Experiment Name: To Study of V-I characteristics Curve of P-N Junction Diode.

Objectives:

1. To plot Volt-Ampere characteristics of Silicon P-N Junction Diode.
2. To find cut-in voltage for Silicon P-N Junction diode.
3. To find static and dynamic resistance in both forward and reverse-biased conditions for the P-N Junction diode.

Hardware Requirement:

1. PN Junction Diode
2. Resistance
3. Regulated power supply
4. Ammeter
5. voltmeter
6. Breadboard and connecting wires

Theory: The volt-ampere characteristics of a diode are explained by the following equations:

$I = I_0 e^{\eta V_T}$

I = current flowing in the diode

I_0 = reverse saturation current

V = voltage applied to the diode

V_T = volt-equivalent of temperature

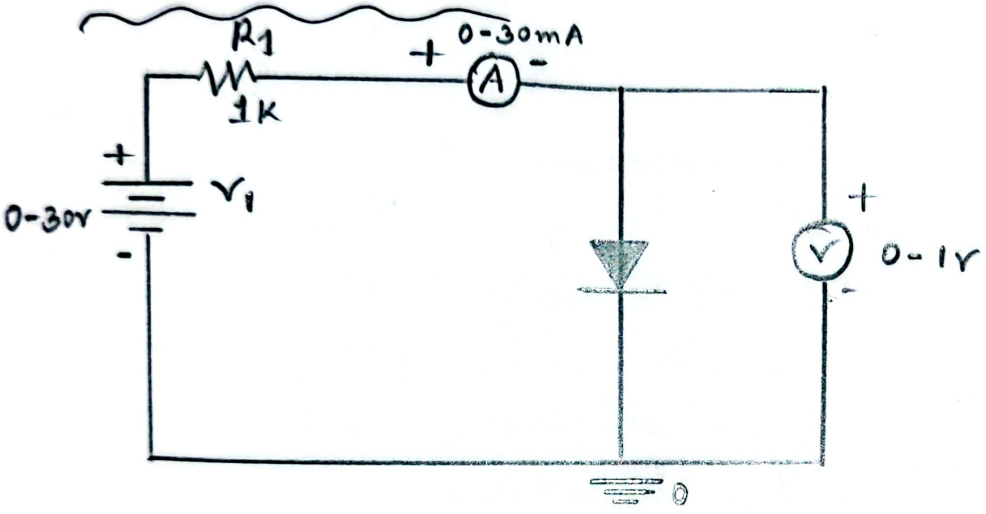
$= \frac{KT}{q} = \frac{T}{11,600} = 26mV$ (at room temp).

$\eta = 1$ (for Ge) and 2 (for Si)

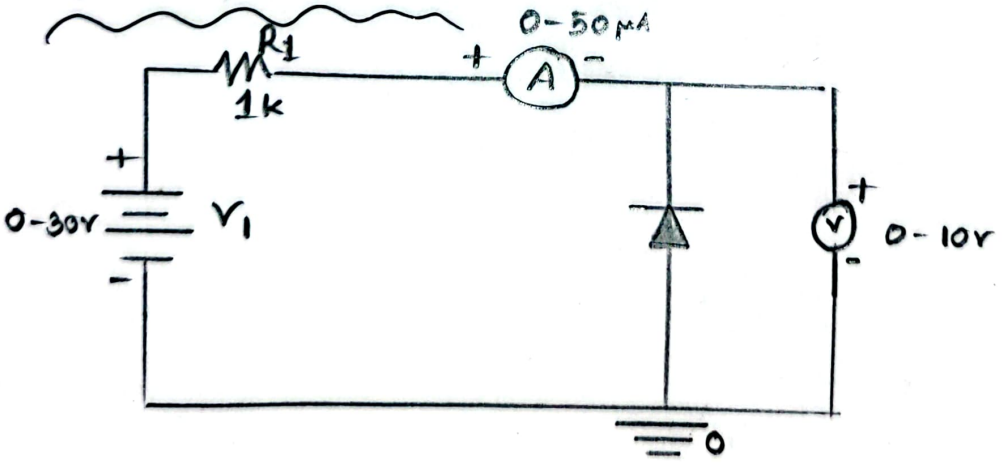
It is observed that the Ge diode has a smaller cut-in-voltage when compared to the Si diode. The reverse saturation current in the Ge diode is larger in magnitude when compared to the silicon diode.

