

Experiment No 1

Aim:-

To Draw V-I characteristics curve of P-N Junction diode.

Apparatus required:-

Voltmeter, Semiconductor diode, Milliammeter, Regulated powersupply (0 -10V) connection wires.

Theory:-

Semiconductor diode – A diode is a two terminal device. One terminal known as the anode and other as the cathode. A semiconductor diode should work like a switch. When its anode made +ve w.r.t.its cathode the diode should act like a closed switch and when its anode made -ve w.r.t. cathode the diode should act like an open switch.

Forward biased characteristics – A test circuit that may be used to determine static characteristics of a diode. The anode current increase rapidly as the forward potential difference across the diode is increased the diode starts conduction only after a certain forward voltage known as threshold voltage is applied across it. The threshold voltage for ‘Ge’ type diode = 0.3V and for ‘Si’ type diode = 0.6V

Reverse biased characteristics – A reverse biased diode characteristics is obtained by reversing the connection here the leakage current flows in the circuit. This current is known as reverse saturation current. An increase in the operating temp. of the diode results in increased generation of e⁻ holes pair in the junction region and with this leakage current increase.

Procedure:-

Forward biased characteristics –

1. Assemble the circuit as shown, keep 10V supply output at min. position.
2. Switch on the supply to the board, slowly increase the 10V supply and take reading of diode current at various voltage settings about 1.5V or less.
3. Plot the voltage on x- axis and current reading on y- axis which look like a forward biased characteristics.
4. We observe from the above characteristics that a forward voltage of about 2V is required before diode starts conduction

Reverse biased characteristics –

1. Now switch of the supply to E.T.B. and reverse the connection to the diode and switch current meter to μA range, switch on the supply to the unit only
2. Slowly increases the 0-10V supply. Note down the readings of current meter for various voltage setting up to 10V
3. Plot the above reading on the same graph sheet by extending the x and y axis on the –ve side.
4. We observe that very little reverse current called leakage current flow through the diode in the reverse biased made for the OA-79 diode. This leakage current will vary from place and will up to around 2-8 μA max. the leakage current is little for Si signal diode.

Observation Table:-

For semiconductor diode forward biased-

S.No.	Voltage (Volt)		Current (mA)	
	No. of Division	No. of Division x LC	No. of Division	No. of Division x LC
1.				
2.				
3.				
4.				
5.				
6.				

For semiconductor diode reverse biased-

S.No.	Voltage (Volt)		Current (μA)	
	No. of Division	No. of Division x LC	No. of Division	No. of Division x LC
1.				
2.				
3.				
4.				
5.				
6.				

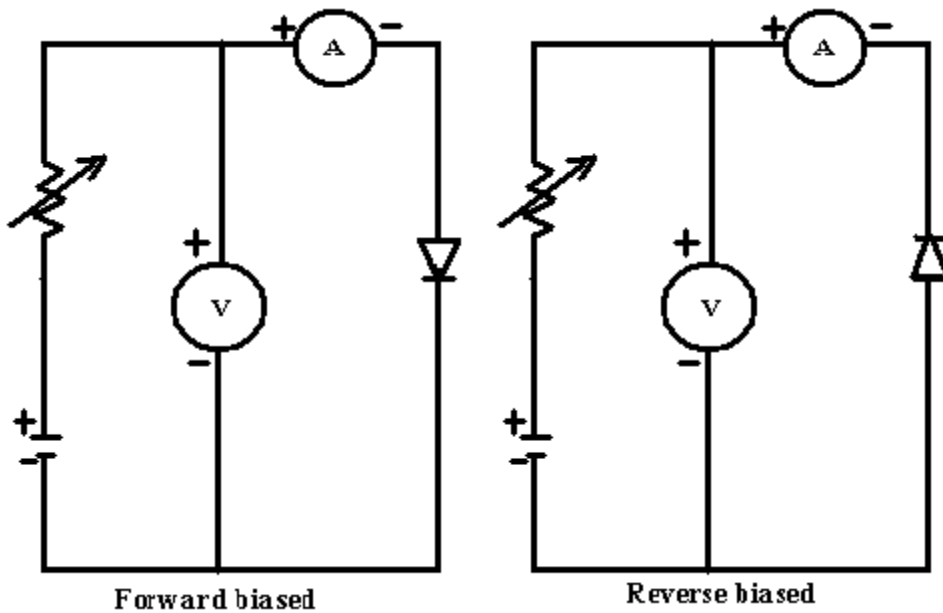
Result:-

Characteristics curves of semiconductor diode are plotted and their variation observed.

Precautions:-

1. Get your connection checked by your teacher before starting the experiment.
2. Use short leads for connections.
3. Make the connection tight and clear
4. Do not increase the voltage instantaneously, it may be cause damage to diode.

Circuit diagram



Experiment N0 2

Aim:-

To Draw V-I characteristics curve of Zener diode.

Apparatus required:-

Voltmeter, Zener diode, Micrometer, Regulated power supply (0-10V), Connection wire

Theory:-

If the reverse biased applied to a P-N junction diode increase a point will be reached at which the junction breaks down and current flows in reverse voltage. In the current rectifier voltage. In the current rectifier diode reverse break-down should not occur within voltage rating of a diode. Reverse breakdown is also known as avalanche break down. The reverse breakdown mechanism predomination in diode having reverse breakdown voltage below about 3V. This type of breakdown is known as Zener breakdown voltage.

A Zener diode exhibits characteristic similar to forward biased 'Si' type diode. Almost no current flow through diode till Zener voltage of diode is reached at which there is sudden increase in current to increase in opposite voltage across the diode remains constant at its voltage.

Procedure:-

Forward Biased Characteristics

1. Assemble the circuit keep 0-10V supply to a minimum position supply to a board.
2. Slowly increase 0-10V supply and take reading of current through the zener diode for various voltage rating.
3. Plot reading on a graph paper take voltage on x-axis and current on y-axis. This plot will look like a forward biased characteristic of 'Si' general purpose diode. There is about 0-6V of forward voltage is required before the diode start conduction.

