

- cations of a even small voltage at the junction may rupture covalent bond and generate large no. of charge carriers. Such sudden change is no. of charge carriers called as surge breakdown.

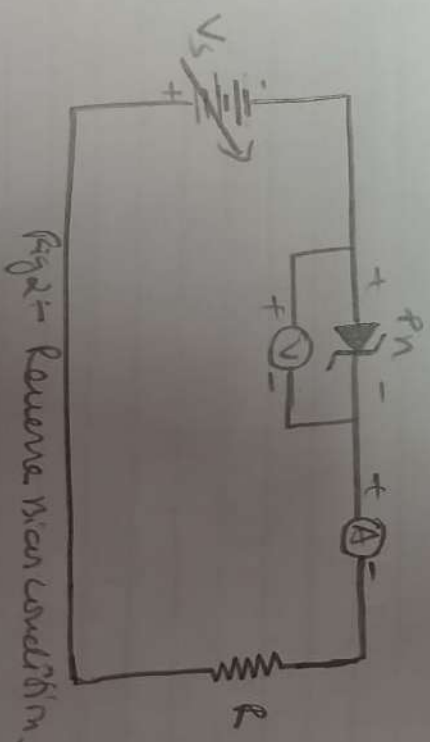
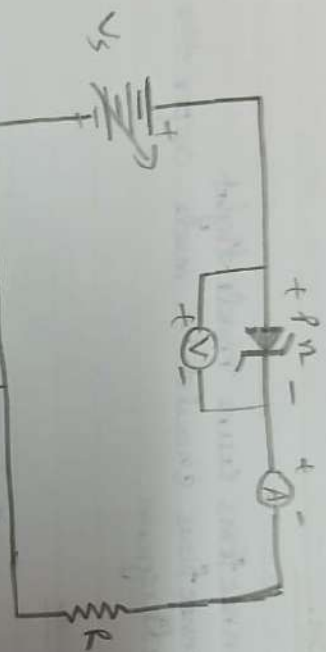
### Procedure

#### ① For Forward Bias

- ① The circuit was connected as shown in the circuit diagram (figure 1.1).
- ② The power supply was switched ON.
- ③ The value of the input DC supply was varied in steps.
- ④ The voltmeter and ammeter readings were noted for each step.
- ⑤ The graph of voltage vs current was plotted.

#### For Reverse Bias

- ① The circuit was connected as shown in the figure 1.2.
- ② The power supply was switched ON.



(iii) But before switching ON the power supply we had replaced the voltmeter with multimeter as we know that voltmeter can give measurement upto a certain limit.

(iv) The value of the input DC supply was varied in steps.

(v) The voltage and current values were noted for each steps.

(vi) The graph of voltage vs. current was plotted.

### Precautions:

1. The connection were made tight
2. The connection should be made as per the circuit diagram.
3. The circuit should not be switched ON until all the connections are made.

Conclusion: After conducting the above experiment, we understand the structure and functioning of a Zener diode and also understand the forward and reverse characteristics of a Zener diode. We also found the regulation of voltmeter in case of non regulated conduction.

AIM: To study the V-I characteristics of Zener diode.

Apparatus Required: Zener diode, Resistor, Ammeter, Voltmeter, Capacitance meter, Connecting wires, Bread board.

Theory: Zener diode is a heavily doped silicon diode. It is a P-N junction diode that does not conduct in reverse bias condition. A Zener diode conducts excellently even in reverse biased condition. These diodes operate at a precise value of voltage called breakdown voltage. A Zener diode when forward biased behaves like an ordinary P-N junction diode. A Zener diode when reverse biased can undergo avalanche breakdown or Zener breakdown.

Zener Breakdown: If both P-side and N-side of the diode are heavily doped, depletion region at the junction reduces. If breakdown voltage is low, the development of strong electric field and applied



Precaution:

- ① The connections were made right
- ② The connections should be made as per the circuit diagram.

Conclusion:

After conducting the above experiment in lab, we understood the structure and functioning of p-n junction diode and also understood the forward and reverse biased characteristics of a silicon diode. and also found the direction of the

# Reverse Bias

Sl. No.	V (supply)	V <sub>s</sub> (V)	I <sub>s</sub> (μA)
1	1	1.063	0
2	2	2.03	0
3	3	3.07	0
4	4	4.06	0
5	5	5	0
6	6	5.37	200
7	7	5.48	300
8	8	5.53	400
9	9	5.55	500
10	10	5.57	600
11	11	5.58	700
12	12	5.59	800
13	13	5.60	900
14	14	5.61	1000
15	15	5.62	1100
16	16	5.63	1200
17	17	5.63	1300
18	18	5.63	

The p-n junction depletion zone breakdown and current begins to flow. usually by either the zone or the avalanche breakdown process.

