Department of Computer Science and Engineering

Details of Lesson Plan

S.No.	Particulars	Details
1.	Course Name	Engineering Physics Lab
2.	Course Code	BSC-212
3.	Academic Year	2024-25
4.	Semester	1st
5.	Number of Lesson plans	13
6.	Faculty Assigned	Dr. Surinder Singh

Surinder

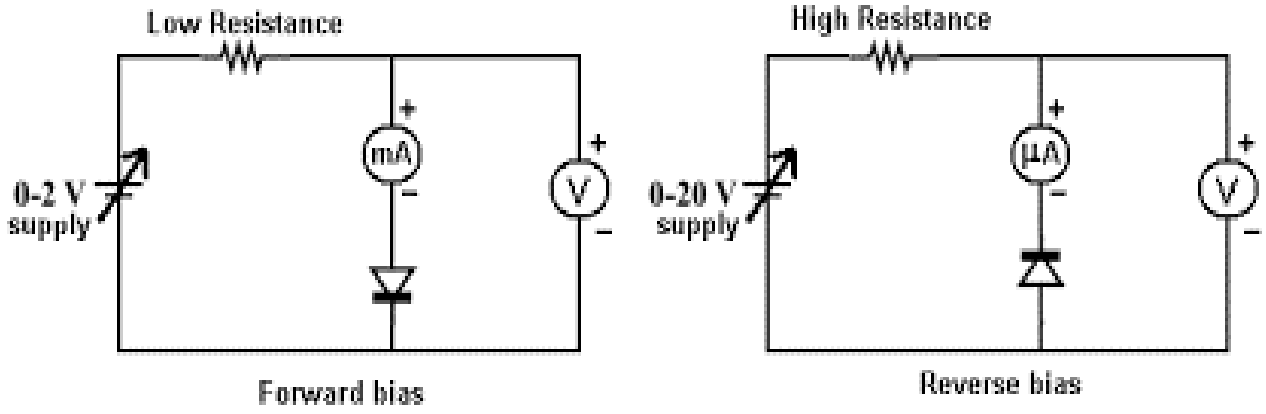
Faculty Signature

Experiment No 1 **Date**

Aim:- To verify and plot the V-I characteristics of a PN junction diode.

Apparatus:- Voltmeter of range(0-2V and 0-20 V), ammeter of range,(0-20mA and 0-20μA) Variable DC power supply(0-10V), connecting wires, PN junction diode.

Circuit Diagram:-



Procedure:-

Forward biased characteristics

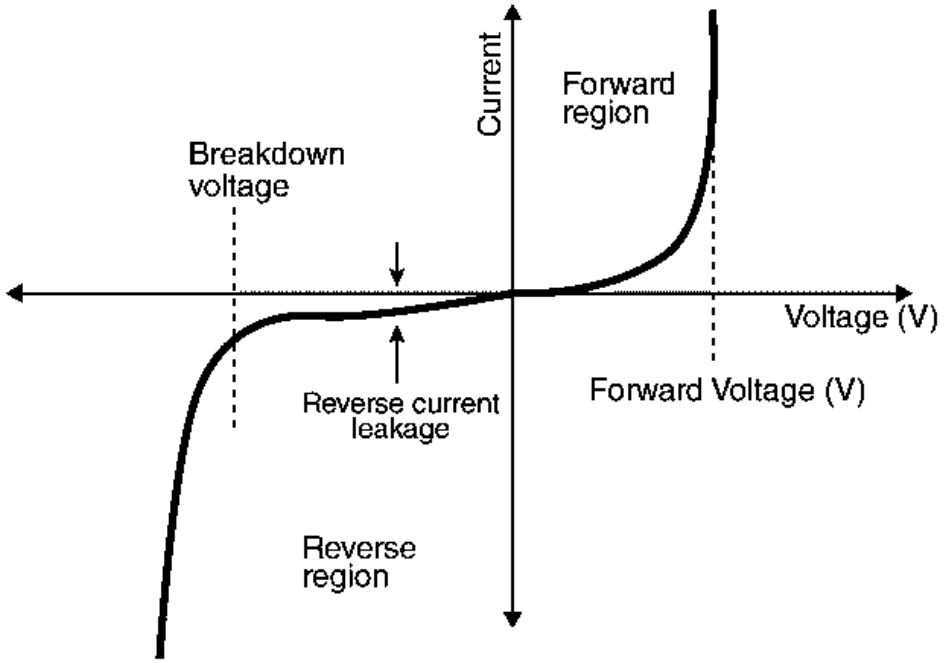
1. Make the connections as per the circuit diagram.
2. Vary the voltage in small steps and measure the forward voltage and note the corresponding current at each incremental step of the voltage.
3. Draw the graph between voltage and current.
4. Obtain the value of knee voltage from the graph.

Reverse Bias characteristics

1. Make the connections as per the circuit diagram.
2. Vary the voltage in small steps and measure the reverse voltage and note the current at each incremental step of the voltage.
3. Draw the graph between voltage and current.
4. Obtain the value of break down voltage from the graph.

Observation table

Forward Bias			Reverse Bias	
S. No.	Voltage in volts	Current in mA	Voltage in volts	Current in µA
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				



Graph for forward and reverse biased PN junction diode

Results:-

1. Diode offers good conducting path (low resistance) when forward biased.
2. Diode offers poor conducting path (high resistance) when reverse biased.

Precautions:-

1. Set the current limit switch properly.
2. Input voltage must be varied in steps.
3. All the connections should be tight.

Expected Viva questions

Que. 1 What is PN junction.

Que. 2 Which types of impurities are added in p and n type semiconductor.

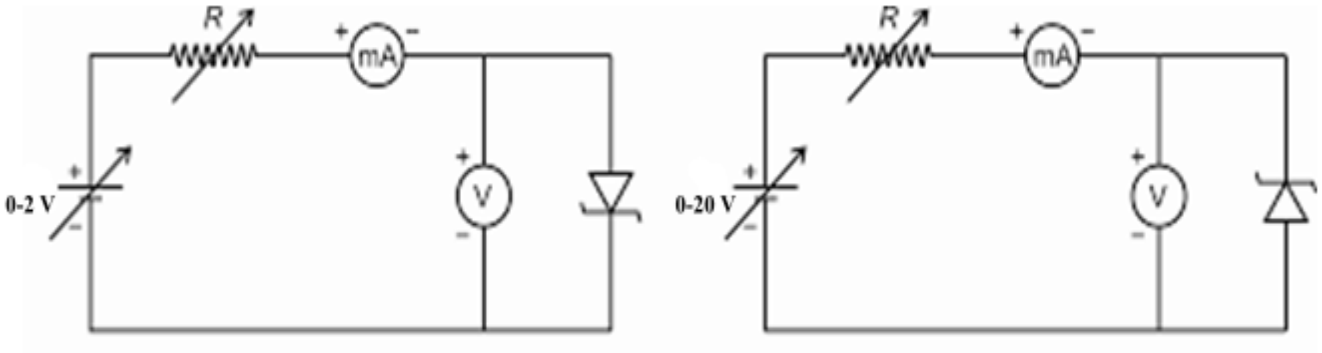
Que. 3 What are the majority charge carriers in p and n type semiconductors

Experiment No 2 **Date**

Aim:- To verify Zener diode characteristics

Apparatus:- Voltmeter of range(0-2V and 0-20V), ammeter of range,(0-20mA and 0-20μA) Variable DC power supply(0-10V), connecting wires, Zener diode.