Reverse Biased Characteristics

1. Switch off supply to E.T.E. and reverse the conduction to the Zener diode.
2. Switch on board slowly increases 0-10V supply and note down the reading of current through diode at various voltage setting.
3. Plot reading on same graph paper sheet by extending both axis on -ve side which take the reverse biased characteristic.
4. We observe negligible current flow through zener diode till zener diode voltage is almost no variation in voltage across zener diode.

Observation Table:-**For Zener diode forward biased-**

S.No.	Voltage (Volt)		Current (mA)	
	No. of Division	No. of Division x LC	No. of Division	No. of Division x LC
1.				
2.				
3.				
4.				
5.				
6.				

For Zener diode reverse biased-

S.No.	Voltage (Volt)		Current ((μ A))	
	No. of Division	No. of Division x LC	No. of Division	No. of Division x LC
1.				
2.				
3.				
4.				
5.				
6.				

Result:-

Characteristic curve of zener diode is plotted.

Precaution:-

1. Get your connection checked by your teacher before starting the experiment.
2. Use short leads for connections.
3. Make the connection tight and clear
4. Do not increase the voltage instantaneously, it may be cause damage to diode.

Experiment No 3

Aim: To draw V - I characteristics of Photo Diode For different Light Intensities.

Introduction & Theory:

A Photo Diode is a two terminal PN Junction Device, which operates in a reverse mode. It has a small transparent window, which allows light to strike on the PN junction. Fig 1 (a) and (b) shows the structure and schematic symbol of Photo Diode. It may be recalled that a rectifier diode has a very small reverse current when it is reverse biased. The reverse biased current is produced by thermally generated electron hole pairs in the depletion layer, which are swept across the junction by the electric field created by the reverse voltage. In a rectifier diode, the reverse current increases with the temperature due to an increase in the number of electron hole pairs. A Photo Diode differs from a rectifier diode in a sense that its reverse current increases with the light intensity at the PN junction. When there is no incident light, the reverse current is almost negligible and it is called the dark current. An increase in the amount of light energy produces an increase in the reverse current

Applications of Photo diodes

- 1) Photo Detection.
- 2) Demodulation.
- 3) Logic Circuits.
- 4) Switching.
- 5) Optional Communication system.
- 6) Character Recognition.

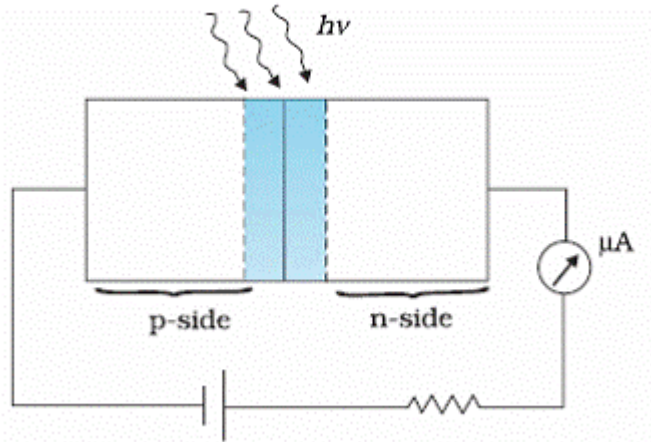
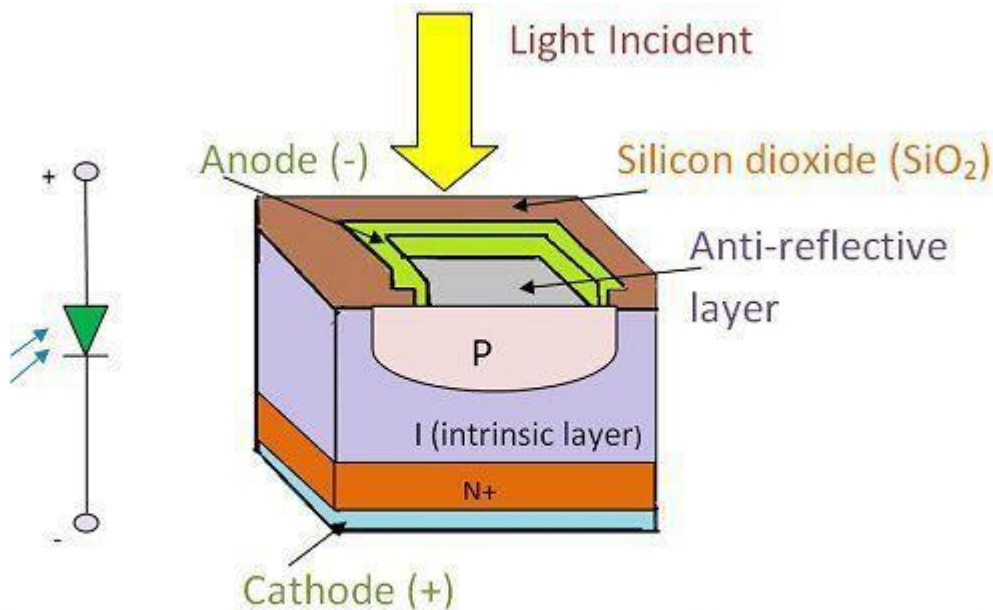


FIG -1



Photodiode Symbol & Construction of Photodiode

Electronics Coach

Experimental procedure

Forward characteristics

- 1) Switch on the trainer kit.
- 2) Set the voltage potentiometer in the minimum position and connect the built in DC source to the input terminals of first circuit (fig -2a) to conduct forward characteristics.
- 3) Connect Ammeter and voltmeter as shown in Fig 2a
- 4) Connect the lamp, Increase the input voltage gradually and measure the Forward voltage drop V_O across the diode in incremental steps as shown in Table -1 and note the current I_O at each incremental step of the voltage.

- 5) Draw a graph between V_O and I_O as shown in Fig -2c
- 6) Note The Forward Characteristics of Photo Diode.

