Experiment-1

Aim: To study the VI characteristics of PN junction diode in forward and reverse biasing.

Apparatus: PN diode is formed by joining p type semiconductor with n type semiconductor. It is done by various joining techniques. It can be applied in two ways:

a) Forward Biasing b) Reverse Biasing

Forward Biasing: When p type is connected to positive terminal and n type is connected to negative terminal of battery, diode is said to be forward biased. As a result the width of potential barrier (0.1 to 0.3V) is reduced. Hence small fwd. voltage is needed to overcome the barrier. This is called forward current and in this biasing the resistance of diode almost becomes zero.

Reverse Biasing: When p type is connected to negative terminal and n type is connected to positive terminal of battery, diode is said to be reversed biased. As a result the width potential barrier is increased and prevents flow of current across the junction. If rev. voltage is continued to increase then electrons get enough kinetic energy to knock out from semiconductor and then breakdown of junction occurs. This is characterised by sudden rise in rev. current and fall in resistance.

Procedure: Forward Bias characteristic

1) Knob of potentiometer R_1 is kept fully anticlockwise
2) Now switch on the unit and set voltage to 0V.
3) Increase the voltage in small steps and note corresponding current.

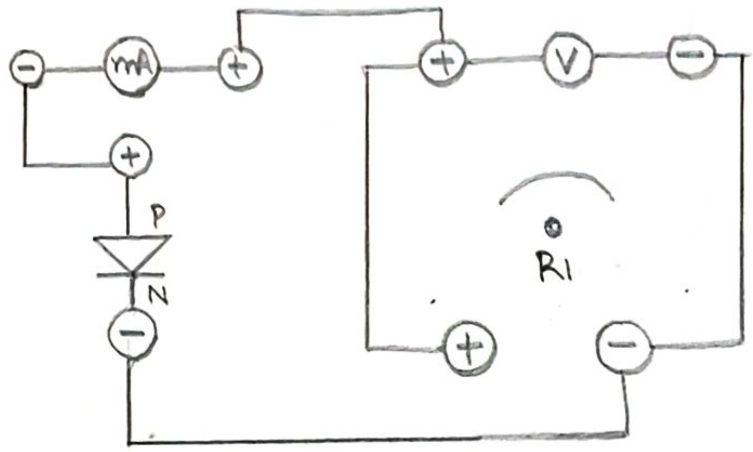


Fig: Forward Biasing

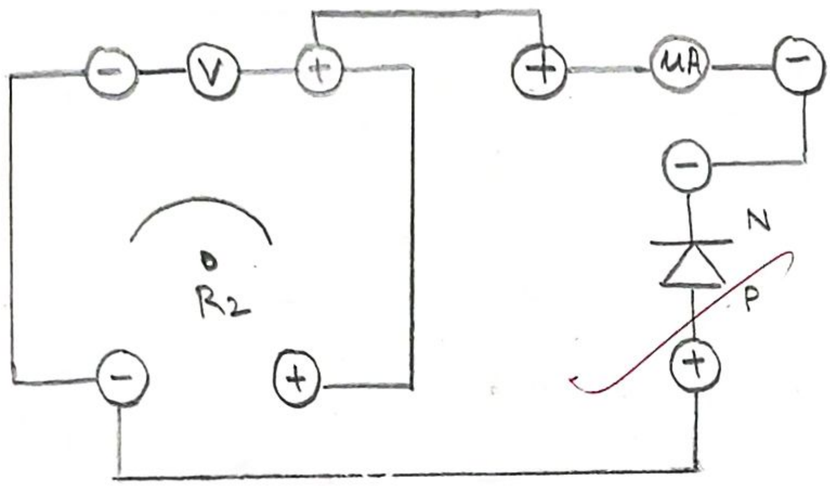


Fig: Reverse Biasing

Observation Table:

Forward Biasing

V	I (mA)
0.1	0
0.2	0
0.3	0
0.4	0
0.5	0.4
0.6	1
0.7	3
0.8	6.8
0.875	10

Reverse Biasing

V	I (μA)
2	8
4	12
6	14
8	20
10	26
12	32
14	38
16	46
18	56
20	66
22	76

Reverse Bias characteristics

1) Knob of potentiometer R_2 is kept fully anticlockwise.
2) Now switch on the unit and set voltage to 0V.
3) Increase voltage in small steps and note corresponding current.
4) Plot graph b/w voltage and current.

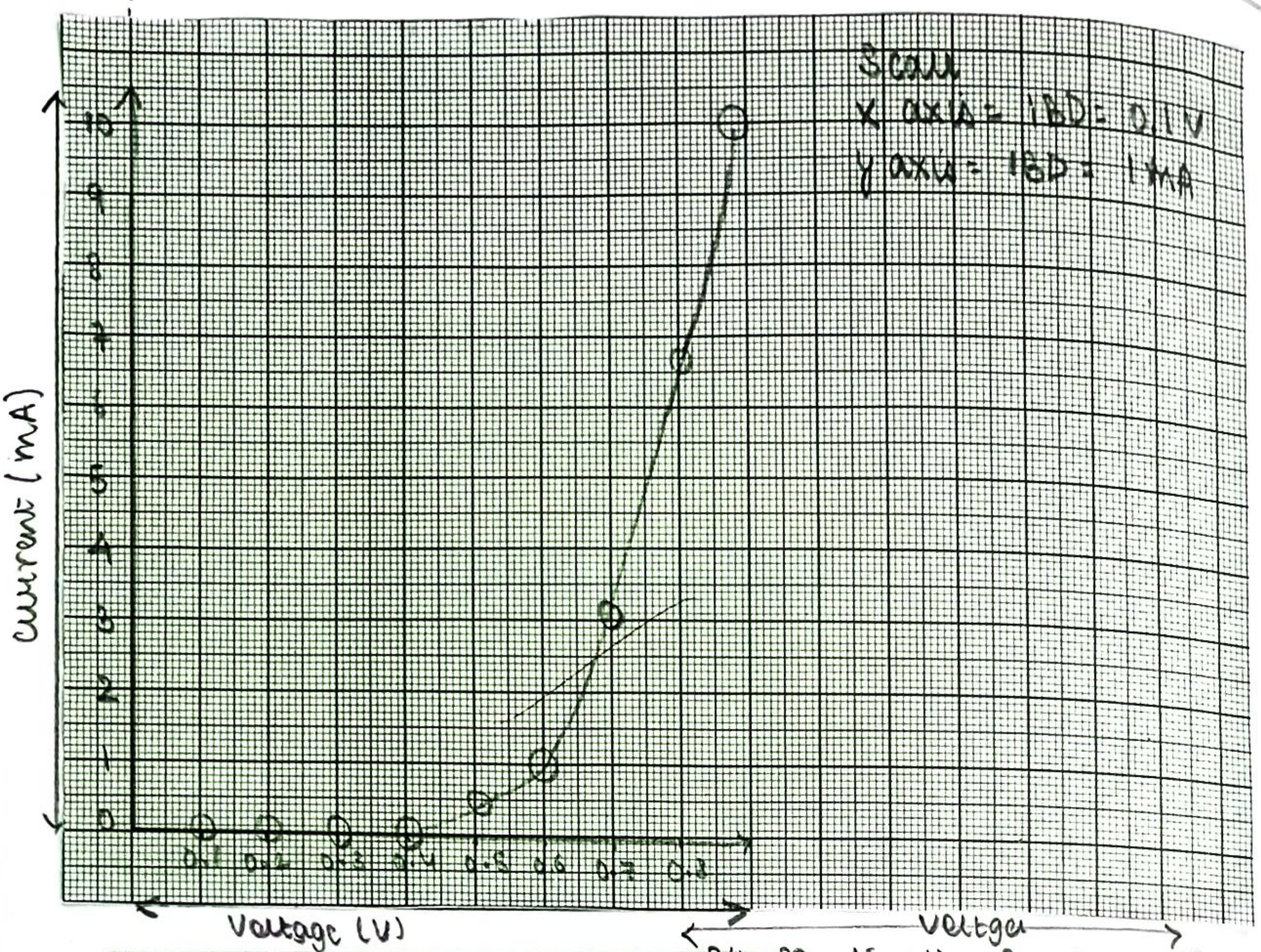
Result: The diode offers good conductive path when forward biased.
The diode offers bad conductive path when reverse biased.