Circuit Diagram:-



Forward Biased Zener diode **Reverse Biased Zener diode**

Procedure:-

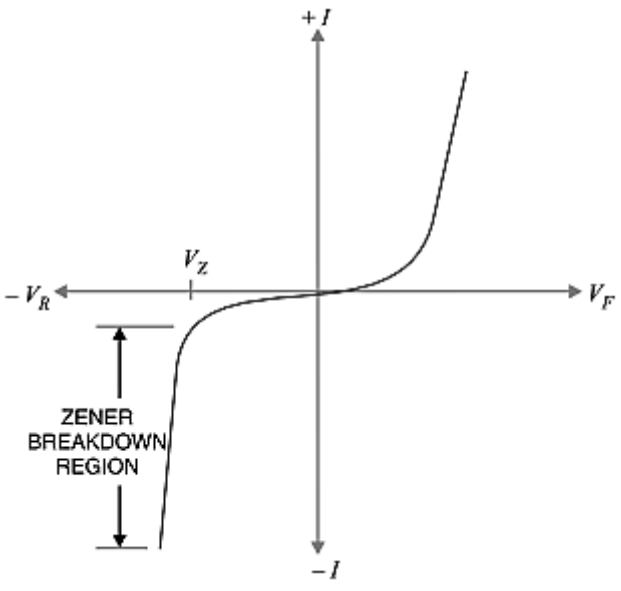
Forward biased characteristics

1. Make the connections as per the circuit diagram.
2. Vary the voltage in small steps and measure the forward voltage and note the corresponding current at each incremental step of the voltage.
3. Draw the graph between voltage and current.
4. Obtain the value of knee voltage from the graph.

Reverse Bias characteristics

1. Make the connections as per the circuit diagram.
2. Vary the voltage in small steps and measure the reverse voltage and note the current at each incremental step of the voltage.
3. Draw the graph between voltage and current.
4. Obtain the value of break down voltage from the graph.

Forward Bias			Reverse Bias	
S. No.	Voltage in volts	Current in mA	Voltage in volts	Current in µA
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				



Graph for forward and reverse biased Zener diode

Result:- Zener diode behaves as ordinary diode when forward biased but when connected in reverse bias it has sharp breakdown.

Precautions:-

1. Set the current limit switch properly.
2. Input voltage must be varied in steps.
3. All the connections should be tight.

Expected Viva questions

Que. 1 What is Zener diode?

Que. 2 Explain the formation of depletion region?

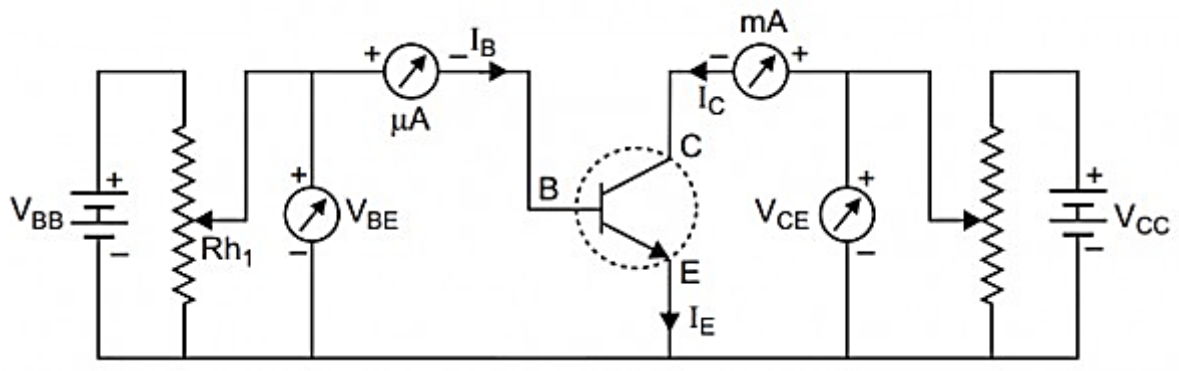
Que. 3 What are various applications of PN junction diode and Zener diode?

Experiment No. 3 **Date**

Aim:- To draw the input and output characteristics of a NPN (or PNP) transistor in common emitter configuration.

Apparatus:- A NPN transistor mounted on a board with three terminals marked emitter (E), base (B) and collector (C), D.C voltmeters of range (0-1V and 0-10V), ammeters of range(0-200μA and 0 – 10 mA) variable D.C power supply of range (0-10V) and connecting wires

Circuit diagram:-



Procedure

Input Characteristics:-

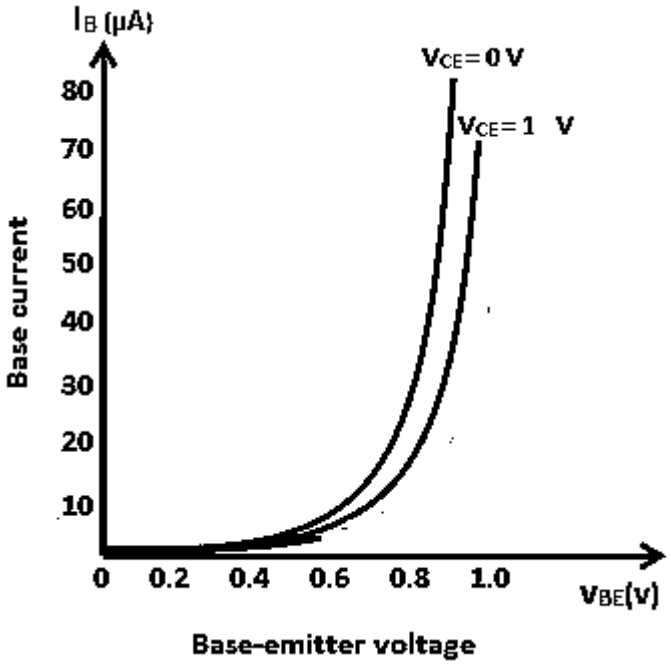
1. Draw the circuit diagram as shown in above figure.
2. To draw the input characteristics adjust the value of V_{ce} = 0 V, keeping the value of V_{be} = 0 V. Note the value of I_b .
3. Increase the value of V_{be} in very small steps and note the corresponding values of I_b .
4. Know adjust the value of V_{ce}=1 V and keeping the value of V_{be}= 0 V. Note the value of I_b. Again increase the value of V_{be} in very small steps and note the corresponding values of I_b keeping V_{ce} always at 1V.
5. Similarly repeat the experiment corresponding to another values of V_{ce}.
6. Taking V_{be} along x-axis and I_b along y-axis plot the various curves.

Output Characteristics

1. To draw the output characteristics adjust the value of I_b at some fixed value with the help of potentiometer Rh_1 . Keeping the value of V_{ce} constant note the value of I_c.
2. Increase the value of V_{ce} in small steps and note the corresponding values of I_c. Keeping I_b always constant.
3. Know increase the value of I_b .Again increase the value of V_{ce} in small steps and note the corresponding values of I_c keeping I_b constant.
4. Similarly repeat the experiment corresponding to another value of I_b.
5. Taking V_{ce} along x-axis and I_c along y-axis plot the various curves.