Circuit Diagram:

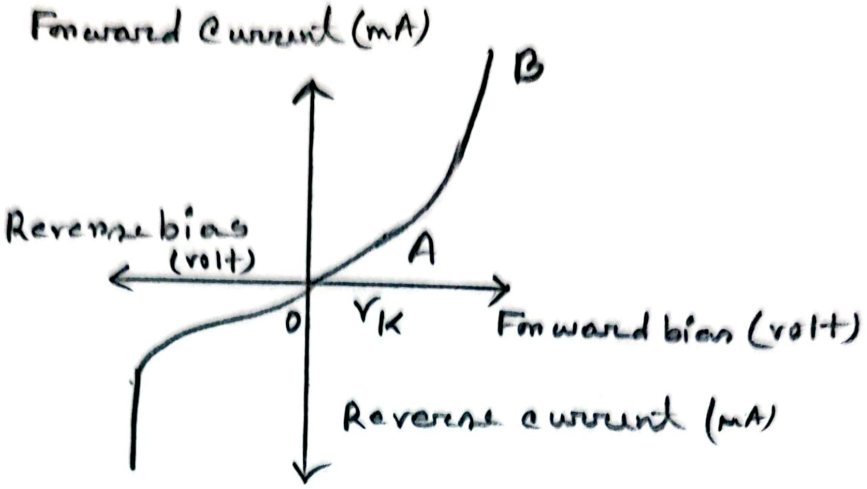
Forward Bias:



Reverse Bias:



V-I Characteristics of P-N junction diode:



Precautions:

1. While experimenting, do not exceed the ratings of the diode. This may lead to damage to the diode.
2. Connect the voltmeter Ammeter in the correct polarities as shown in the circuit diagram.
3. Do not switch ON the power supply unless you have checked the circuit connections as per the circuit diagram.

Experiment:

Forward Biased condition:

1. Connect the P-N Junction diode is in forward bias i.e; Anode is connected to the positive of the power supply and the cathode is connected to the negative of the power supply.

2. Use a Regulated power supply and ~~the cathode~~ of range (0-30)V and series resistance of 1KΩ.

Reverse Biased Condition:

1. Connect the P-N Junction diode in reverse bias i.e; The anode is connected to the negative of the power supply and the cathode is connected to the positive of the power supply.

2. For various values of reverse voltage (V_R) note down the corresponding values of reverse current (I_R)

Tabular column:

Forward Bias:

S.NO	~~Vf (volts)~~ E	I_f (mA)	V_f (volt)
01	1V	0.5mA	0.59V
02	1.5V	2mA	0.629V
03	2V	3mA	0.648V
04	3V	5mA	0.674V
05	5V	9mA	0.7V
06	6V	11mA	0.71V

Reverse Bias:

S.NO	E	V_R (volts)	I_R (mA)
01	1V	1.03V	0
02	2V	2V	0
03	2.62V	2.62V	0
04	3.5V	3.5V	0
05	5V	5V	0