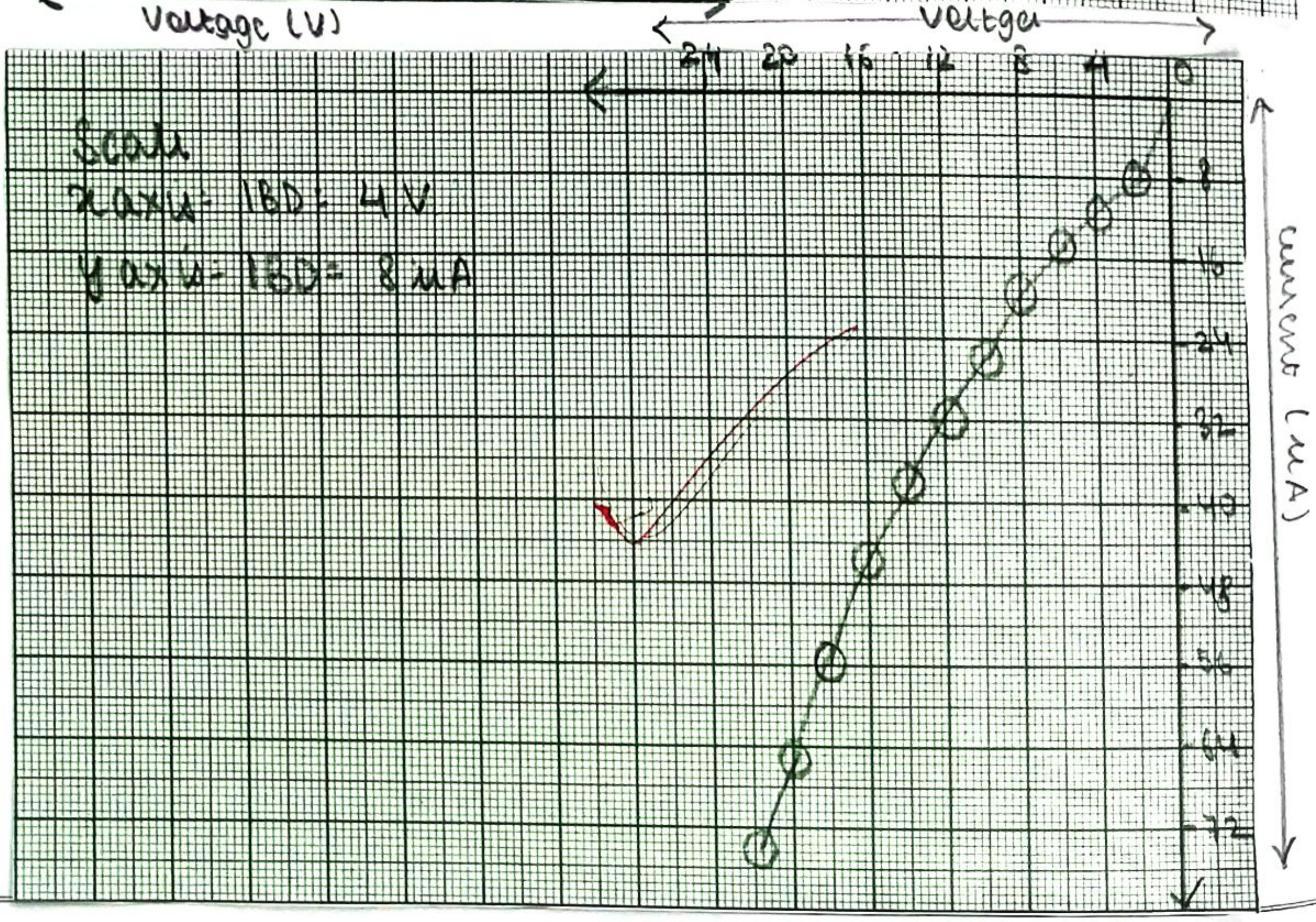
Implications: 1) PN junction diode in reverse biased configuration is sensitive to light from a range b/w 400nm to 1000nm which includes visible light, hence it can be used as photodiode
2) It can also be used as solar cell.
3) PN junction forward bias condition is used in all LED lighting applications.
4) The voltage across PN juction is used to create temperature sensors and reference voltages.
5) It is used in many circuits like rectifiers, varactors for voltage controlled osciuation.
6) It is used in clipping circuits as wave shaping in computer, radios, radars, etc.
7) It is used as switches in digital logic circuits.

Viva Questions: 1) What is meant by junction?
A junction is a common surface of p type and n type semiconducto

2) What is meant by doping?
Doping is the process of deliberately adding appropiate impurities to pure semiconductors.

Teacher's Signature :


Scale
X axis = 1BD = 0.1 V
Y axis = 1BD = 1 mA
Current (mA)
Voltage (V)


Voltage
Scale
x axis = 1BD = 4 V
y axis = 1BD = 8 μA
Current (μA)

3) What is meant by a junction potential barrier?
A junction potential barrier is potential difference b/w junction terminals of semiconductors.

4) What are two types of biasing?
Forward biasing and reverse biasing are two types of biasing.

Teacher's Signature :

Experiment-2

Aim: To determine frequency of the AC mains using sonometer and electromag.

Apparatus: A sonometer with soft iron wire, an electromagnet, a step down transformer, hanger with slotted weights, calamp stand, meter scale, sensitive balance, connecting wires.

Theory: If a wire of length L and mass per unit length m is stretched over two bridges with tension T and plucked, it vibrates with frequency:

$$n = \frac{1}{2L}\sqrt{\frac{T}{m}} = \frac{1}{2L}\sqrt{\frac{Mg}{m}}.$$

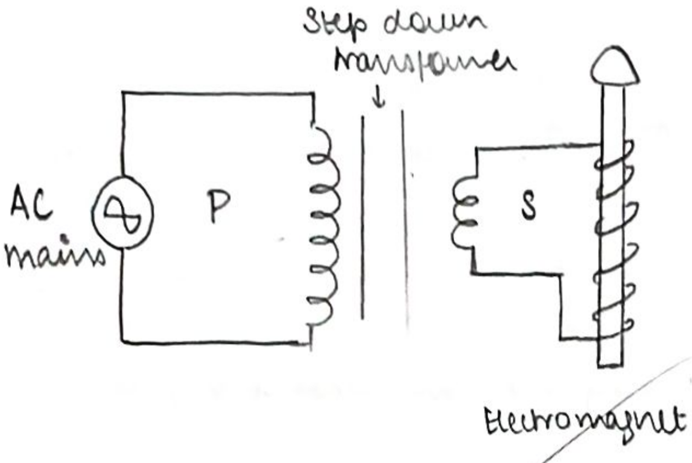
In this expt. the length of the wire and tension are so adjusted that the natural frequency of wire is equal to frequency of the electromagnet.

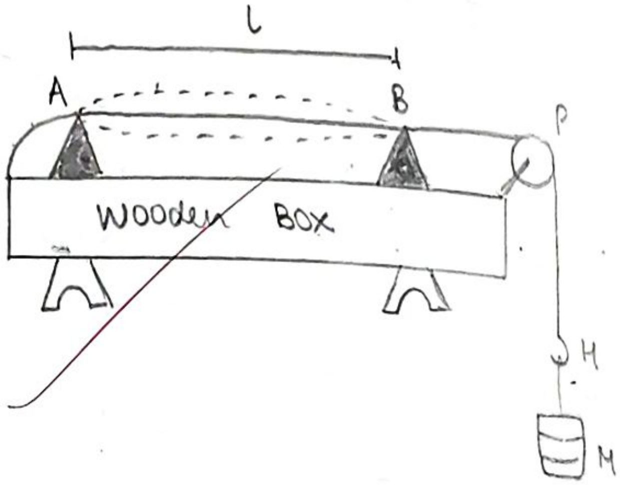
The electromagnet has soft iron cylindrical core on which enameled copper wire is wrapped. Current through the ac mains is stepped down by a step down transformer. and then passed through the copper wire of the electromagnet. The current magnetises the cylinderical core twice during each cycle - first with one polarity when the current flows in one direction and then with the opp. polarity when the current flows in opp direction. When the tip of this cylinderical core is kept very close to the stretched soft iron wire of the sonometer, the wire will be pulled towards the tip of the core 100 times per second. So the natural frequency n of sonometer wire is double the frequency f of the ac mains.

$$f = \frac{n}{2} = \frac{1}{4L}\sqrt{\frac{Mg}{m}}$$

As T, L and m can be measured, n and hence f can be determined. The value of mass per unit length m can be determined either by weighing a definite length of wire or by measuring the radius r and taking the density ρ of material of wire from the table. The mass per unit length is given by $m = \pi r^2 \rho$

Diagram


Step down
transformer
AC
mains
P
S
Electromagnet


l
A
B
P
Wooden Box
H
M

Procedure: 1) Hold the electromagnet vertically in a clamp stand about 2-3 mm above sonometer wire.