Observation table for input characteristics

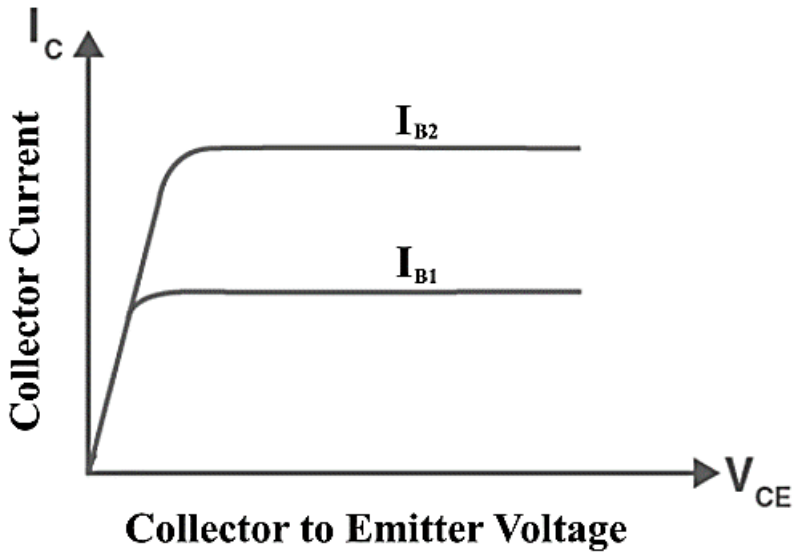
S. No.	Base Voltage (V_{be}) mV	I_b (µA)	
		V_{ce}= 0 V	V_{ce}= 1V
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



Graph for Input characteristics

Observation table for output characteristics

S. No.	Collector Voltage (V_{ce}) V	I_c (mA)	
		I_b = 40 µA	I_b = 80 µA
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



Graph for output characteristics

Results:-

1. A study of the input characteristics shows that the current rapidly increases as the value of V_{be} is increased from zero to positive value. The collector voltage V_{ce} has very little effect on the value of I_b.
2. A study of the output characteristics shows that the collector current I_c depends upon the base current. Starting from $V_{ce} = 0$, I_c rises first steeply and after a particular value of V_{ce} has been reached I_c increases at a very slow rate. After a certain V_{ce} again a sharp increase in I_c can be observed. This is due to the junction breakdown.

Precautions:-

1. Collector voltage must not exceed the breakdown voltage from the junction.
2. For a NPN transistor the emitter must be given a positive voltage with respect to base and collector a negative voltage with respect to base.
3. Correct value of biasing must be used.

Expected Viva questions

Que. 1 What is a transistor?

Que. 2 What are various configurations of a transistor? Which configuration is preferred over others and why?

Que. 3 What are various applications of transistor?

Experiment No. 4 **Date**

Aim:- To measure the frequency of A.C. mains using an electrical vibrator.

Apparatus:- Electrical vibrator, AC supply source, a frictionless pulley, pan, weight box, a long uniform thread, a meter scale.

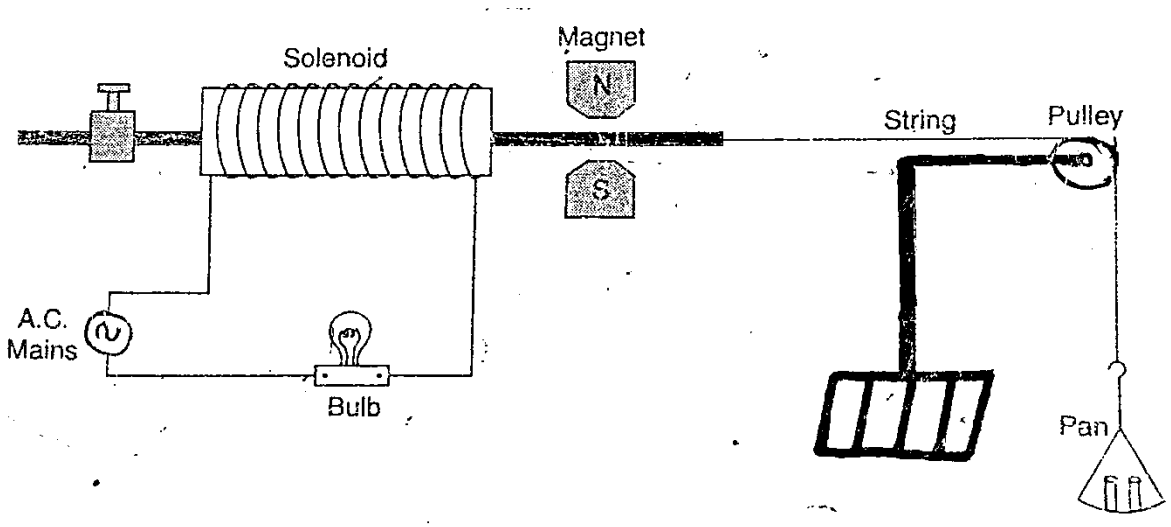
Formula used:-

$$n = \frac{1}{2l}\sqrt{\frac{T}{m}}$$

Where, n is the frequency of AC mains to calculate

l is the distance between two nodes, T is the tension in the string and m is the mass per unit length of string

Diagram



Procedure:-

1. After inserting 100W bulb in the circuit of the solenoid switch on the mains and adjust the length of rod so that it is in resonance with the frequency of AC mains and its free ends attain maximum amplitude.
2. Now switch off the current and tie a uniform thread to the rod. Pass the thread over a frictionless pulley placed on the table and to its free end tie a light weight pan. Put some weights on pan.
3. Switch on the current when the string will be found to vibrate in a number of loops which can be sharply defined by displacing the vibrator by adjusting the distance between the consecutive node and thus determine the length of the loop.

4. Repeat this process by varying weights in the pan and in each case note down the corresponding value of average length of one loop.
5. Weigh the pan and compute the total tension of the string. Also weigh the thread of given length and calculate its mass per unit length.

Mass of 100 cm of string = ……..gms

Mass per unit length of thread = ……..gm

Weight of empty pan (w) =……..gms

Observation table

S. No.	No. of loops	Distance between extreme nodes	Length of one loop (l)	Weight in pan (w')	Tension T=$(w+w')$g	$n=\frac{1}{2l}\sqrt{\frac{T}{m}}$
1 2 3 4 5						

Results:- The mean frequency of AC mains =……..Hz

Precautions:-

1. Thread should be of uniform thickness.
2. Length of steel rod should be adjusted before attaching the thread so that it is in resonance with AC.
3. The pulley should be frictionless.
4. Height of the pulley should be adjusted.

Expected Viva questions

Que. 1 Define frequency and what is the frequency of AC mains?
Que. 2 Explain the working of the electric vibrator?
Que. 3 In determination of frequency of AC mains by electric vibrator on which parameters the frequency of AC mains depends?

Experiment No. 5 **Date**

Aim:- To determine the wavelength of sodium light using a plane transmission grating

Apparatus:- A spectrometer, table lamp, spirit level, sodium lamp, magnifying glass diffraction grating.

