Experiment No : 13

Aim : To draw the V - I characteristic curve of a p-n junction in forward and reverse bias.

Apparatus : A p-n junction diode, battery , rheostat, 0-3 V voltmeter, 0 – 10 V voltmeter, milli-ammeter (0-100), micro-ammeter (0 – 100), connecting wires.

Theory : *Forward bias* – When the p-type semi-conductor is connected to the positive and the n- type semiconductor is connected to the negative terminal of a battery, the diode is in forward bias. On increasing the forward bias voltage the current starts increasing rapidly after a certain voltage called as the cut-in voltage or the knee voltage.

Reverse bias – When the p-type semi-conductor is connected to the negative and the n- type semiconductor is connected to the positive terminal of a battery, the diode is in reverse bias. On increasing the reverse bias voltage, there is a small reverse current in the order of micro-amperes which increases slightly.

Procedure :

i) For forward bias :

1. Make the circuit diagram as shown in the figure.
2. Note the least count of the voltmeter and milli-ammeter.
3. By moving the rheostat make the voltmeter reading zero and note the current measured by the milli-ammeter.
4. Slowly move the rheostat till the voltmeter shows 0.1 V and then note the corresponding current in the milli-ammeter.
5. Repeat the above step for voltmeter readings 0.2V, 0.3V etc till the voltmeter reads 0.7V(For Ge diode 0.4V)
6. Plot a graph between the forward bias voltage and current, taking the voltage along the x- axis and current along the y-axis.

i) For reverse bias :

1. Make the circuit diagram as shown in the figure.
2. Note the least count of the voltmeter and micro-ammeter.
3. By moving the rheostat make the voltmeter reading zero and note the current measured by the micro-ammeter.
4. Increase the reverse voltage in steps of 1V till the voltmeter reads 10V and measure the corresponding reverse current in the each case.
5. Plot a graph between the reverse bias voltage and current, taking the voltage along the x- axis and current along the y-axis.

Result :

The V - I characteristic curve of a p-n junction in forward and reverse bias has been plotted.

The junction resistance in forward bias = _____ Ω

Precautions :

1. All connections should be clean and tight.
2. Forward bias voltage beyond breakdown should not be supplied.
3. Reverse bias voltage beyond breakdown should not be supplied.

Sources of error :

1. The junction diode may be faulty.
2. The connections are not clean or tight.

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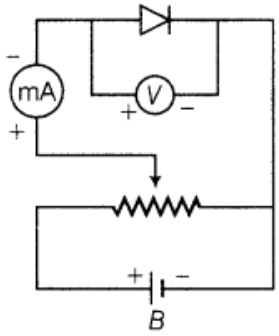
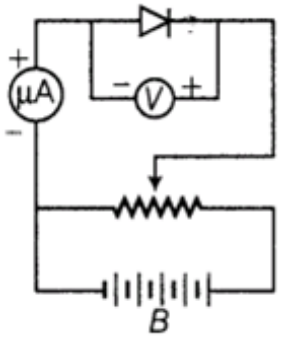
Circuit Diagram



Forward bias



Reverse bias

Observations

a) Forward bias

i. L.C. of voltmeter _____ V
ii. L.C. of milli-ammeter _____ mA
iii. Zero error of voltmeter _____ V
iv. Zero error of milli-ammeter _____ mA

b) Reverse bias

i. L.C. of voltmeter _____V
ii. L.C. of micro-ammeter _____ μA
iii. Zero error of voltmeter _____ V
iv. Zero error of micro-ammeter _____ μA

Observation Table

Sr. No.	*Forward bias voltage (V)*	*Forward Current (mA)*
1	*0*	
2	*0.1*	
3	*0.2*	
4	*0.3*	
5	*0.4*	
6	*0.5*	
7	*0.6*	
8	*0.7*	
9	*0.8*	

Sr. No.	*Reverse bias voltage (V)*	*Reverse Current (μA)*
1	*0*	
2	*1*	
3	*2*	
4	*3*	
5	*4*	
-	-	
-	-	
-	-	
-	*10*	

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