2) Bring two wedges A and B close to each other. Cut a small piece of paper fold it into a shape and hang it on the wire between wedges.

3) Suspend a load of 2kg on the hanger and switch on the ac supply. Slide the wedges gradually away from each other till the wire starts vibrating and the rider begins to flutter. Make minor adjustments until the amplitude of vibration of wire is maximum and rider flies off.

4). Measure the length of wire b/w two wedges A and B with metre scale.

5) Increase the dist b/w two wedges by a few cm. Repeat the above process by again putting the rider on wire b/w the wedges but this time slide the wedges gradually towards each other till the rider again flies off. Again measure the length b/w the wedges. The mean of two lengths gives the resonant length.

6) Increase the load in steps and find out the resonant length l in each case.

7) Switch off the ac mains and remove the magnet. Take about 1m of wire and find its wt. by a sensitive balance and hence find mass per unit length m.

Result: The frequency of ac mains = 47.05 Hz
Standard value = 50 Hz
Percentage error = 5.9 %.

Precaution: 1) The string should be uniform, inextensible and kink free

2) The wt M in the formula should include the wt of hanger.

3) The sonometer wire should be of a magnetic material like iron so that it is attracted by the electromagnet.

4) The tip of the core of the magnet should be 2-3 mm vertically above the centre of sonometer wire.

Observation

Length of wire = 150 cm

Mass of wire = 9.12 gm

Mass per unit length, m = 0.06 gm/cm

Acceleration due to gravity, g = 9.8 m/s^2

S.NO	Load M (gm) (gm)	Length for resonance, L			Frequency (Hz)
		wedges moving outward (cm)	Wedges moving inward (cm)	Mean L (cm)	$f = \frac{1}{4L}\sqrt{\frac{Mg}{m}}$
1	1000	65.3 − 41.2	62.5 − 37.5	24.55	42.03
2	1500	64.5 − 37.5	69.5 − 42	27.25	46.34
3	2000	68 − 37	69.3 − 38.1	31.1	46.91
4	2500	69.3 − 36.1	69 − 36.6	32.8	49.70
5	3000	73. − 36.5	72.4 − 36.4	36.25	50.27

Mean frequency = 47.05 Hz

Viva Questions: 1) Why is sonometer box hollow?

1) When the stem of a vibrating tuning fork is gently pressed against the top face of sonometer box, the air enclosed in the box also vibrates. This increases the intensity of sound.

2) What type of wire is used in a sonometer?

The wire should be flexible, should have uniform density throughout and its length should not vary while its vibrating.

3) What is alternating current? What is its frequency?

It is the current which changes its direction many times in a second. The no. of times it changes its direction in a second is called frequency.

4) What is ac mains?

AC mains stands for the main wires which supply alternating current or voltage to a place.

Implications:- 1) A sonometer is a diagnostic instrument used to measure the tension, frequency or density of vibrations.

2) It is used to determine hearing sensitivity.

3) A clinical bone sonometer measures bone density to help determine such conditions as the risk of osteoporosis.

4) It is also used to test for hearing loss and other disorder of ears.

5) to determine the frequency of ac mains.

Teacher's Signature :

Experiment - 3

Aim: To verify Stefan's law by electrical method (using vacuum diode).

Apparatus: A 6 volt battery to heat the filament of the diode, vacuum diode valve EZ-81, DC voltmeter (0-10 volts), DC ammeter (0-1 Amp) and rheostat (100 Ω). Usually all the components

Description of Apparatus: In this expt we use a vacuum diode EZ-81. which has a cylindrical made of nickel. The tungsten heater filament is closely fitted inside the cathode sleeve. A mixture of barium and strontium oxides is sprayed over the outer surface of nickel sleeve from which thermionic emission takes place. Since the cathode sleeve and the heater filament are in close physical contact we take the temp of cathode as the temp of filament. Cathode of the diode is sealed by passing electric current through the tungsten heater filament.

Theory and Formula: E be the energy radiated per second from a unit surface area of a black body at temp T surrounded by another body at T_0 then,

$$E = \sigma(T^4 - T_0^4)$$ here σ = Stefan's constant

For bodies other than black body, power emitted is given as

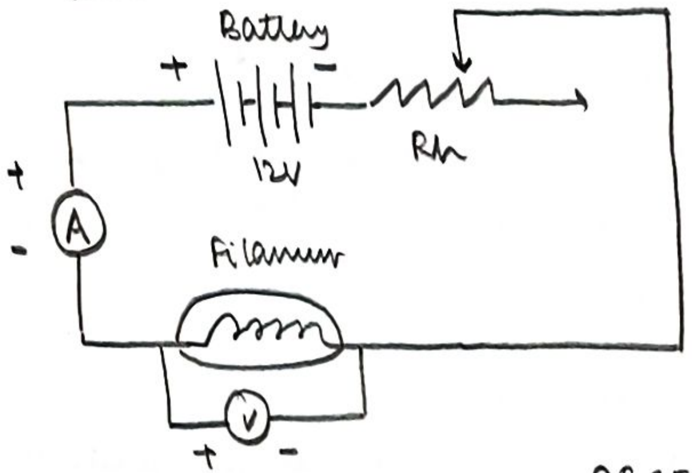
$$P = C(T^a - T_0^a)$$ here C = some const. depends on the material.

$$P = CT^\sigma\left(1 - \frac{T_0^\sigma}{T^\sigma}\right)$$

If $T >> T_0$ then, $P = CT^\sigma$

$$\log_{10} P = \sigma \log_{10} T + \log_{10} C.$$

Diagram



OBSERVATION

- Voltage across filament at glowing point; $V_g = 1.1\,V$
- Current through filament at glowing point; $I_g = 140\,mA$

$$\therefore R_g = \frac{V_g}{I_g} = \frac{1.1 \times 1000}{140}$$

$$R_g = 7.86\,\Omega$$

- Resistance of filament at $0^\circ C$,

$$\frac{R_g}{R_0} = 3.9$$

$$R_0 = \frac{7.86}{3.9}$$

$$R_0 = 2.01\,\Omega$$

S No	Filament Voltage V_f (volts)	Filament Current I_f (mA)	Power radiated $P = V_f I_f$ (Watt)	Filament resistance $R_T = \frac{V_f}{I_f}$ (Ω)	$\frac{R_T}{R_0}$	T(K)	$\log_{10} P$	$\log_{10} T$
1	1.1	140	0.154	7.85	3.90	487.17	-0.65	2.68
2	1.3	170	0.221	7.64	3.80	500	-0.61	2.69
3	1.5	200	0.300	7.50	3.73	490.78	-0.522	2.69
4	1.7	210	0.357	8.09	4.02	528.94	-0.47	2.72
5	1.9	225	0.425	8.44	4.20	552.63	-0.43	2.74
6	2.1	240	0.504	8.75	4.35	572.79	-0.35	2.75
7	2.3	255	0.586	9.01	4.43	589.47	-0.26	2.77
8	2.5	270	0.677	9.32	4.68	610.10	-0.21	2.78
9	2.7	285	0.769	9.66	4.71	619.92	-0.16	2.79
10	2.9	300	0.870	9.66	4.80	631.5	-0.13	2.80

1) Power P radiated by body: In this electrical method tungsten filament of vacuum diode is used as radiating body. The electrical power (VI) should be equal to Power P radiated by the body.