Formula used:-

$$\lambda = (a+b)\ \mathrm{Sin}\theta n,$$

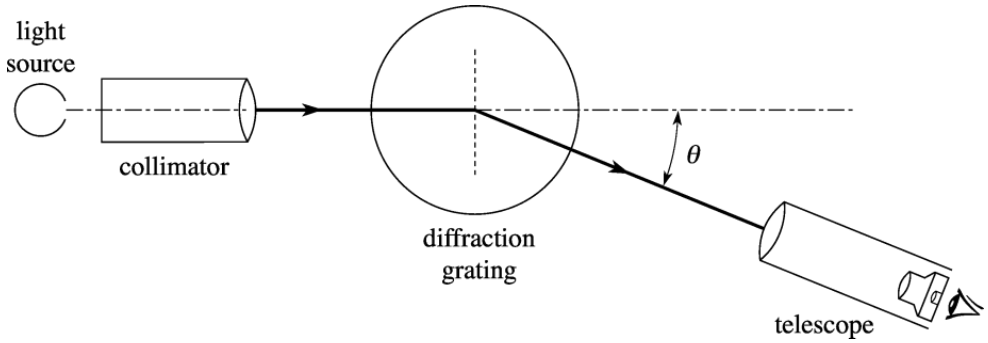
Where λ is the wavelength of the light used,

(a+b) is the grating element and

(a+b) = 2.54/N, here N is the number of lines/inch of the grating,

θn is the angle of diffraction

Diagram:-



Procedure:-

(a) **Setting of spectrometer**:- It involves the following steps

1. Setting of telescope:- The telescope is first is turned towards some white wall the eyepiece is shifted with respect to the crosswire till a sharp image of the crosswire is obtained. The eye piece is now fixed with respect to the crosswire. The telescope is focused on a distant object and the parallax between the image and the crosswire is removed. Thus the telescope is set for parallel rays.
2. Setting of the collimator: - The position of the lens of collimator is adjusted such that a sharp and well defined image is seen through the telescope.
3. Setting of the prism table:- The prism table is first made perfectly horizontal with the help of the spirit level and the leveling screws. The height of the prism table must be on the axis of the collimator and the telescope.

(b) **Setting of grating for normal incidence**:- For this the slit of the collimator is illuminated by the sodium lamp. Now the position of the telescope is adjusted in such a way that the image of the slit is focused on the vertical crosswire in the field of view of the telescope. Now the axes of the collimator and the telescope are in the same line. The position of telescope is noted on the circular scale and it is know turned to 90° and clamped. The given grating is mounted at the centre of the prism table such that the grating surface is perpendicular to prism table. The prism table is rotated so that the image of the slit reflected from the grating surface lies at the intersection of the cross wire. In this position the grating is at 45° to the incident light. The prism table is suitably rotated through 45° in such a way that the grating is normal to the incident light.

(c). Determination of angle of diffraction (θn)

1. After the adjustment of grating rotate the telescope to the left side of the direct image and adjust the vertical cross wire for first order. Note down the readings of both the verniers in each setting.
2. Now rotate the telescope to the right side of the direct image and repeat the above procedure for first order.
3. Find out (L-R) for V1 and V2 for each spectral line. This give angle 2θ.

Observation Table

Order of spectrum	Vernier	Left side reading			Right side reading			2θ =L-R	θ
		M.S.	V. S.	Total (L)	M.S.	V. S.	Total (R)		
First	V1 V2								

Calculations:

Vernier constant of spectrometer = …….

Number of lines per inch of grating (N) = …….

Grating element (a + b) = 2.54/N

Wavelength, λ = (a+b) Sinθn,

Result:- The wavelength of sodium light = …….Angstrom

Precautions:-

1. Ruled surface of grating must face the telescope.
2. Grating should be set for normal incidence.
3. Grating should not be touched by fingers.
4. The readings of both the verniers should be taken.
5. Slit should be made very fine and bright.
6. For reading magnifying glass should be used.

Expected Viva questions

Que.1 Define diffraction and explain its type?
Que. 2 Explain the construction of diffraction grating. Also bring out the points of difference between the reflected and transmission grating?
Que. 3 Explain various parts of spectrometer

Experiment No:- 6 **Date:-**

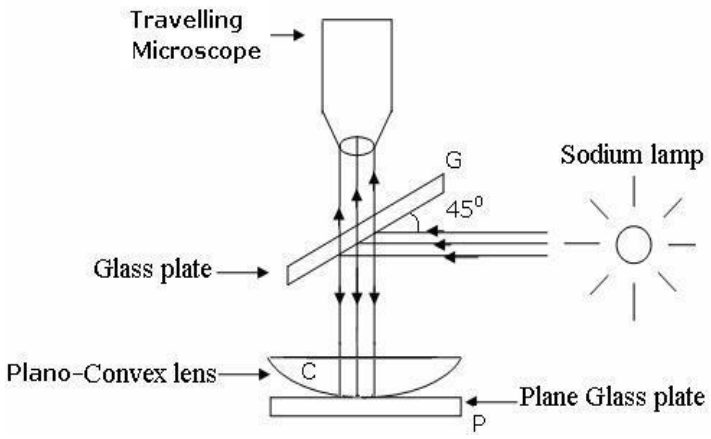
Aim:- To compute the wavelength of monochromatic light using Newton's rings apparatus.

Apparatus:- A sodium Lamp, Newton's ring Apparatus, microscope, magnifying glass, etc

Formula Used: $\lambda = \frac{Dm^2 - Dn^2}{4R(n-m)}$

Where Dm^2 is the diameter of the m^{th} ring, Dn^2 is the diameter of the n^{th} ring and R is the radius of curvature of plano convex lens.

Diagram:-



Newton's rings apparatus

Newton's rings

Procedure:-

1. Level the microscope.

2. Place the Newton's ring apparatus as shown in the figure in front of a sodium lamp so that the height of the centre of the glass plate G is same as that of the centre of the sodium lamp.

3.Focus the microscope so that it lies vertically above the center of the lens D and alternate bright and dark rings are clearly visible.

4.Adjust the position of the microscope so that point of intersection of the cross-wire is perpendicular to the horizontal scale.

5.Move the microscope to the left so that the cross-wire lies tangentially along 10^{th} dark ring note down the reading on the vernier scale move the microscope and note down the reading when the cross-wire lies tangentially at the centre of 8^{th}, 6^{th} ,4^{th}, 2^{nd} dark rings respectively.

6.Now keep the microscope on the right and note the reading when the crosswire is tangent to the 2^{nd} , 4^{th} , 6^{th} , 8^{th} , 10^{th} dark rings. Note down the reading.

7. After reaching the 10th ring move the microscope backward and again note down the reading corresponding to the same rings on the right and then on the left of the centre of the ring system.

Observation table :-

Radius of curvature of convex surface =..... cm.

Ring No.	Microscope reading		Diameter of the Ring	$\lambda = \frac{Dm^2 - Dn^2}{4R(n-m)}$
	Left	Right		

Vernier constant of the microscope

10V.S.D=9 M.S.D

1V.S.D=9/10 M.S.D

Vernier Constant= 1M.S.D-1 V.S.D = 1M.S.D- 9/10 M.S.D

= 1/10M.S.D =0.1/10mm

= 0.001mm =0.001cm.