Reverse characteristics

- 1) Switch on the trainer kit.
- 2) Set the voltage Potentiometer in the minimum position and connect the built in DC source to the input terminals of second circuit (fig -2b) to conduct Reverse Characteristics and swith on the bulb.
- 3) Connect the Micro Ammeter and voltmeter as shown in Fig -2(b)
- .4) Adjust the Voltage V_O in incremental steps and measure the V_O and I_O from the meters for each incremental steps as shown in Table -2. 5) Draw a graph between V_R and I_R .
- 5) Draw a graph between V_R and I_R .
- 6) Repeat step 1 to step 6 at different intensities of light. Draw V_R Vs I_R on the same graph a shown Fig 2(c).

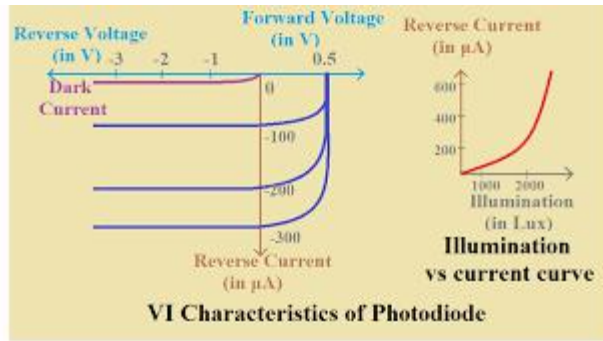
OBSERVATION TABLE

TABLE -1

S.NO.	V_O volts	I_O (mA)

TABLE-2

S.NO.	V_O volts	I_O (mA)



Result: V-I characteristics of PIN and Avalanche photodiodes are studied.

Viva Voce

1. What is photodiode?
2. How photodiode is different from LED.
3. What do you mean by biasing of diode.
4. Explain the principle of PIN and Avalanche photodiode.

voltage (Photovoltaic effect). When a load is connected across the cell, the potential causes the photocurrent to flow through the load. The e.m.f. generated by the photovoltaic cell in the open circuit,

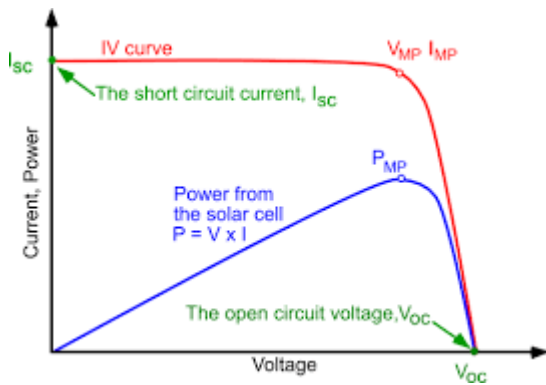
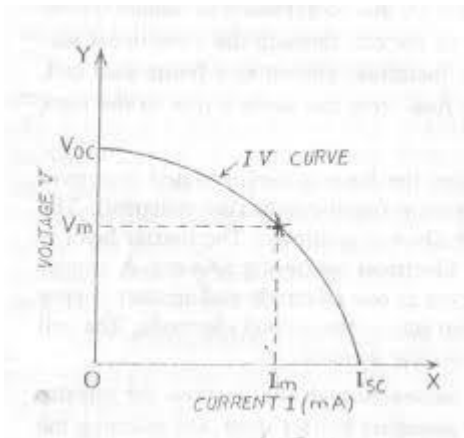
PROCEDURE:-

- 1) Connect the circuit as shown in diagram.
- 2) Switch on the lamp.
- 3) Use digital multimeter as voltmeter and micro ammeter for measuring current.
- 4) Measure short circuit current (ISC) for zero load (i.e. $R_L = 0$)
- 5) Measure open circuit voltage (VOC) when R_L is maximum.
- 6) Now make $R_L = 0$, vary R_L and note corresponding values of voltage and current.
- 7) Plot I-V curve.
- 8) Draw a line making an angle 45° with X-axis to meet the curve at a Point, find its co-ordinate I_m and V_m gives maximum power dissipation
- 9) Calculate fill factor 'FF'.

OBSERVATION TABLE :

Tabular column:

S.NO.	Voltage	Current(μA)	Load Resistance (RL)



RESULT:- Fill factor of a given solar cell = ----- %

PRECAUTIONS:

- 1. Connections should be made carefully
- 2. No external light should be incident on photo diode.

Experiment N0 5

Aim To determine the energy band gap of a semiconductor diode.

Apparatus required:-

Thermometer, Oven, Semiconductor diode, D.C. power supply, Ameter (μ Amp), etc.

Theory:-

A semiconductor doped or undoped always posses and energy gap between its conduction band and valance band. For the conduction of electrity we have to given certain amount of energy to the electron so that it goes from valance band to conduction band. This amount of energy is measure of band gap between two bands.

When a P-N junction is reverse biased the current through the junction is due to minority current carriers i.e. electron in p-section and holes in N- section. The concentration of this carriers is dependent upon the energy band gap raised to E. The reverse current I_s (saturated value) is function of the temp. of the junction diode and varies according to the following relation:

$$\text{Log } I_s = \log \{ A1 N_n N_p (V_n / P_p + V_p / n_n) e^{E/KT} \}$$

Where

N_n = density of electron in N-type

P_p = density of holes in P-type

V_n = velocity of electrons

K = Boltzman's constant

T = absolute temp. of junction diode

A = area of junction

$$(\text{Band gap}) \Delta E = [\text{slop of line} / 5.036] \text{ ev}$$

Procedure:-

1. Plug the main load to the nearest main that is 230V + 10% 50Hertz A.C.
2. Insert the thermometer and the diode in the holes of oven.
3. Plug the two leads of the diode of this socket red plug in the black socket and black in red.
4. No, other connections are necessary as rest of wiring in building.
5. Now put the power on/off switch to ON position and see that the jewel light is glowing.
6. Now put the power 'ON/OFF' to Off. Put the oven switch to 'ON' position and allow the oven temperature to increase upto 80°C.

$$\Delta E = [\text{slop of line} / 5.036] \text{ ev}$$

Result:-

The Energy band gap of a semiconductor diode found to beev

Precaution:-

1. Maximum temperature should not exceed 80° C.
2. Bulb of the thermometer and diode should be insert.
3. Silicon diode should not to be used with the setup as the temperature needed is 125°C and in oven the thermometer provided will not stand to this temp.