2) Temp T of radiating body: For tungsten filament $R_T/R_0 = 3.9$ where R_T is resistance at glowing position and R_0 is the resistance at 0°C. The temp of radiating body is.

$$\frac{R_T}{R_{0\,273}} = \left[\frac{T}{273}\right]^{1/2}$$

We need filament resistance R_{273K} at 0°C which can be measured by determining the resistance at room temp. That is R_{300K} and temp coefficient of resistance, $\alpha = 0.0053\,K^{-1}$ $[R_T = R_0(1+\alpha t)$

Procedure: 1) Keep the current at zero position by adjusting the current control knob at minimum.

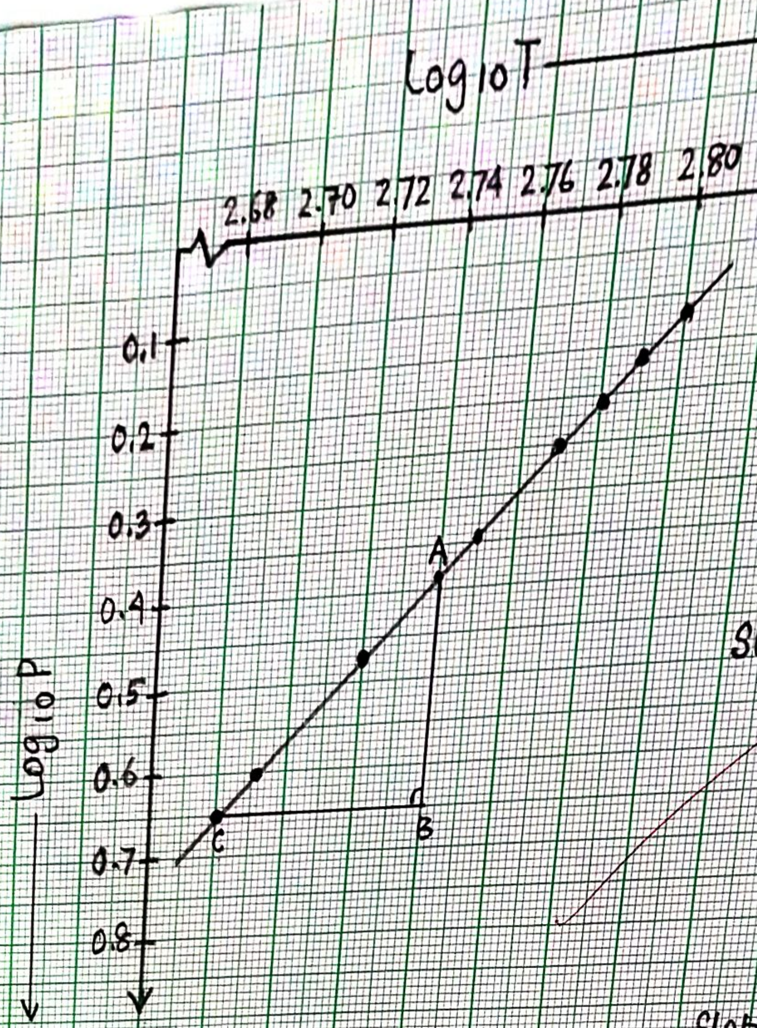
2) Find the value of R_g, resistance at glowing position. Now filament current I is increased and apply some filament voltage (V_f) by adjusting current control knob one by one at 0.2V, 0.4V, 0.6V.... etc. and measure the corresponding filament current I_f in the ammeter after steady state is reached.

3) Repeat the expt for sufficient no. of set of observations so graph can be plotted.

Result: The graph b/w $\log_{10} P$ and $\log_{10} T$ is a straight line and the slope of straight line is about 4 . Hence, Stefans law is verified within the experimental error.

Precautions: 1) To get accurate resistance at a particular temp the V_f and I_f should be read every time after achieving steady state or the time difference b/w each observations should be about 3 or 4 minutes.

2) The slope of line should be determined as accurate as possible.



Scale:

x-axis: 1cm = 0.02 of $\log_{10}T$

y-axis: 1cm = 0.1 of $\log_{10}P$

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

$$= \frac{0.65 - 0.41}{2.74 - 2.68}$$

$$= \frac{0.24}{0.06}$$

Slope = 4

Experiment - 4

Aim: To study charge and discharge of a condenser through resistor.

Apparatus Required: DC supply (15 volt, 25mA), Resistance (10 KΩ, 50 KΩ) capacitor (500 μF, 1000 μF) DC voltmeter (0-25V), DC milliammeter (0-10 mA), toggle switch, stop clock.

Formula used: 1) Charging eqn for capacitor C, through resistor R is
$q = q_0 (1 - e^{-t/RC})$ where RC is time constant and q_0 is maximum charge acquired by the capacitor.

$$i\frac{dq}{dt} = \frac{q_0}{RC} e^{-t/R} = \frac{CE}{RC} e^{-t/RC} = i_0 e^{-t/RC}$$

2) Discharge eqns are:

$q = q_0 e^{-t/RC}$.

$i = -i_0 e^{-t/RC}$ here $i_0 = E/R$ and RC = time const.

Procedure: A) For charging of condenser

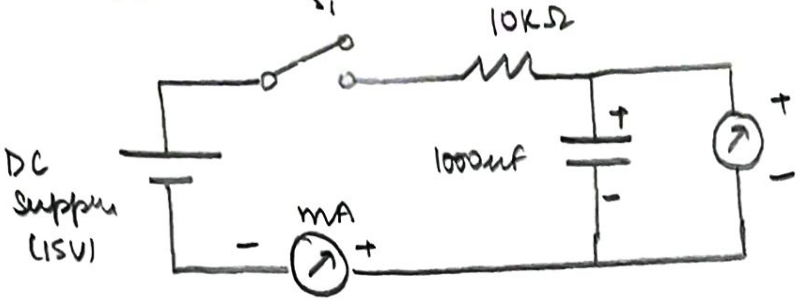
1) Close switch S_1 and simultaneously start a stop clock.
2) Reading in voltmeter will increase while current in millimeter will decrease. Record readings of voltmeter and milliammeter after every 1 sec. or 2 sec till voltage reaches a maximum and current a minimum.
3) Repeat the expt by changing R and C.

B) For discharging of condenser.

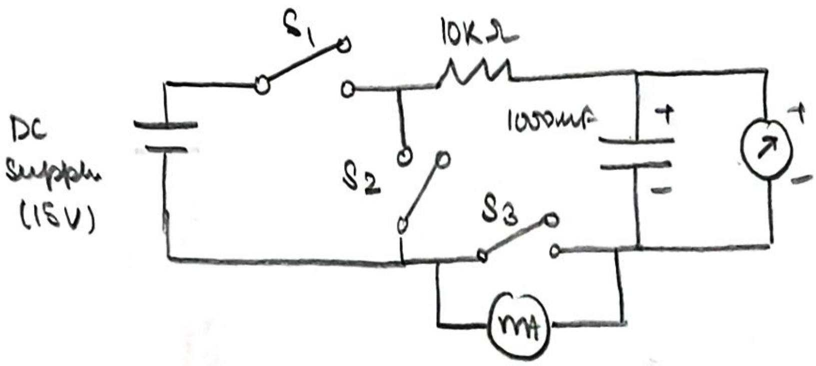
1) Close S_1 till reading in voltmeter reaches maximum value then open S_1, close S_2, S_3. Condenser will start discharging across R. Reading in voltmeter will decrease. Take reading of voltmeter after

Teacher's Signature :

Diagram:



Charging of condenser



Discharging of condenser

OBSERVATION

* For Charging Condenser

S.NO	Time (sec)	Voltage (v)	Current (mA)
1	5	0.51	3.8
2	10	0.34	5.8
3	15	0.24	6.6
4	20	0.18	7.4
5	25	0.10	7.8

R = 10K Ω

C = 1000 uF

* for discharging of condenser

S.NO	Time (sec)	Voltage (v)	Current (mA)
1	5	5.2	0.45
2	10	3.4	0.64
3	15	2.0	0.75
4	20	1.2	0.81
5	25	0.8	0.85

R = 10K Ω

C = 1000 uf

Time const. (Theoretical) $= 10^4 \times 10^3 \times 10^{-6} = 10$ sec every 1 or 2 sec till readings become minimum.