Precautions:-

1. Lens and glass plate should be cleaned properly.

2. Lens of large focal length should be used.

3. The point of intersection of the cross-wire should coincide tangentially with a particular ring.

Expected Viva questions

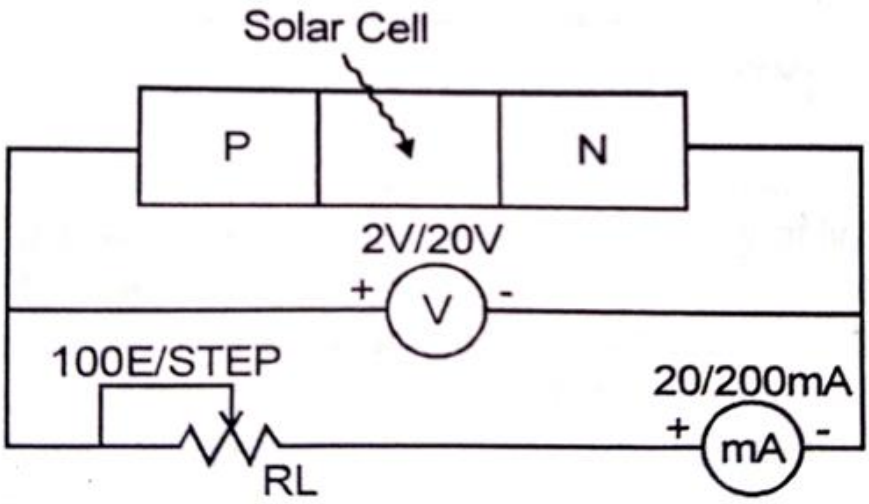
Que.1 Which lenses are used in Newton's rings assembly?
Que.2 Newton's rings experiment is based on division of wavefront or division of amplitude. Justify your answer.
Que. 3 If polychromatic light is used in Newton's rings experiment, what is the color of central spot of the rings?

Experiment No. :-7 **Date:-**

Aim: - To examine the characteristics of a Solar cell.

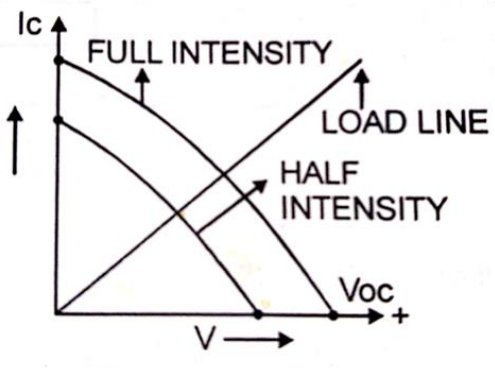
Apparatus: - Solar cell, milli-voltmeter, milli-ammeter, variable resistor, power supply, table lamp and connecting wires.

Circuit diagram



Procedure:-

1. Make the connection as per the circuit diagram shown above.
2. The intensity of the lamp is kept at minimum. The load resistance is not connected into the circuit. The open circuit voltage is noted.
3. The load dial is set at 100 ohms. The voltages and current is noted down. The load is varied in steps of 100 ohms in each setting the voltage and current are recorded.
4. The intensity of lamp is increased. At this setting the load is again varied from100 to 900 ohms and corresponding voltages and current are noted down. The open circuit and short circuit current are also note down.
5. The intensity of lamp is set to its maximum value and step no. 4 is repeated.
6. A graph of current versus voltage is plotted.



Current voltage characteristics of the solar cell

Observation table

S. No	R_L	Half intensity		Full intensity	
		Voltage	Current	Voltage	Current
1.					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Results:-From the current voltage characteristics of a solar cell it is seen that on open circuit, the output voltage of the panel is 0.6V and the current is zero. If the panel is short circuited, current is maximum while the output voltage of the panel becomes zero in both the cases the output power is zero. Also it is seen from the graph that voltage varies depending on the current drawn.

Precaution:-

1. The positive terminal of the solar cell should be connected to positive terminals of milli voltmeter and milli ammeter.
2. After performing the experiment switch off the circuit.

Expected Viva questions

Que.1 What is solar cell. What materials are used for its fabrication?
Que.2 Explain how do you calculate the efficiency of solar cell.
Que.3 What are various applications of solar cells ?

Experiment No.:-8 **Date:-**

Aim: - To determine the dispersive power of a given prism using a spectrometer.

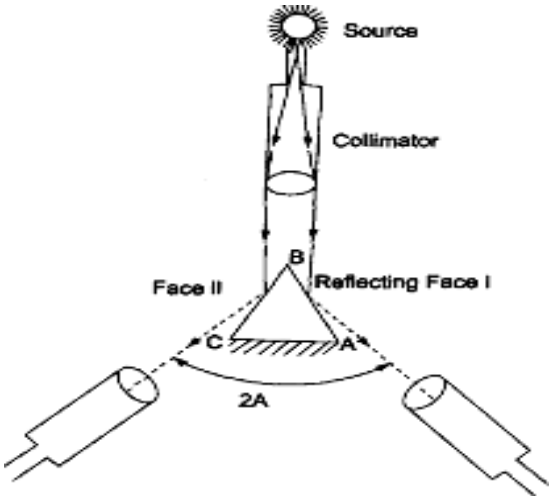
Apparatus:-Spectrometer, spirit level, prism, table lamp, magnifying glass and mercury lamp.

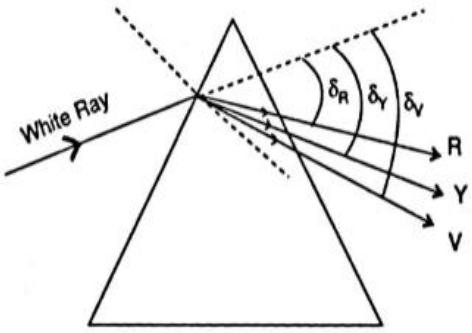
Formula used: - The dispersive power **(**ω) of the material is given by

$$\omega = \frac{\mu_v - \mu_r}{\mu_y - 1}$$

Where μv, μ r and μy are the refractive indices of violet, red, and yellow colors.

Diagram:-





Procedure:-

(a) Setting of spectrometer:- It involves the following steps

1. Setting of telescope- The telescope is first is turned towards some white wall the eyepiece is shifted with respect to the crosswire till a sharp image of the crosswire is obtained. The eye piece is now fixed with respect to the crosswire. The telescope is focused on a distant object and the parallax between the image and the crosswire is removed. Thus the telescope is set for parallel rays.
2. Setting of the collimator: - The position of the lens of collimator is adjusted such that a sharp and well defined image is seen through the telescope.
3. Setting of the prism table:- The prism table is first made perfectly horizontal with the help of the spirit level and the leveling screws. The height of the prism table must be on the axis of the collimator and the telescope.

(b) Determination of the angle of prism (A):-

1. The prism is mounted on the prism table with the edge B at the center of the prism table and the base CA perpendicular to the axis of the collimator.

2. The ray from the collimator fall on the face BC and BA of the prism from which these rays get reflected in the direction as shown in figure.
3. The telescope is turned to receive the reflected ray from BC. The image of the slit is made to coincide exactly with the vertical crosswire.
4. The main scale and vernier scale V1 and V2 are taken.
5. Now the telescope is turned towards the right to receive the ray reflected from BA and again image of the slit made to coincide exactly with the vertical crosswire.
6. The main scale and vernier scale reading are again noted ,we get the angle 2A, Half of 2A gives the angle of prism.

(c) Determination of angle of minimum deviation (δm)

1. Telescope is placed in front of the collimator and obtains the direct image of the slit in the telescope on crosswire.
2. Note the readings V1 and V2 .Now place the prism centrally on the table such that light falls on the face BC of the prism.
3. Turn the telescope to receive the emergent ray which get dispersed from the face BA of the prism and focused on the crosswire.
4. Now gradually rotate the prism table in the clockwise direction. The image will appear to turn in the anti-clock wise direction. A stage will come when it will again start moving in the clockwise direction.
5. Coincide that particular position on which the ray just turn back with the crosswire. This is the position of minimum deviation.
6. Note the main scale and vernier scale readings. It will give angle of minimum deviation for different colors.
7.