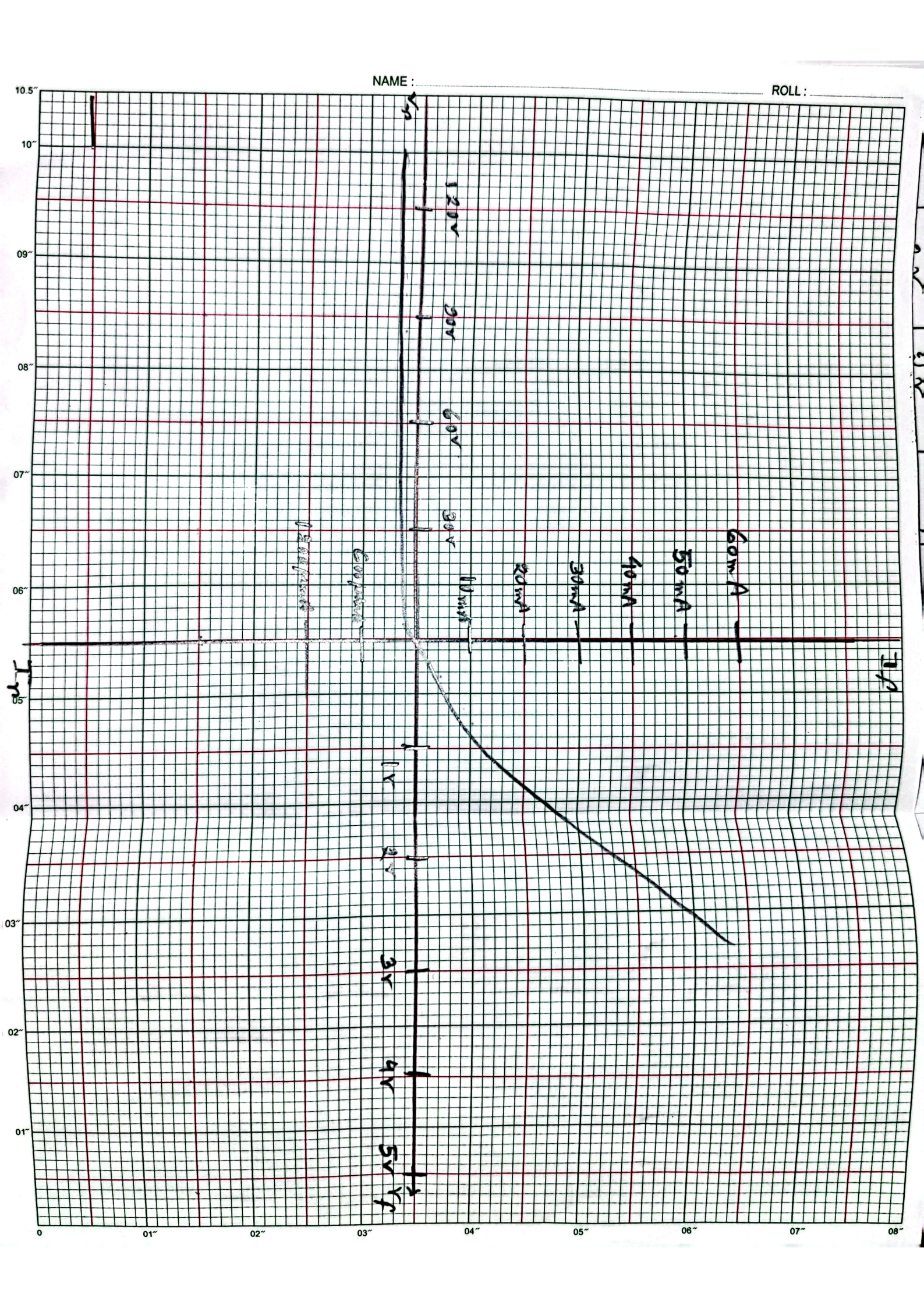
Graph (instructions):

1. Take Graph sheet and divide it into 4 equal. Mark the origin at the centre of the graph sheet.

2. Now mark +ve x-axis as V_F
   -ve x-axis as V_R
   +ve y-axis as I_f
   -ve y-axis as I_R

3. Mark the readings tabulated for the diode forward biased condition in the first quadrant and the diode reverse the biased condition in the Third quadrant.

NAME : ..... ROLL : .....



Result:

Thus, the VI characteristics of the P-N junction diode are verified.

1. Cut in voltage = ... V
2. Static forward resistance = ... Ω
3. Dynamic forward resistance = ... Ω

Conclusion: In this experiment we have to remain careful while taking input of the reverse bias. As the breakdown voltage can flow an infinite amount of current. We have to be careful while taking input. We don't increase the V_R more then 5V as it will be dangerous.

We have to carefully fill up the graph. So that it will show the correct Breakdown voltage.