2) For discharge current open S_2. Again close S_1 so that reading in voltmeter reaches a max. Then open S_1, S_3 and close S_2. Reading in milliammeter will start increasing. Take its readings after every 1 or 2 sec.

3) Repeat the expt by changing R and C.

Result: The time constant of circuit from graph 9 sec
Theoretical value of time constant 10 sec.

Sources of Error: 1) It is better to use voltmeter and milliammeter having small least count.

2) Condenser should not be leaky.

3) Appropriate value of R and C gives quite a good no. of observation should be used.

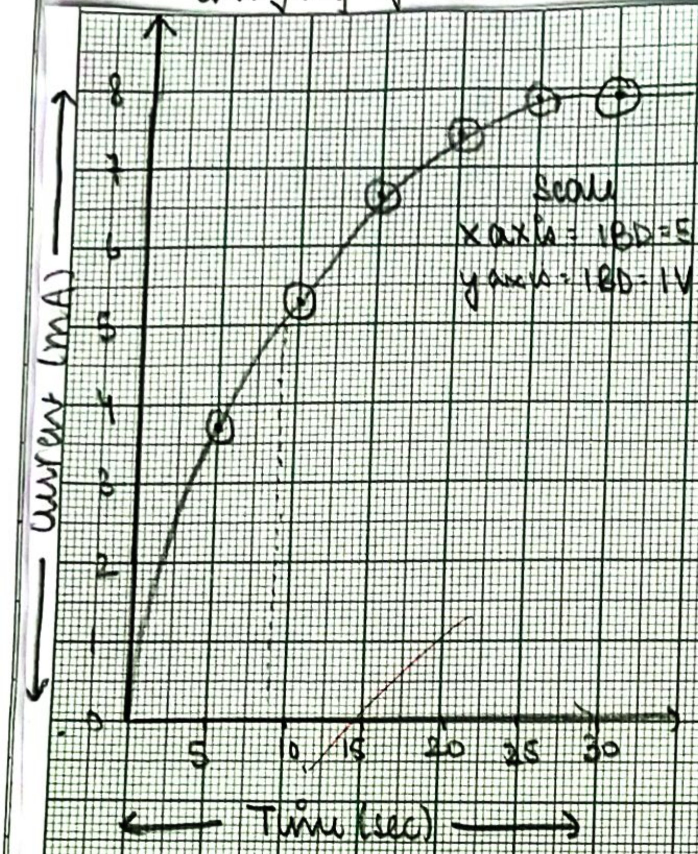
Viva: 1) What is capacitor charging?

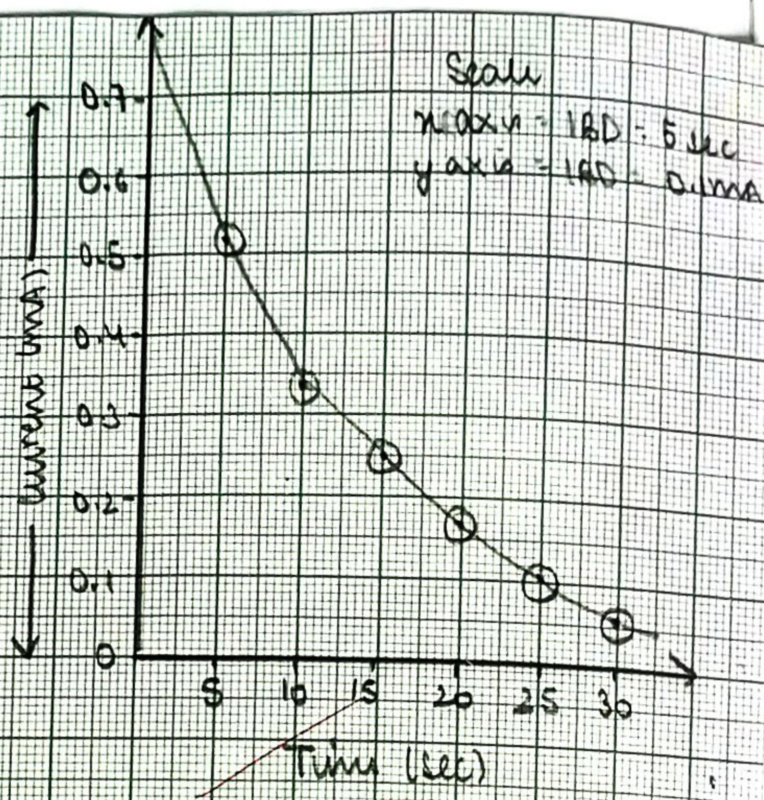
1) The initial current is high when a battery is connected in series resistor and capacitor because the battery carries charge from one plate of capacitor to the other. The charging current asymptotically approaches 0 as the capacitor is charged up to battery voltage.

2) Why does capacitor charge and discharge through resistance?

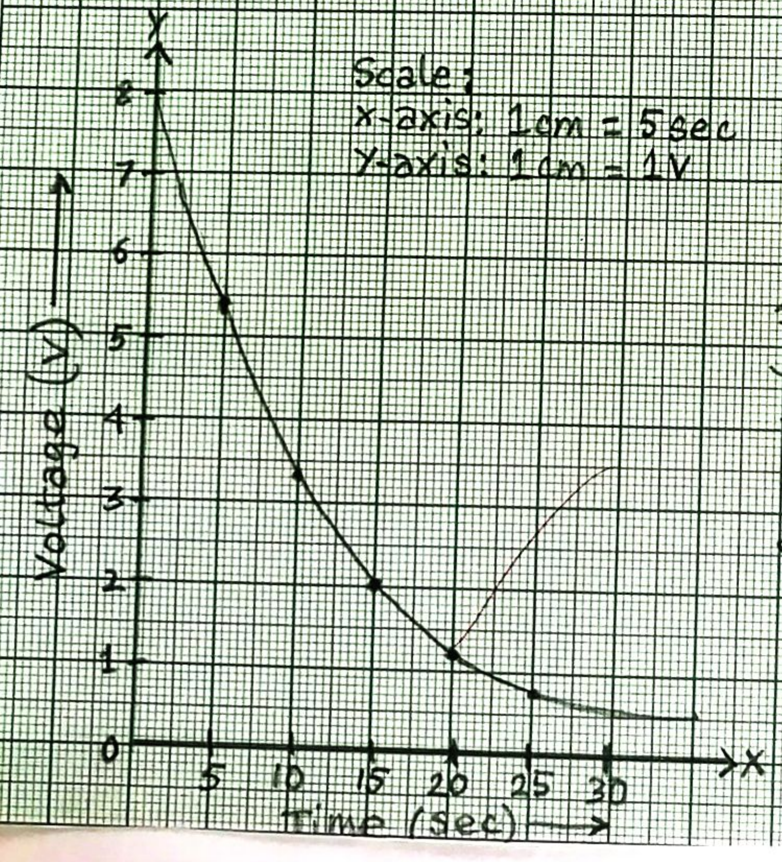
2) Charges pass via the resistor to charge a capacitor in a series circuit with a resistor. The pd across the capacitor increases as chargeing progresses until it reaches the supply voltage value.

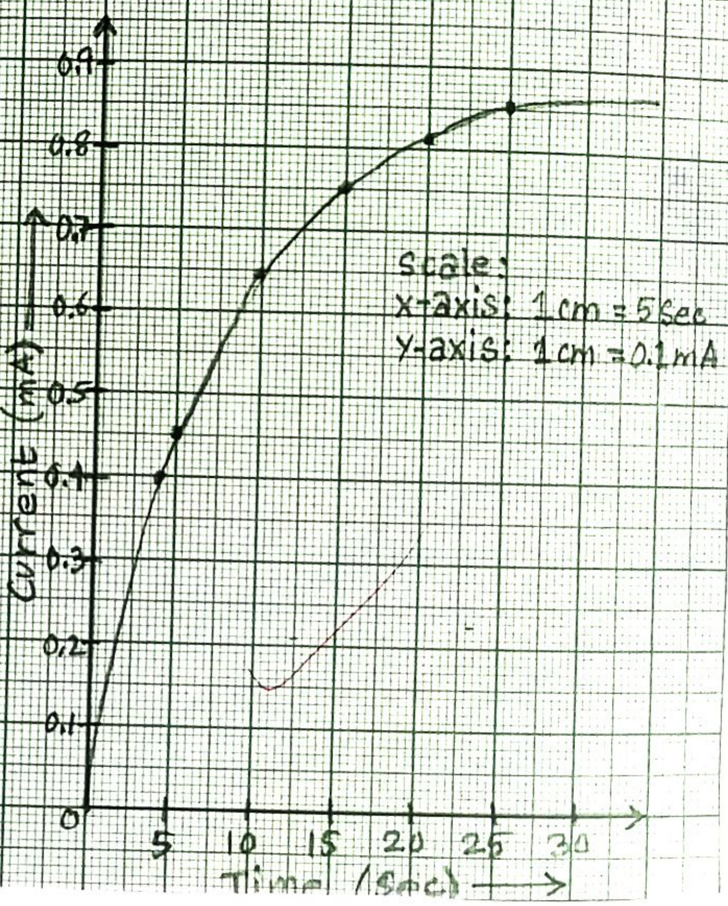
Charging of condenser





Discharging of condenser





Experiment-5

Aim: To determine the forbidden energy gap.