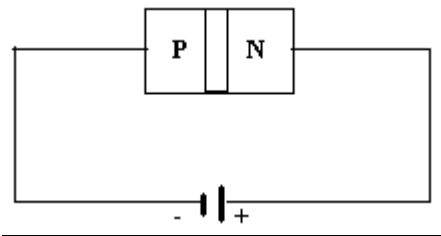
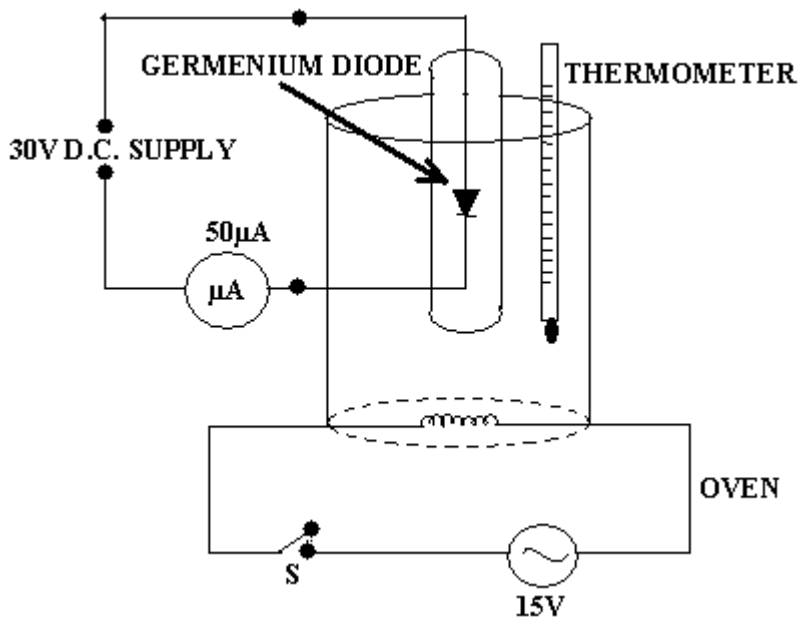
Calculation:-

1. Slop of line = $y_2 - y_1 / X_2 - X_1$
2. Energy band gap in ev

$$\Delta E = [\text{slop of line} / 5.036] \text{ ev}$$

Observation table:-

S.No.	Temp. in °C (T)	Current in μ amp I_s	Temp. in K (T)	$10^3/T$ (K)	Log I_s
<u>1.</u>	75°C				
<u>2.</u>	70°C				
<u>3.</u>	65°C				
<u>4.</u>	60°C				
<u>5.</u>	55°C				
<u>6.</u>	50°C				
<u>7.</u>	45°C				
<u>8.</u>	40°C				



EXPERIMENT NO. (6)

AIM: Calculate the refractive index of the material of prism by spectrometer.

APPARATUS REQUIRED: Spectrometer, prism, slit of variable width, spirit level reading lens, sodium lamp and reading lamp.

FORMULA USED:
$$\mu = \frac{\sin [(A + (\delta_m))/2]}{\sin (A/2)}$$

Where A is the refracting angle of the prism and (μ) is respectively the angle of minimum deviation for the yellow colour. Refractive index of the prism.

$$\mu = \frac{\sin [(A + (\delta_m))/2]}{\sin (A/2)}$$

Where μ is the refractive index of the material of prism for the yellow colour respectively.

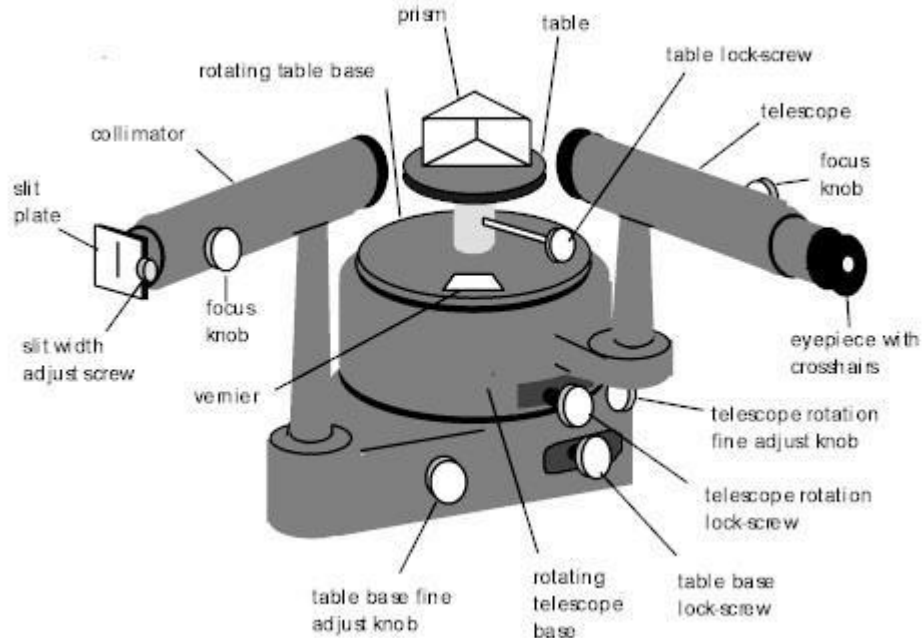
PROCEDURE:

(I) Adjustment of the spectrometer: -

1. Adjust the spectrometer so that the axes of collimator and telescope intersect each other on the vertical axis of the telescope, the prism

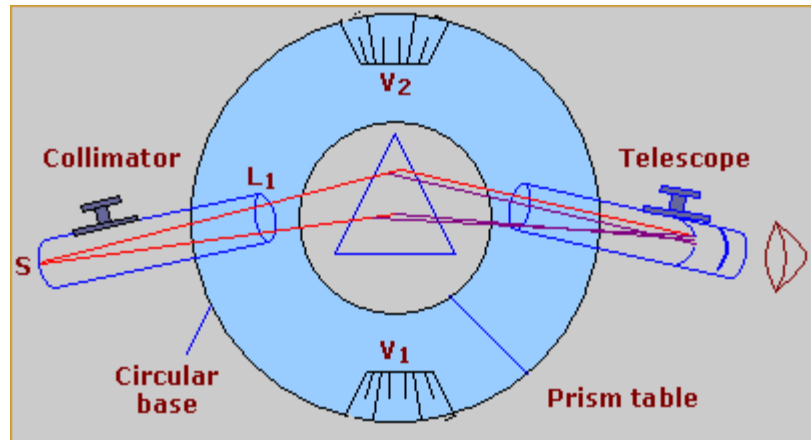
table is horizontal; telescope and collimator are focused for the parallel rays by Schuster's method.