Calculations:-

Determination of vernier constant

Value of one division on vernier scale =0 .5 degree

Total number of vernier scale division = 30

Least count of vernier scale =0.5/30= 1/60 degree

Observation tables

Table 1. Determination of the angle of prism

	Telescope on the left hand side			Telescope on the right hand side				
	M.S	V.S	Total(a)	M.S	V.S	Total(b)	A=(a-b)/2	Mean Angle A
V1								
V2								

Table 2. Determination of angle of minimum of deviation

		Telescope reading for direct ray			Telescope reading for minimum deviation position			Telescope reading for minimum deviation for different colors	
		M.S	**V.S**	**Total(c)**	**M.S**	**V.S**	**Total (d)**	**δ =(c-d)**	**Mean**
Violet	V1								$\delta_v =$
	V2								
Yellow	V1								$\delta_r =$
	V2								
Red	V1								$\delta_y =$
	V2								

Calculation: - Calculate the value of refractive indices for violet, yellow and red colors by using the following formulas:-

$$\mu_v = \frac{Sin\left(\frac{A+\delta_v}{2}\right)}{Sin\frac{A}{2}}$$

$$\mu_r = \frac{Sin\left(\frac{A+\delta_r}{2}\right)}{Sin\frac{A}{2}}$$

$$\mu_y = \frac{\frac{Sin(A+\delta_y)}{2}}{Sin\frac{A}{2}}$$

Result:-The dispersive Power of the given prism is.....

Precautions

1. The spectrometer must be set for parallel rays**.**
2. The readings of both the verniers should be taken
3. The image must be fine and sharp.
4. The prism must be placed in the correct position

Expected Viva questions

Que. 1 Define angle of prism and angle of minimum deviation?
Que. 2 What is angular dispersion?
Que.3 How do you calculate the dispersive power of material of the prism. What is the source of light used.

Experiment No :- 9 **Date:-**

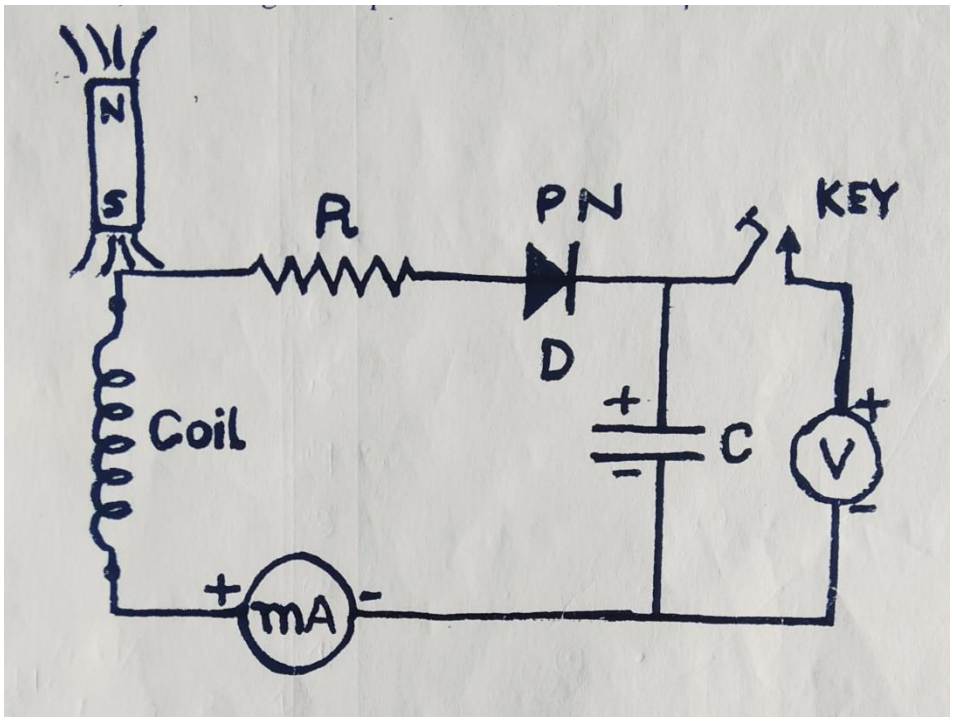
Aim:- To analyze the variation of EMF with respect to velocity of magnet to verify Faraday's laws.

Apparatus :- Resistance(100Ω to 1000Ω),capacitor(1mF to1μF),PN junction diode, voltmeter(0-2.5V),ammeter(0-200mA), A bar magnet, Key, two induction coils and connecting wires.

Formula used:- $V= 2\pi r\theta/T$

where V is the maximum linear velocity of the magnet, r is the radius of semi- circular arc, θ is the angular amplitude and T is the time period.

Circuit diagram:-



Procedure:-

1. Mount a small permanent magnet at the middle point of semi-circular arc and suspend the aluminum frame containing the semi-circular arc from its centre so that the whole frame can oscillate freely through induction coils.

2.Adjust the position of two weights on the diameter of the arc to have the minimum time period.

3.Make the connection as per the circuit diagram.

4.Take the magnet carrying arc to one side so that the amplitude of vibrations is about 30 degree(it can be noted from the graduated scale attached to the frame) and release the arc. Note the time of 10 oscillations.

5.Repeat twice, keeping the amplitude same and find the time period.

6.Perform the experiment at an incremental step of 10 degrees and note the corresponding peak voltage.

7.Plot the graph between the linear velocity of the magnet and the maximum induced emf. Take velocity along x-axis and induced emf along y-axis. The graph should be straight line as shown in the figure.

Calculations:-

Radius of semi circular arc (r) = ...cm

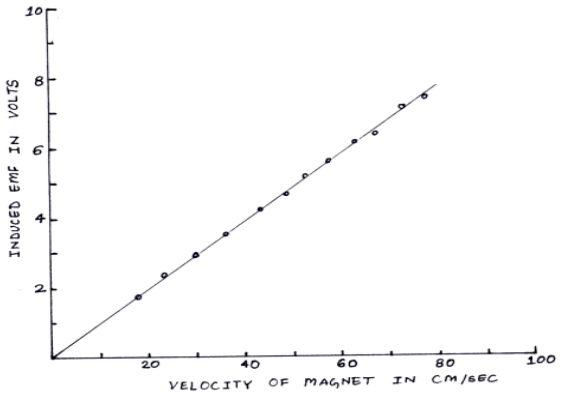
Time for 10 oscillations = ...sec

Time for one oscillations (T) =.....sec.

Observation table:-

S. No	θ in degree	Induced emf in volts	V= 2πrθ/T
1	0		
2	10		
3	20		
4	30		
5	40		
6	50		
7	60		

Graph:-



Precautions:-

1.The semi-circular frame should oscillate freely from the jeweled support.

2. Magnet should pass freely through the coils.

3.The peak value of induced emf developed in the coil should be measured.

4.The bar magnet should be small and should be mounted at the middle of semi-circular arc.