Theory: A semiconductor doped or undoped, always possess an energy gap b/w its conduction and valence bands. For conduction of electricity a certain amount of energy is to be given to the electron, so that it goes from valence band to the conduction band. The energy so needed is the measure of energy gap ΔE b/w two bands.

When a PN junction is reversed biased the current through the junction is due to the minority carriers i.e. due to e^- in the P section and holes in N section. The concn. of these carriers is dependent upon the energy gap ΔE. The reverse current I is function of temp of junction diode

$$\log I = \log\left(A e^{n} N_n N_p \frac{(V_n + V_p)}{P_p \; N_N}\right] - e\frac{\Delta E}{KT} \quad \text{—(1)}$$

where N_n = density of e^- in N , P_p = density of holes in P

V_n = velocity of e^- , V_p = velocity of holes

A = Area of junction , K = Boltzman constant

T = Absolute temp of junction

$$N_N = 2\left(\frac{2\pi m_p KT/e}{h^3}\right)^{3/2} \qquad N_p = 2\left(\frac{2\pi m_p KT/e}{h^3}\right)^{3/2}$$

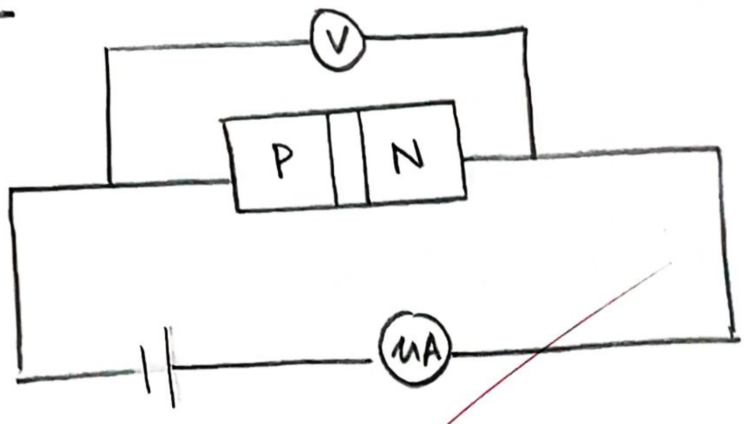
$$\log I_s = \text{constant} - 5.036\,\Delta E\,(10^3/T).$$

Therefore a graph is plotted b/w $\log I_s$ and $10^3/T$. Slope will be $5.036\,\Delta E$.

Panel Description: Besides the main ON/OFF switch & Pilot lamp, there is one ON/OFF switch provided for the heater alongwith a 3 position

Teacher's Signature :

Diagram:



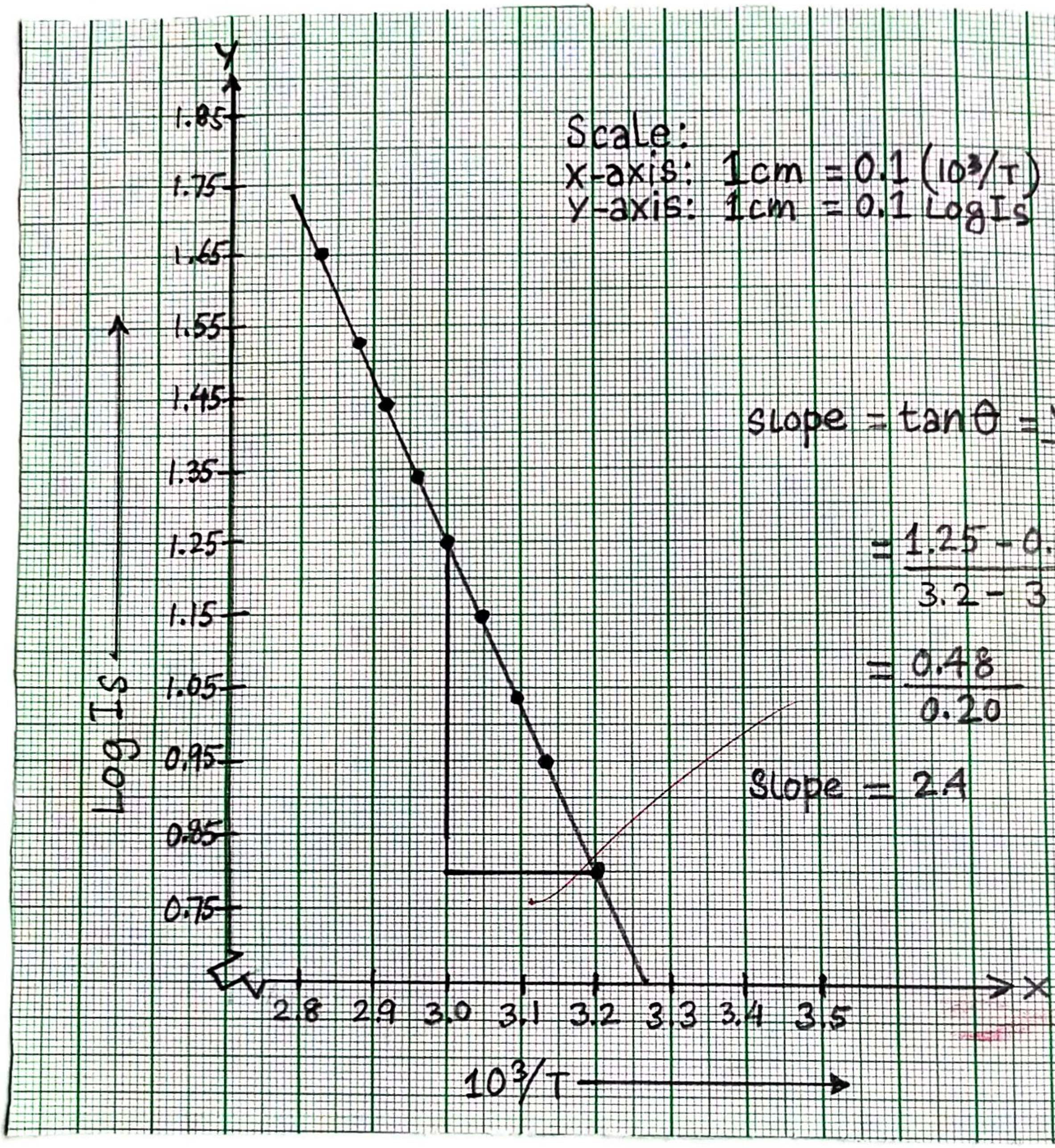
Current in μA (I_s)	Temp (°c)	Temp (K)	$\frac{10^3}{T}$	Log I_s
46	80	353	2.83	1.66
34	75	348	2.87	1.53
28	70	343	2.91	1.44
22	65	338	2.95	1.34
18	60	333	3.00	1.25
14	55	328	3.04	1.14
11	50	323	3.09	1.04
8	45	318	3.14	0.90
6	40	313	3.19	0.77
6	35	308	3.24	0.77

heat control switch. This controls the rate of flow of current to the heater and hence controls the rate at which temp rises. There are 2 meters provided on the front panel, the voltmeter is used to measure the voltage applied across the reverse biased diode and the microammeter is used to measure the current in the circuit. The voltage to be applied can be varied (from 0-10V) by the potentiometer on the lower right side of the panel.