2. Level the spectrometer with the help of spirit level and leveling screws.



(II) Measurement of refracting angle A of the prism: -

1. First find the least count of the scale provided on the spectrometer.
2. Place the prism on prism table such that A is at the center and its base is normal to the direction of incident light. Illuminate the slit with mercury lamp.
2. Now take readings of both verniers by turning the telescope towards face AB and then by turning it towards the face AC of prism.



(III) Measurement of angle of minimum deviation δ_m :

1. Place the prism on prism table such that light from collimator falls obliquely on one refracting face AB of the prism.
2. Then bringing the telescope towards other refracting face AC of the prism sees the spectrum.
3. Bring the position of minimum deviation. In this position yellow spectral lines is focused and then take reading.
4. Then readings for direct image of site are taken.
5. Then difference of two readings and its mean value are taken which gives δ_m for yellow color.

						(b)							(b')		

Mean value of $2A = \dots\dots\dots$

Value of $A = \dots\dots\dots$

(ii) **Table for the angle of minimum deviation (δ_m) of the prism:**

S.NO	For the light refracted from face AB of prism						For the light reflected from direct image						Difference δ_m		
	V ₁			V ₂			V ₁			V ₂					
	MSR	VS R	Total l (a)	MS R	VS R	Total l (b)	MS R	VSR	Total (a')	MS R	VS R	Total l (b')	a a'	~ ~b'	Mean
1															

CALCULATIONS :

From the tables :

$$\text{Refracting angle of prism } A = \frac{(a \sim a') + (b \sim b')}{4}$$

$$\text{Minimum deviation } (\delta_m) = \frac{(a \sim a') + (b \sim b')}{2}$$

$$\mu = \frac{[\sin((A + (\delta_m))/2)]}{\sin (A/2)}$$

refractive index of prism $\mu = \frac{[\sin((A + (\delta_m))/2)]}{\sin (A/2)}$

$$\sin (A/2)$$

RESULT : Refractive index of Prism $\mu = \text{-----}$

Standard value =

Percentage error =

PRECAUTION:

1. Before the experiment, the spectrometer must be well adjusted.
2. The source of light must be placed near the slit of collimator.
3. While finding either the angle of prism A or the angle of minimum deviation, we must take difference in two readings of same vernier.
4. To avoid the backlash error the micrometer screw must always be turned in one direction.

Experiment No 7

Aim:-

To determine the wavelength of sodium light by using the method of “Newton’s Ring”

Apparatus required:-

Optical arrangement for Newton’s Ring, Traveling microscope, Sodium lamp, Short focus convex lens, Reading lens and a Spectrometer.

Theory:-

Newton’s Ring are formed due to interference between the wave reflected from the top and the bottom surface of the air film formed between the simple glass plate and planoconvex lens. A part is reflected at C without any phase reversal the other part is reflected along CD at point D. it is again reflected and goes out in the form of ray -2 with a phase reversal of π . The expression show that a maximum of a particular order will occur for a constant value of t. In case of this system remain constant along with a circle. Let “R” be the radius of the curvature of the surface in contact with the plate “ λ ” be the wavelength used. D_n and D_{n+p} be the diameter of n^{th} and $(n+p)^{\text{th}}$ dark ring respectively.

$$D_n^2 = 4n \lambda R \quad \text{and} \quad D_{n+p}^2 = 4(n+p) \lambda R$$

$$D_{n+p}^2 - D_n^2 = 4 \lambda R p$$

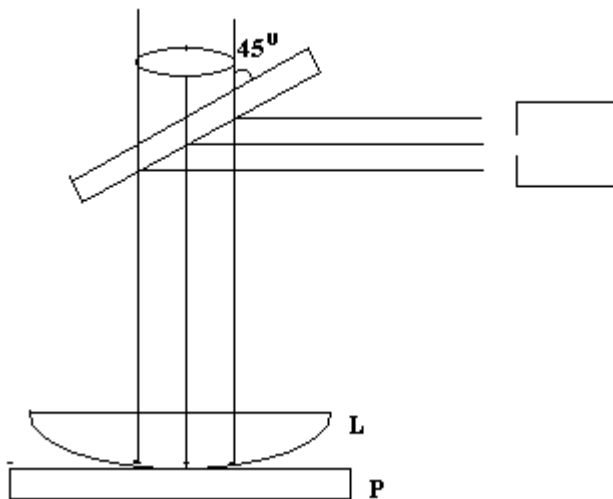
3.	4									
4.	3									
5.	2									
6.	1									

Result:-

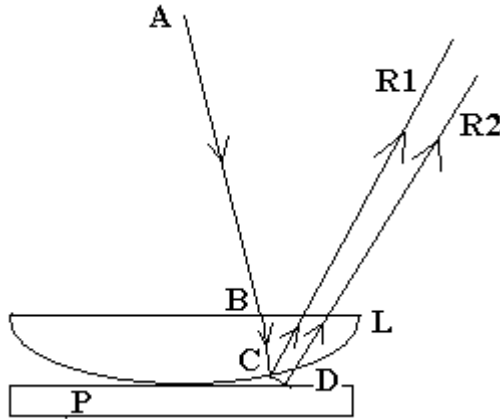
The wavelength of sodium light is

Precautions:-

1. Surface of the glass plate and lens should be cleaned.
2. Height from sodium lamp should be parallel.
3. Reading should be noted very carefully.



