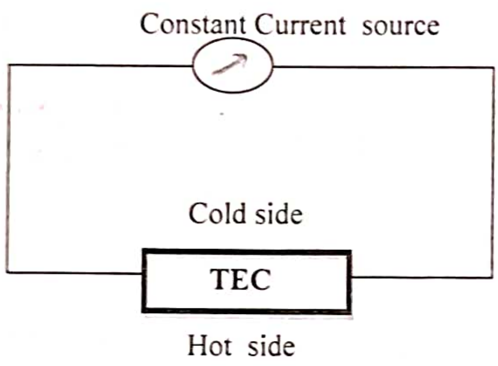
APPARATUS: TEC, power supply, milli voltmeter, milliammeter.

FORMULA:

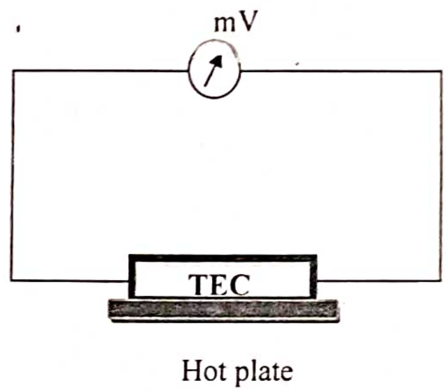
Seebeck coefficient $\sigma = - \Delta V/\Delta T$

CIRCUTE DIAGRAM:

To study Peltier effect

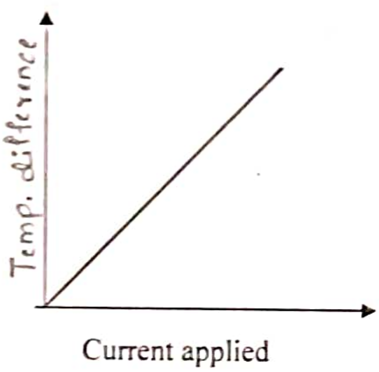


To study the Seebeck effect

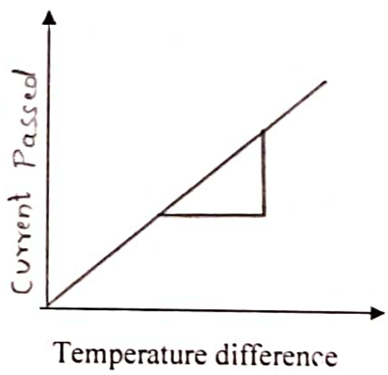


NATURE OF GRAPH:

To study Peltier effect



To study the Seebeck effect



STUDY OF SEEBECK EFFECT AND PELTIER EFFECT USING THERMOELECTRIC COOLER

OBSERVATIONS:

1. Room temperature T :

TABULATION

To study the Seebeck effect:

Temperature of cold junction:

Sl.No.	Temperature of hot junction	Difference in temperature ΔT (^oC)	Voltage across the junction ΔV

To study Peltier effect

Sl.No.	Current passed through TEC I (A)	Temperature of hot junction T1	Temperature of cold junction T2	Difference in temperature $\Delta T = T1-T2$ (^oC)

RESULT:

Seebeck coefficient = ----------V/^{0}K

STUDY OF SEEBECK EFFECT AND PELTIER EFFECT USING THERMOELECTRIC COOLER

OBSERVATIONS:

1. Room temperature T :

TABULATION

To study the Seebeck effect:

Temperature of cold junction:

Sl.No.	Temperature of hot junction	Difference in temperature ΔT (°C)	Voltage across the junction ΔV

To study Peltier effect

Sl.No.	Current passed through TEC I (A)	Temperature of hot junction T1	Temperature of cold junction T2	Difference in temperature ΔT = T1-T2 (°C)

RESULT:

Seebeck coefficient = ----------V/°K