Procedure: 1) Rig up the circuit, using the diode, meters and power supply
2) Set the power supply potentiometer (0-10V) fully anticlockwise
3) Switch ON the main unit.
4) Set the temp control switch to any desireable position and switch 'ON' the heater.
5) Allow the oven temp to exceed upto 65°C as soon as the temp reaches 65°C switch OFF the oven, enabling the temp to rise further and become stable at around 70°C.
6) Apply a suitable reverse bias to the PN junction.
7) When the temp becomes stable start taking the reading of current and temp.
8) Plot a graph b/w reading of $10^3/T$ on x axis and $\log I_s$ on y axis.
9) After determining the slope, calculate band gap as follows.

$$\Delta E = \frac{\text{slope}}{5.036} = 0.47 \text{ eV}.$$

Implications: 1) Band gap engineering is the process of controlling or alternating the band gap of a material by controlling the composition of certain semiconductor alloys, such as GaAlAs, InGaAs and InAlAs. It is possible to construct layered materials



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

$$= \frac{1.25 - 0.77}{3.2 - 3}$$

$$= \frac{0.48}{0.20}$$

slope = 2.4

<u>Calculation:</u> $\Delta E = \dfrac{\text{slope}}{5.036} = \dfrac{2.4}{5.036} = 0.47\,\text{eV}$

Date ___

Expt. No. ___ Page No. ___

with alternating compositions by techniques like molecular beam epitaxy.

ii) These methods are exploited in the design of heterojunction bipolar transistors (HBTs), laser diodes, solar cells.

iii) In photonics, band gaps or stop bands are ranges of photon frequencies where, if tunneling effects are neglected, no photons can be transmitted through a material. The material exhibiting this behaviour is known as photonic crystal. By applying the technique in supersymmetric quantum mechanics, a new class of optical disordered materials have been suggested.

iv) Similar physics applies to phonons in a phononic crystal.

Teacher's Signature : ___

Experiment - 6

Aim: To study the characteristics of a zener diode.

Theory: Semiconductor PN junction diode are generally used as rectifiers. They are suitable for converting AC into DC. But they suffer from the disadvantage that their max safe inverse voltage is relatively small. When a reverse voltage is applied conduction stops and the PN junction diode blocks the reverse current like any other rectifier. As the reverse voltage increases a small current flows in the circuit. If however, the reverse potential is increased beyond a limit, the reverse current increases sharply to a high value. At the voltage where the current increases suddenly is called Break Down Voltage. This sudden increase in current is known as AVALANCHE or ZENER CURRENT.

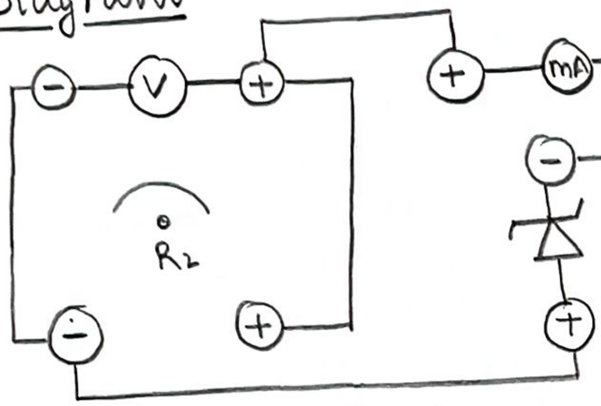
Procedure:- Forward bias characteristics

1) Make all connections as shown in fig.
2) Knob of potentiometer R_1 is kept fully anticlockwise.
3) Now switch ON the unit and set the voltage to 0V.
4) Increase the voltage in small steps and note down the corresponding current.
5) Plot the graph between voltage and current.

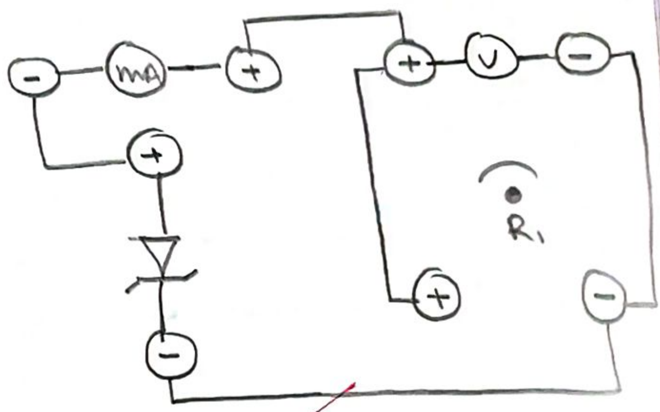
Reverse bias characteristics

1) Make all connections as shown in fig.
2) Knob of potentiometer R2 is kept fully anticlockwise.
3) Now switch ON the unit and set voltage to 0V.
4) Increase the voltage in small steps and note down corresponding current.
5) Plot the graph b/w voltage and current.

Diagram



Reverse Biased



Forward Biased

* Observation Table

→ For Reverse bias

S.NO	Voltage (V)	Current (mA)
1	5.2	0
2	5.4	0
3	5.6	0
4	5.8	0.2
5	6.0	0.25
6	6.2	1.9
7	6.4	3.0
8	6.6	6.0

→ For Forward bias

S.NO	Voltage (V)	Current (mA)
1	0.58	0
2	0.60	0.2
3	0.62	0.2
4	0.65	0.3
5	0.66	0.5
6	0.68	1.0
7	0.7	2.0
8	0.72	3.0
9	0.74	7.0

Implications: 1) In a DC circuit, Zener diode can be used as voltage regulator or to provide voltage reference.

i) The main use of zener diode lies in the fact that the voltage across a zener diode remains const for a larger change in current. This makes it possible to use a zener diode as a const voltage device or voltage regulator.

Working application: With growing popularity of smart phones, arduino based projects are being preffered these days.

These projects involve the use of Bluetooth technology based device. These BT devices requires 3V voltage for operation. In such cases, a zener diode is used to provide a 3V reference to BT device.

2) Waveform clippers (consists of 2 zener diodes) can be used not only to reshape a signal, but also to prevent voltage spikes from affecting ckts. that are connected to power supply.

Viva: 1) What is a zener diode?

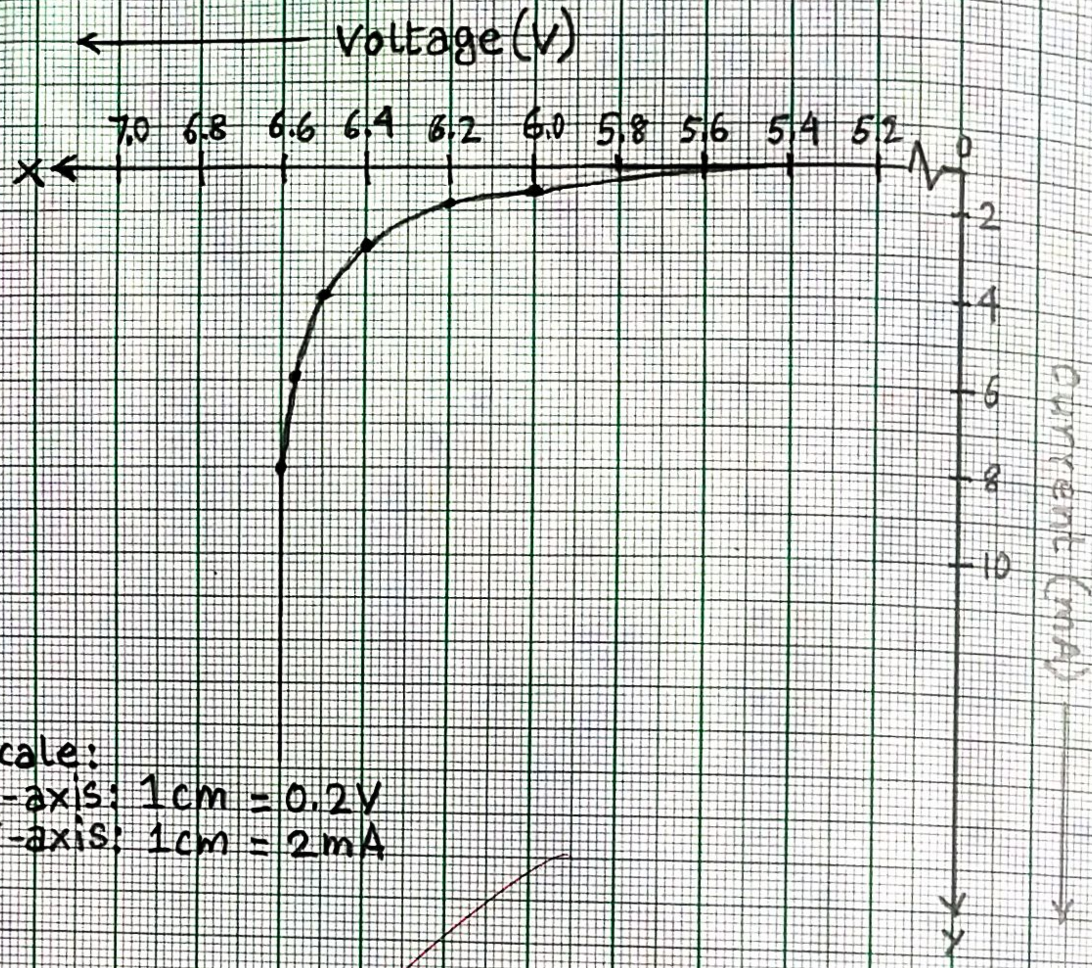
A junction diode which can operate in reverse breakdown voltage region is called zener diode.