Diagram



Experiment No8

Aim:-

To determine the frequency of A.C. mains by using an Electric vibrator.

Apparatus required:-

Electric vibrator, Table lamp Weight box, finishing chord, A.C. source etc.

Theory:-

When a chord of mass per unit length is connected to the vibrating rod of the vibrator and stretched by a tension 'T' the chord vibrates in segments as in Melde's experiment if the length of the chord is adjusted until the notes are clearly marked the frequency of the stretched string is vibrating with the frequency of A.C. mains then if 'l' be length of one loop of vibrating string its frequency of vibration is given by.

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

where m is mass per unit length of chord
 $m = 5.4 \times 10^{-3} \text{ gm/cm}$

Procedure:-

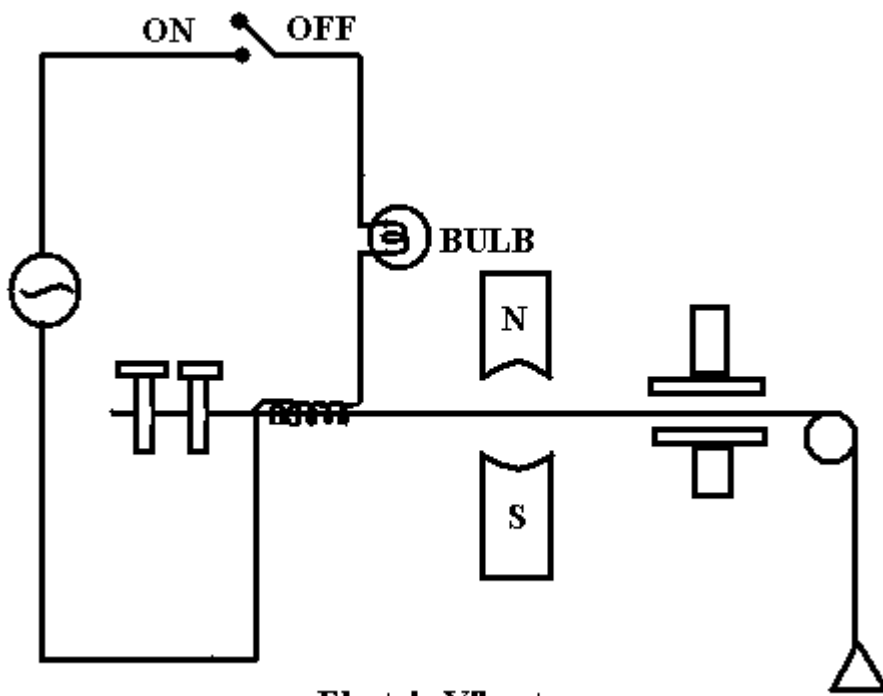
1. Switch the current on and see that the rod of the electric vibrator begins to vibrate
2. Adjust the length of the rod of it is free and perform vibrating of maximum amplitude.
3. The length of the vibrating rod is adjusted by stopping the vibration fills the nodes are clearly defined.
4. Mark the position of the extreme hole leaving on it the first & last loop.
5. Measure the length of vibrating chord and divide it to the no. of loops to get 'l' for same tension take move set of reading by alternating the change of chord.
6. Calculate the mean total tension applied to the chord.
7. Repeat the experiment with different tension.

Observation Table:-

S.No.	No. of loops (N)	Length of chord (L)	Length of per loops $l = \frac{L}{N}$	Mass of pan m1	Mass on pan m2	Total mass $M = m1 + m2$	Tension $T = M \times g$	$\eta = \frac{1}{2l} \sqrt{\frac{T}{m}}$
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								

Precaution:-

1. Length of steel rod must be adjusted to that it vibrated in resonance with A.C. frequency of this is obtained when the free end of the rod vibrates with maximum amplitude.
2. There must be no friction in pulley.
3. Reading must be taken carefully.



Electric Vibrator

Experiment No 9

Aim:-

To determine the wavelength of violet and green light by using a diffraction grating

Apparatus required:-

Plane transmission grating, Spectrometer, Reading lamp and Reading lens.

Theory:-

If white light from a narrow slit parallel by lens is made to fall on grating and another lens employed to converge the rays issuing from the grating. We obtain image of the slit along the same direction as the incident rays of zeroth order and has the same colour as the source of light. Surrounding of this direct image on either side are the image of the first order the second order and soon. If θ be angle of diffraction for nth order for wavelength λ then,

$$N \lambda = (e + d) \sin \theta$$

$$\lambda = (e + d) \sin \theta / n$$

where $(e + d)$ is grating element.

Procedure:-

1. Before using the spectrometer first do the adjustment.
2. Grating should normal to the axis of collimator the slit should be adjust parallel to the lens of grating for the determination of angle of diffraction.

3. Rotate the telescope to the left side of the direct image and adjust the spectral line to on the cross wire vertically for first order. Note down the reading of both the vernier each setting.
4. Rotate the telescope to the right of direct image and repeat the above procedure i.e. for first order.
5. Find out the difference of the same kind of vernier for each spectral line in the first order. This angle is twice time the angle of diffraction for that particular colour and order. Half of that will be the angle of diffraction.
6. Find out the angle of diffraction for other colour in first order as well as second.

Observation:-

(A) Table for diffraction angle

Order of spectrum	Colour of light	Vernier	Reading of telescope for left spectrum θ_1			Reading of telescope for right spectrum θ_2			$\theta = \frac{\theta_1 - \theta_2}{2}$
			MS	VS	TR	MS	VS	TR	
n ₁		V1							
		V2							
		V1							
		V2							
n ₂		V1							
		V2							
		V1							
		V2							

(B) The no. of lines ruled per inches on grating (N) = 15000

Grating element (e + d) = 2.54 / 15000 cm.