Expected Viva questions

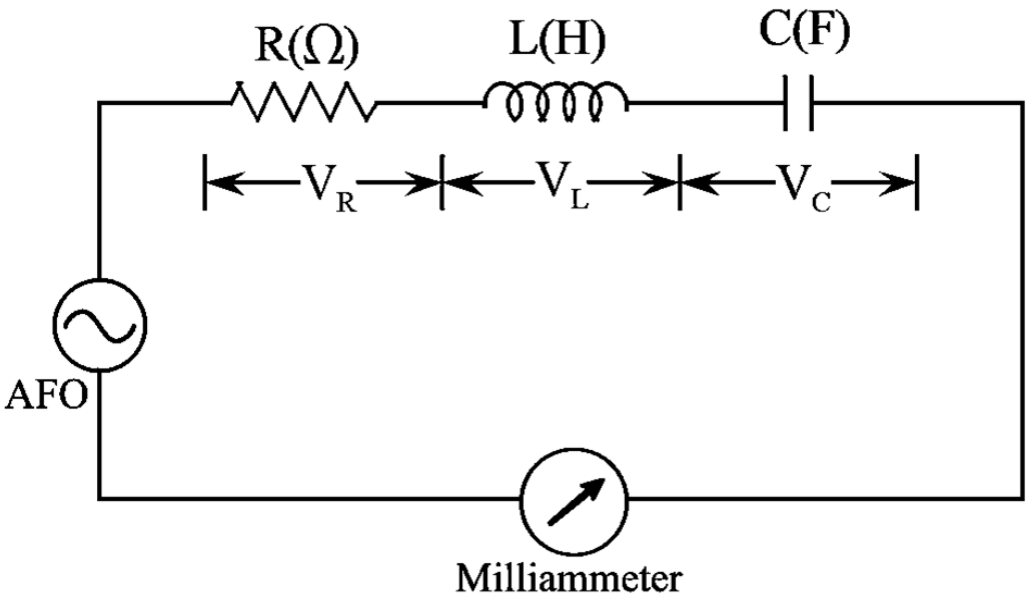
Que.1 State Faraday's laws and Lenz's law
Que. 2 Explain the working of circuit diagram?
Que. 3 What conclusions can be drawn from graph ?

Experiment No :-10 **Date:-**

Aim:-To plot series resonance curve in an LCR circuit by varying frequency.

Apparatus required:- An audio frequency oscillator(10KHz-200KHz), an inductance coil, a capacitor, a non inductive resistance box, voltmeter, milli-ammeter and connecting wires.

Circuit diagram:-



Procedure:-

1.Set up a series resonance circuit consisting of inductance coil(L), resistance(R), and capacitor(C) with respect to supply source (A.F oscillator) and ac milliammeter as shown in the figure.

2.Now set the value of capacitor, resistor and the amplitude at 15V then adjust the oscillator to the frequency range from10KHz to 200KHz.

3.Vary the frequency from audio frequency oscillator in the steps of 10KHz and note the corresponding value of current in the milliammeter for each observation.

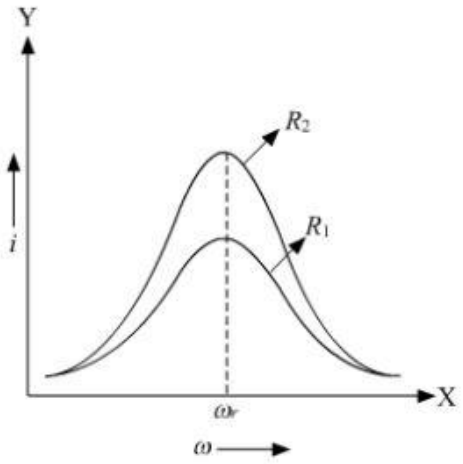
4.Plot the graph between frequency and the current for each observation. The maximum value of current on the graph gives the resonance frequency.

Observation Table

S. No	Frequency in kHz	Current in mA
1.		
2.		
3.		
4.		

5.		
6.		
7.		
8.		
9.		
10		

Graph



Precaution:-

1.The value of inductance L and capacitor C should be properly selected so the resonance frequency of the circuit should lies between 10KHz-200KHz.

2.Adjust the frequency of oscillator so, the milli-ammeter in LCR circuit show maximum current.

3.The value of output voltage from oscillator, resistance R and capacitor C must be kept constant through experiment.

Expected Viva questions

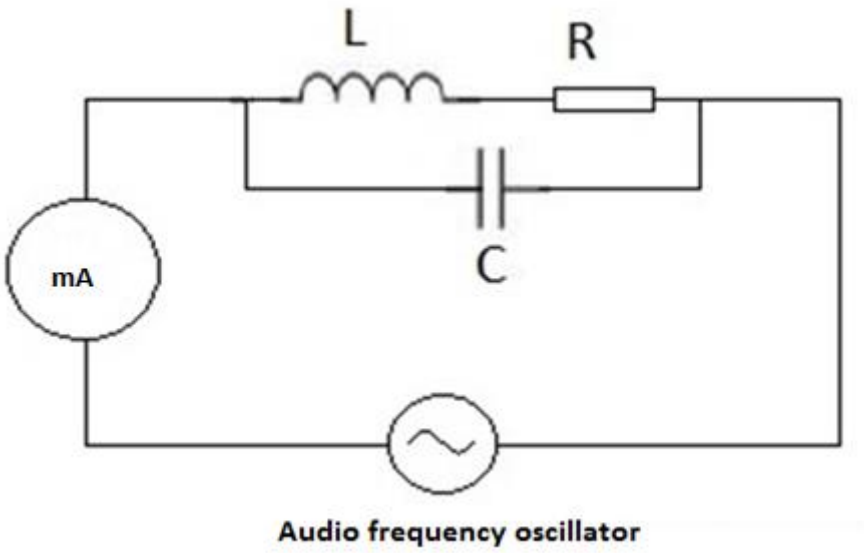
Que.1 What is resonance frequency in LCR series circuit ?
Que.2 Explain the working of LCR series circuit?
Que. 2 State various applications of LCR series circuit?

Experiment No :-11 **Date:-**

Aim:-To plot parallel resonance curve in an LCR circuit by varying frequency.

Apparatus required:- An audio frequency oscillator(10KHz-200KHz), an inductance coil, a capacitor, a non inductive resistance box, voltmeter, milli ammeter and connecting wires.

Circuit diagram



Procedure:-

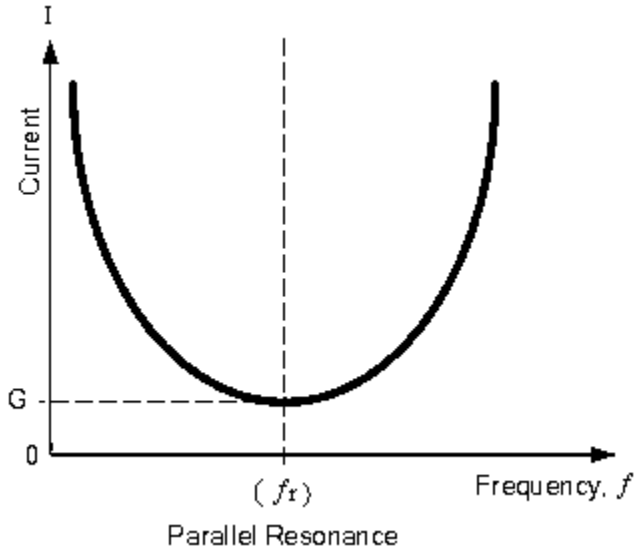
1. Set up a parallel resonance circuit consisting of inductance coil (L) ,resistance (R) and capacitor (C) with respect to supply source(A.F. oscillator) and audio frequency milliammeter as shown in the figure.
2. Now set the value of capacitor, resistor and the amplitude at 15V then adjust the oscillator to the frequency range from10KHz to 200KHz.
3. Vary the frequency from audio frquency oscillator in the steps of 10KHz and note the corresponding value of current in the milliammeter for each observation.
4. Plot the graph between frequency and the current for each observation. The minimum value of current on the graph gives the resonance frequency.