### Procedure:

- ① First, we took the case of forward biased, the circuit was connected as shown in the figure 1.1.
- ② The power supply was switched ON.
- ③ The value of the input DC supply was varied in steps.
- ④ The corresponding voltage and ammeter readings were noted.
- ⑤ Now, we take the case of reverse biased. The circuit was connected as shown in the figure 1.2.
- ⑥ This time, we removed the voltmeter because voltmeter can give readings upto a particular limit. In case of reverse biased.
- ⑦ The power supply was switched ON.
- ⑧ The corresponding voltage and current readings were noted.
- ⑨ The graph of voltage ( $V_0$ ) vs. current ( $I_0$ ) was plotted.



determines the amount of current that may flow through the diode.

### Function of a p-n junction diode in Reverse Bias

The positive terminal of battery is connected to n-side (cathode) and the negative terminal of battery is connected to the p-side (anode) of a diode. Therefore, very little current will flow through the diode.

### Function of a p-n junction diode in Reverse Bias

The positive terminal of battery is connected to n-side (cathode) and the negative terminal of battery is connected to the p-side (anode) of a diode. Therefore, very little current will flow through the diode. break down. The holes in the p-type material are pulled away from the junction, leaving behind charged ions and causing the width of the depletion region to increase like a wire. because the n-type region is connected to the positive terminal. The electrons will also be pulled away from the junction with similar effect once the electric field intensity increases beyond a critical level.



Table? For forward bias

Table? For forward bias

$\Gamma_b(m)$

Table 2: for Revenue Wren:

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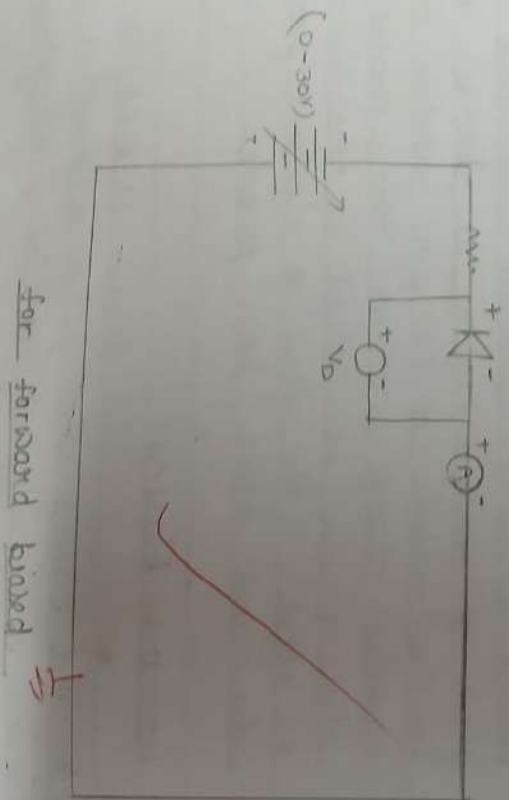
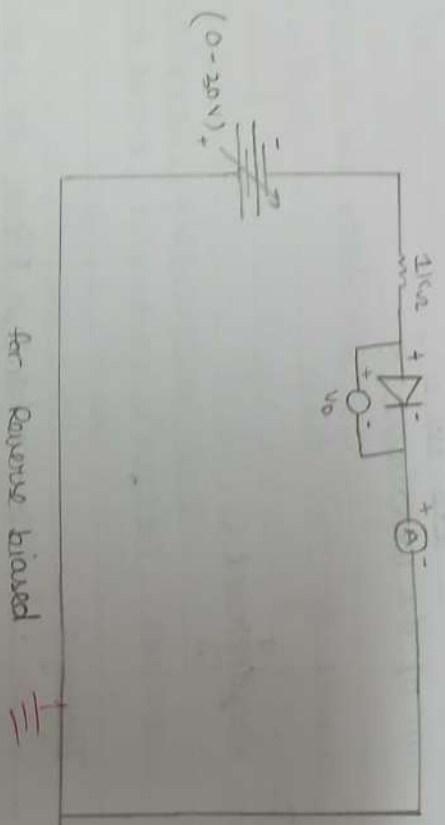
### Reverse biasing

When p-type semiconductor is connected to the negative terminal and n-type to the positive terminal, nearly zero current flows in this condition.

### Function of a p-n junction diode in forward bias

The positive terminal of battery is connected to the p-side and the negative side of the battery is connected to the n-side of the diode. The holes to the p-type region and the electrons in the n-type region are pushed forward. The junction and start is neutralised. The depletion zone reduces its width. The positive potential applied to the p-type material repels the holes while the negative potential applied to the n-type material repels the electrons. The change in potential between the p-side and the n-side decreases with increasing forward bias voltage. The depletion zone eventually becomes thin enough. The amount of minority charge diffusion to the near neutral zones

### Circuit Diagram



Exp

Diagram for forward

Theory

read board



AIM: To study the V-I characteristics of a p-n junction diode.

Apparatus Required: diode, power supply,

Ammeter ( ), Voltmeter, connecting cables, resistor, bread board.

Theory:

A p-n junction is known as a semiconductor or diode. an crystal diode. It is the combination of P-type and n-type semiconductor which offers supply nearly zero resistance to current and forward bias and nearly infinite resistance to the flow of current in reverse bias i.e, current is negligible.

Forward biasing:

When p-type semiconductor is connected to the positive terminal of the voltage source and n-type to negative terminal nearly zero resistance is offered to the flow of current.