= 1.69 x 10⁻⁶ M

Result:-

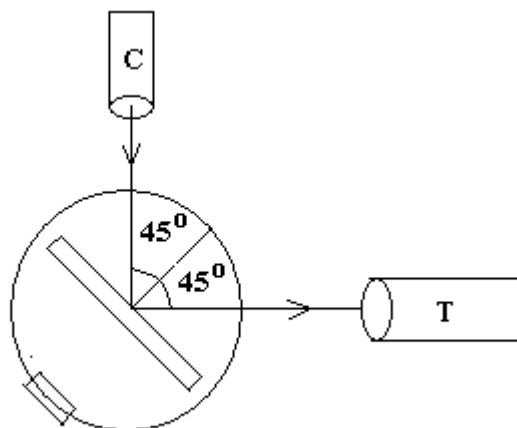
The wavelength of different colour for the given source of light.

Colour of spectral	Observed	Standard	Percentage error
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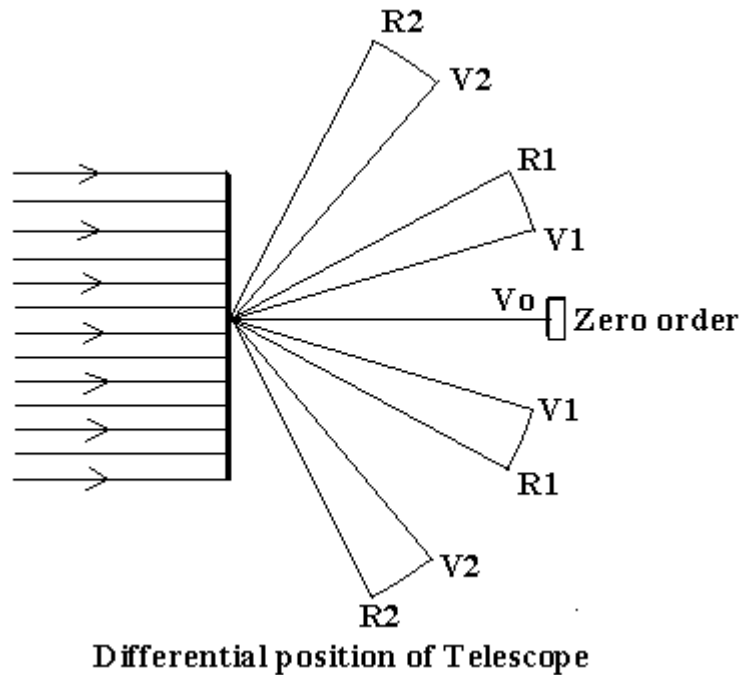
line	wavelength λ (A°)	wavelength λ (A°)	
Violet		4358 A°	
Green		5461 A°	

Precaution:-

1. The mechanical adjustment of the telescope should be correct.
2. The optical arrangement of the spectrometer must be made correctly.
3. The slit used should be as narrow as permissible.
4. In handling the grating do not touch the faces glass.



Position of Telescope after 90° rotation



EXPERIMENT NO 10

AIM: Calculate the wavelength of green and violet light by plane transmission grating and spectrometer using mercury lamp.

APPARATUS REQUIRED: Plane transmission grating, spectrometer, mercury lamp, reading lens, reading lamp.

THEORY: When a parallel beam of monochromatic light of wavelength is incident normally on a grating constant e , by Heidelberg's principle each point of each slit emits out secondary wavelength in all directions, which interfere and get focused in the focal plane of a convex lens (or telescope). The path difference between the diffracted waves at an angle θ from the corresponding points of two consecutive slits is $e \sin\theta$. When this path

difference is equal to integer multiple of wavelength the waves produce constructive interference.

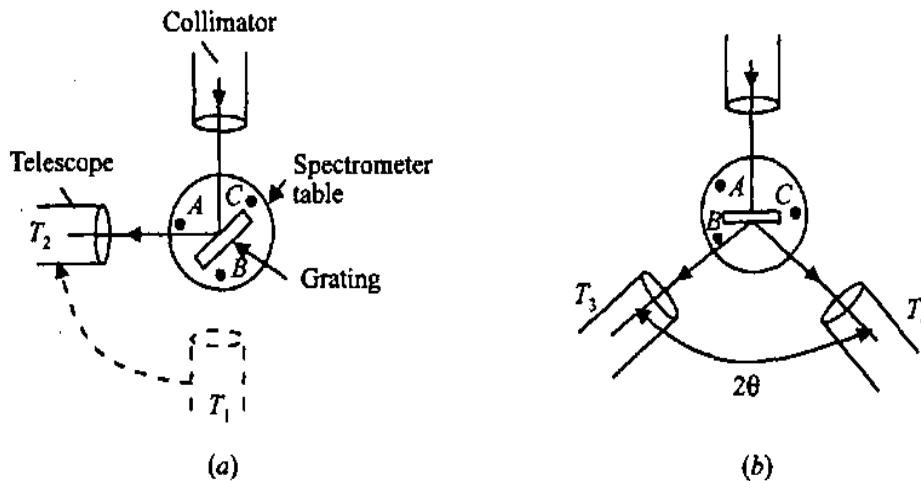
FORMULA USED: $e \sin \theta = n \lambda$ (whose $n = 0, 1, 2, 3, 4, \dots$) for principal maxima

where,

$\lambda =$ Wave length of light

$n =$ order of spectrum

$e \sin \theta = \underline{n \lambda}$



PROCEDURE:

(I) Adjustment of the spectrometer:

1. Adjust the spectrometer so that the axes of collimator and telescope intersect each other on the vertical axis of the telescope; the prism table is horizontal, telescope and collimator are focused for the parallel rays by Schuster's method.
2. Level the spectrometer with the help of spirit level and leveling screws.

(II) Adjustment of Grating on the prism table.

1. The grating is mounted in the middle of the prism table such that light incident from collimator falls normally on the grating. To obtain this condition following adjustment are made.
2. The telescope is brought in the line if collimator and slit is focused at the cross wire. This position of telescope is noted.
3. The telescope is turned by 90° now the axis of telescope becomes normal to the axis of collimator.
4. Now the grating is mounted on the prism table width its ruled surface at the center of prism table and perpendicular to the joining the two leveling screws of the prism table is then gradually rotated till the image of slit formed by the light refracted from the grating surface is focused at the point of intersection of cross wire in the telescope. The leveling screw P&Q are then adjusted such that the image of the slit lies equally above and below the intersection point of cross wire. Here plane grating makes an angle 45° with incident light.
5. Now grating is turned by 45° or 135° such that the ruled line of grating face the telescope. The light incident from the collimator is row normal on the grating prism table is now clamped.