Observation Table

S. No	Frequency in kHz	Current in mA
1.		
2.		
3.		
4.		

5.		
6.		
7.		
8.		
9.		
10		

Graph



Parallel Resonance

Precaution:-

1.The value of inductance L and capacitor C should be properly selected so the resonance frequency of the circuit should lies between 10KHz-200KHz.

2.Adjust the frequency of oscillator so, the milli-ammeter in LCR circuit show maximum current.

3.The value of output voltage from oscillator, resistance R and capacitor C must be kept constant through experiment.

Expected Viva questions

Que.1 Define resonance?
Que.2 Explain the working of LCR parallel circuit?
Que. 2 State various applications of LCR parallel circuit?

Experiment No :-12 **Date:-**

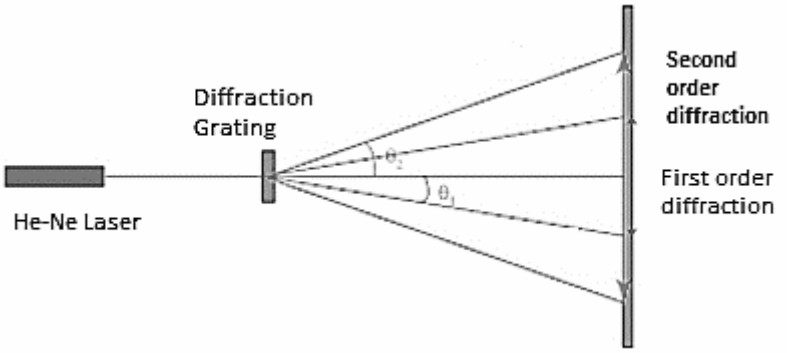
Aim:- To determine the wavelength of a He-Ne laser.

Apparatus required:- He-Ne laser source, spirit level, diffraction grating, calibrated screen and scale.

Formula used:- $\boldsymbol{\lambda = \frac{(a+b)Sin\theta}{n}}$

Where $\boldsymbol{\lambda}$ is the wavelength of the light used, n is the order of diffraction and θ is the angle of diffraction.

Diagram:



Procedure:-

1.Place the laser source, diffraction grating and screen on the table as shown in figure.

2.Switch on the laser source and adjust the relative orientation of laser with respect to diffraction grating such that spot is observed on the screen.

3.Adjust the position of the screen by moving it toward and away from the diffraction grating till five spots are clearly observed on the screen

4.The bright circular spot at the middle corresponds to the principal maxima.

5.Mark the position of spots on either side of principal maxima

6.Measure the distance between principal maxima and first order maxima on either side.

7.Also measure the distance between principal maxima and second order maxima.

8.Also note down the distance(D) between the grating and screen with measuring scale.

9.Calculate the value of wavelength by using above mentioned formula.

Observation Table

Order of diffraction	Position of spot		Mean X in cm	Distance between screen and grating D in cm	$\theta = \frac{X * 180}{D * \pi}$	Sinθ	$\lambda = \frac{(a+b)Sin\Theta}{n}$
	On LHS (cm)	On RHS (cm)					
First							
Second							

Calculation

Grating element (a+b)= $\frac{2.54}{N}$

Number of lines per inch on the grating (N)=

Result: The wavelength of He-Ne laser beam=.....Angstrom

Precautions:

1. Do not look directly at the laser beam because it is hazardous to the eyes.

2. Properly adjust the position of screen so the spots are observed clearly on screen.

3. Grating should be set for normal incidence.

4. Diffraction grating should not be touched by fingers.

Expected Viva questions

Que.1 Define diffraction and state necessary conditions for diffraction?
Que. 2 Explain the construction of diffraction grating.
Que. 3 Explain the working of Helium neon laser ?

Experiment No :-13 **Date:-**

Aim:- To determine the specific rotation of sugar/glucose using Laurent's Half shade polarimeter.

Apparatus required:- Laurent's half shade polarimeter, sodium lamp,50cc flask, two beakers, analytical balance, weight box.

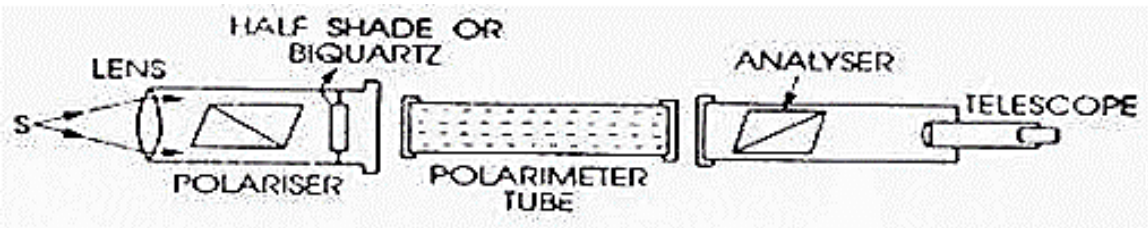
Formula used:- $S = \frac{\theta}{lc}$ degree(dm)$^{-1}$ (gm/cc)$^{-1}$

Where θ is the angle of rotation in degree

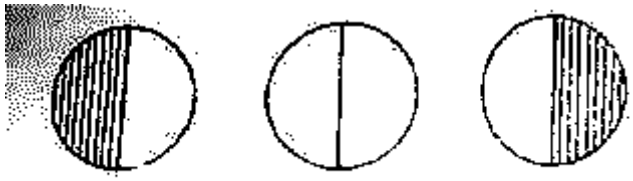
l is the length of solution in decimeter

c is the concentration of the solution in gm/cc.

Diagram:-



Laurent's half shade polarimeter



Procedure:-

1. Weight about 2-5 gm cane sugar and dissolve it into 25 cc to 35cc water. Now this is cane sugar solution.
2. Switch on the sodium light and clean the polarimeter tube and fill it with distilled water and the end caps so that no air bubble remains in the tube. Place the tube in its proper position.
3. Look through the analyzer and rotate it clockwise till the two halves of the field of the view are of same intensity. This position is such that slight rotation makes one half dark and the other bright and slight rotation in opposition direction will make first half bright and other half dark as shown in the figure.
4. Take the reading of the analyzer when both the halves are equally bright with distilled water in the tube.
5. Now replace the distilled water in the tube with sugar solution so formed. Place the tube in position and note the scale readings when both the halves are in equally bright position.
6. Take the readings for different concentrations of sugar solution.
7. Measure the length of the tube and convert into decimeter.

Observations:-

Least count of the vernier of the analyzer=.....

Mass of the sugar(m)=.....

Length of tube=.....cm= .....(1)Decimeter.

Concentration of sugar solution=.....(c)gm/cc

S.No	Analyzer reading		Difference θ	Specific rotation $S = \frac{\theta}{lc}$ degree(dm)$^{-1}$ (gm/cc)$^{-1}$
	Without sugar solution	With sugar solution		

Result: - The value of specific rotation(S)=..... degree(dm)$^{-1}$ (gm/cc)$^{-1}$

Precautions:-

1.The tube and glass window should be clean.

2. There should be no air bubble in the glass tube when the tube is filled with solution.

3.The cap of the tube should be screwed in such a manner such that there is no leakage. These should not be very tight so as to strain window.

Expected Viva questions

Que.1 Define polarization?
Que.2 Differentiate between levorotatory and dextrorotatory solutions?
Que. 2 Explain the working of Laurent's half shade polarimeter?