2) What is meant by reverse breakdown?

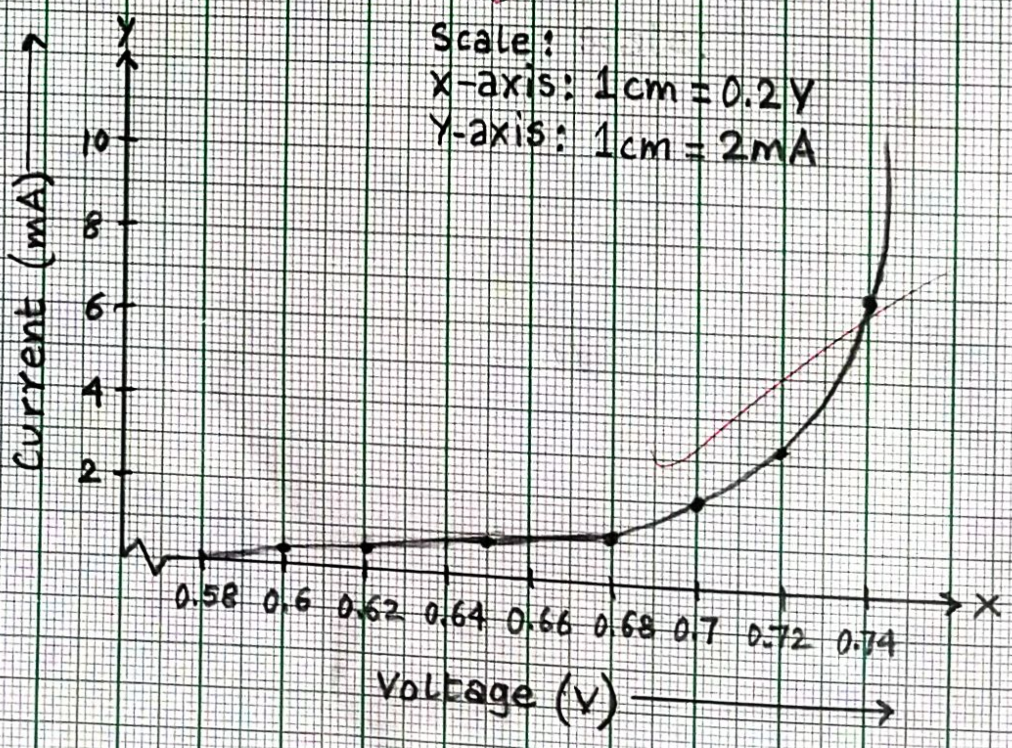
Sudden increase in reverse current of p-n junction diode when a definite reverse voltage is applied is called reverse breakdown.

3) What is zener current?

The cause of reverse breakdown will rupture a very large no. of covalent bonds due to high reverse voltage applied.



Scale:
X-axis: 1cm = 0.2V
Y-axis: 1cm = 2mA



Scale:
X-axis: 1cm = 0.2V
Y-axis: 1cm = 2mA

Experiment - 7

Aim: To measure the diameter of thin wire using diffraction.

Apparatus: Helium-Neon laser. thin wire mounted in holder, screen.

Theory: When a wire is illuminated by a laser beam, a diffraction pattern is observed on the screen. If 'd' is the diameter of wire, diffraction is being observed at a dist 'D' from the screen and 'X' is the width of central maxima, then,

$$d = \frac{\lambda D}{X}$$ where λ = wavelength of light.

Procedure: Illuminate the wire with laser beam and observe the diffraction pattern on the screen. Measure the distance D of the screen from wire and width of central maxima X. Apply the formula to find out the diameter of the wire. Wavelength of He-Ne laser is 6328 A°.

Result: Diameter of given wire is found to be 0.02cm

Precautions: 1) Don't see directly into the laser

2) Keep the mounted wire about 1 m away from laser and from screen 1 to 1.5m away.

Implications: 1) One can calculate the wavelength of light laser used in this expt.

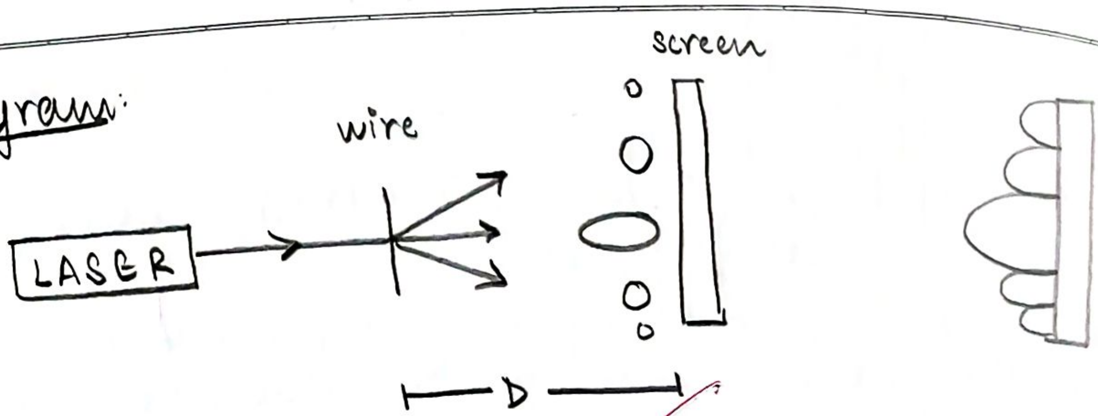
2) One can study the diffraction pattern of laser

3) We can calculate the value of NA using laser

4) It can be very useful in the measurement of atmospheric pollutant such as dust, smoke, etc. Pulse laser is used.

Teacher's Signature : ____________

Diagram:



Observation Table :

S No	Distance from screen (D)	Width of central maxima (x) (in cm)	Diameter of wire (d) (in cm)
1.	100	0.3	0.021
2	150	0.4	0.023
3	200	0.7	0.018

Calculation:

① $d = \frac{\lambda D}{x}$

$= \frac{6328 \times 10^{-8} \times 100}{0.3}$

$= 0.021$ cm

② $d = \frac{\lambda D}{x}$

$= \frac{6328 \times 10^{-8} \times 150}{0.4}$

$= 0.023$ cm

③ $d = \frac{\lambda D}{x}$

$\Rightarrow \frac{6328 \times 10^{-8} \times 200}{0.7}$

$\Rightarrow 0.018$

Mean diameter, $d = \frac{0.021 + 0.023 + 0.018}{3}$

$d = 0.02$ cm.

5) S/C lasers are used for printing.

Viva: Expand the term LASER.

Light Amplification by Stimulated Emission of Radiation

What is diffraction?

Diffraction is defined as the bending of waves around the corner of an obstacle.

What is the value of He Ne laser?

6328 A° (6328×10^{-8} cm)

Hanshika
1/6/23