(III) Measurement of angle diffraction θ

1. Note down the least count of spectrometer.

2. The telescope from the position of direct image of slit is rotated towards left till the first order spectrum is seen in the field of view then telescope is clamped the reading of both vernire V_1 & V_2 are noted by coinciding the vertical cross wire with the spectrum line.
3. Now the telescope is turned towards the right side of the direct image of the slit and again reading of both vernire V_1 & V_2 are noted for first and second order spectrum.
4. Then find the difference of reading of either side of slit for the same vernire (V_1 & V_2) for the same order. Then take the mean and find the half of it, which will give the angle of diffraction for the said order.

OBSERVATION TABLE:

Value of 1 division of main scale = -----"

Total no. of division on vernire scale = -----"

Least Count of Vernire = $\frac{1 \text{ div. Of main scale}}{\text{Total no of division on the vernire scale.}}$

For diffraction angle " θ "

S. No.	Order of spectrum	Vernire scale	Position of telescope on the left side of direct image of slit			Position of telescope on the right side of direct image of slit			$2\theta = X - Y$	Angle of diffraction
			m.s. reading	v.s. reading	Total reading	m.s. reading	v.s. reading	Total Reading		
1	n=1	V_1								
		V_2								

2	n=2	V ₁								
		V ₂								

From table =----- $e \sin \theta = n\lambda$

FORMULA: $e \sin \theta = n\lambda$

CALCULATION:

$$\theta = \frac{a - a' + b - b'}{4}$$

$$e \sin \theta = n\lambda$$

$$(e \sin \theta) / n = \lambda$$

$$(e = 1.9 \times 10^{-6})$$

RESULT: The wavelength of green light of found to be -----

PERCENTAGE ERROR: Observed Value - given value =

DISCUSSION /CONCLUSION:

PRECAUTIONS:

1. Before starting the experiment, the spectrometer should be properly adjusted.
2. Light must fall normally on the grating.
3. The collimator, prism table should be properly leveled with the help of a spirit level.
4. While taking the observation the prism table should be seeing lamped.

5. For each observation both verniers must be read.

EXPERIEMENT NO-10

AIM:- To determine the Hall coefficient of given semiconductor.

APPARATUS REQUIRED:-Electromagnets, power supply of electromagnet, Gauss meter for measuring of magnetic flux, germanium crystal, stand, constant power supply.

THEORY:-When a current carry conductor is placed in the cross magnetic and electric field a electric field is induced in the conductor which is perpendicular to the applied electric and magnetic field. This effect is known as Hall Effect and induced potential difference is known as Hall voltage.

PROCEDURE:-

1. Connect the power supply to the electromagnets .Switch on power supply adjust the current (say 1amp).
2. With the help of Gauss meter measure the magnetic field if it is 1000gauss then carry the next step otherwise by adjusting the electromagnets coil adjust magnetic field at 1000gauss
3. Connect the Hall crystal to constant current power supply in their respective sockets.
4. Switch on the power supply and adjust the current (Ix).

5. There may be some voltage in the (mv) meter even outside the magnetic field this is due to imperfect alignment for four contacts of Ge, Hall voltage should alignment for four contacts of Ge crystal and is generally known as zero field potential in case it's value is compare to Hall voltage it should be adjusted to a minimum possible .In all case this error should be subtracted from the Hall voltage reading.

6. Now place the probe in the magnetic field as shown in figure and switch on the electromagnetic power supply and adjust the current to any desired value .Rotate the Ge crystal probe till it become perpendicular to magnetic field. Hall voltage (V_H) becomes maximum in this adjustment.

7. Change the value of (I_x) insteps and note corresponding value of (I_x) and (V_H). Take many reading then plot a graph in V_H and I_x values. It will be straight line .whose slope will be given by V_H/I_x .

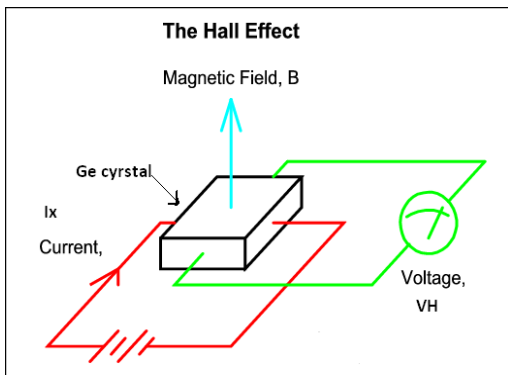


FIGURE
OBSERVATION-

Thickness of crystal-0.55cm

Magnetic field -1000gauss

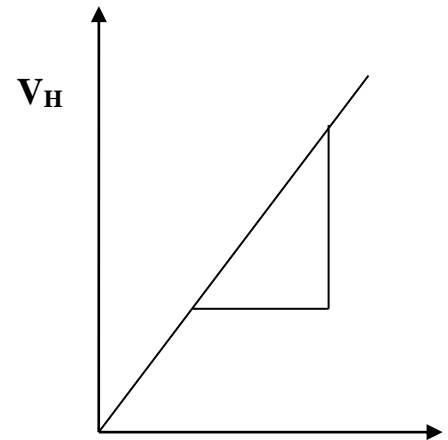
S.No.	Hall Current(I_x)	Hall Voltage (V_H)
1		
2		
3		
4		
5		

6		
7		
8		
9		
10		

CALCULATION-

$$slope = \frac{y_1 - y_2}{x_2 - x_1}$$

$$Hall\ coefficient = \frac{V_H t}{BIx}$$



I_x

RESULT- The Hall coefficient of given semiconductor is.....volt cm/gauss amp.

PRECAUTION-

1. Handle the Ge crystal with care, it can break.
2. Handle the probe of gauss-meter with care it may damage in mishandling.
3. Does not use electromagnetic continuous at full current .It may be start heat.
4. Gap between poles of electromagnet must be remaining fix during one reading.

