5/5/2022

EXPERIMENT NO.1

EC111

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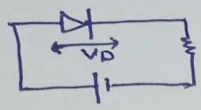
GROUP NO. 18

Name - Vishal Kumar Prajapati Roll - 2101227

Aim:
To draw static forward characteristics of diode.

Apparatus:
IN4007, 1kΩ resistor, power supply, breadboard

Circuit Diagram:



Vin	V_D (V)	I_D (mA)
0	-0.3783	0
0.2	0.3458	4.89 μA
0.4	0.4524	78.78 μA
0.8	0.4924	206.45 μA
0.8	0.5230	0.387
1.0	0.5410	0.739
1.2	0.5564	0.786
1.4	0.5684	0.9060
1.6	0.5790	1.0941
1.8	0.5864	1.2785
2.0	0.5975	1.4156
4	0.6344	3.525
6	0.6576	5.495
8	0.6721	7.612
10	0.6832	9.535
12	0.6920	11.553

Verified
05/05/2022

EXPERIMENT NO. 1

TITLE: TO STUDY V-I CHARACTERISTICS OF A DIODE

OBJECTIVE:

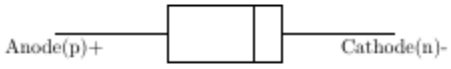
To design the circuit and verify the V-I characteristics.

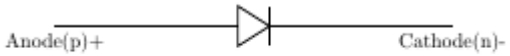
APPARATUS REQUIRED:

- Resister 1kohm
- power supply
- breadboard
- diode IN4007
- wires, etc.

THEORY:

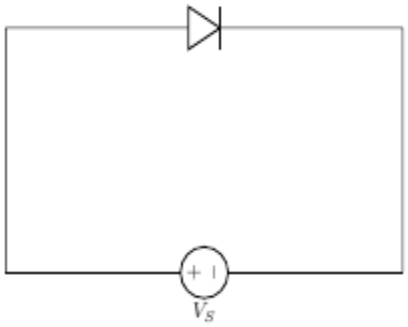
The diode is a device formed from a junction of n-type and p-type semiconductor material. The lead connected to the p-type material is called the anode and the lead connected to the n-type material is the cathode. In general, the cathode of a diode is marked by a solid line on the diode.

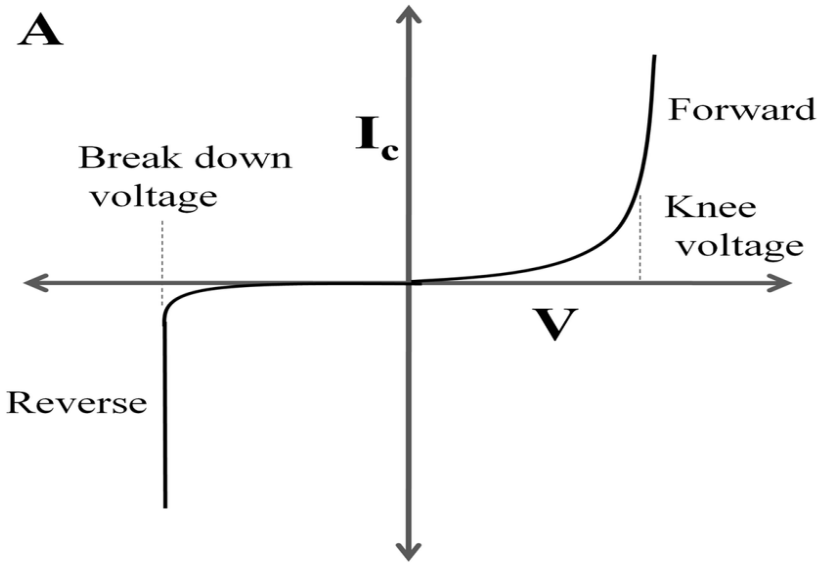




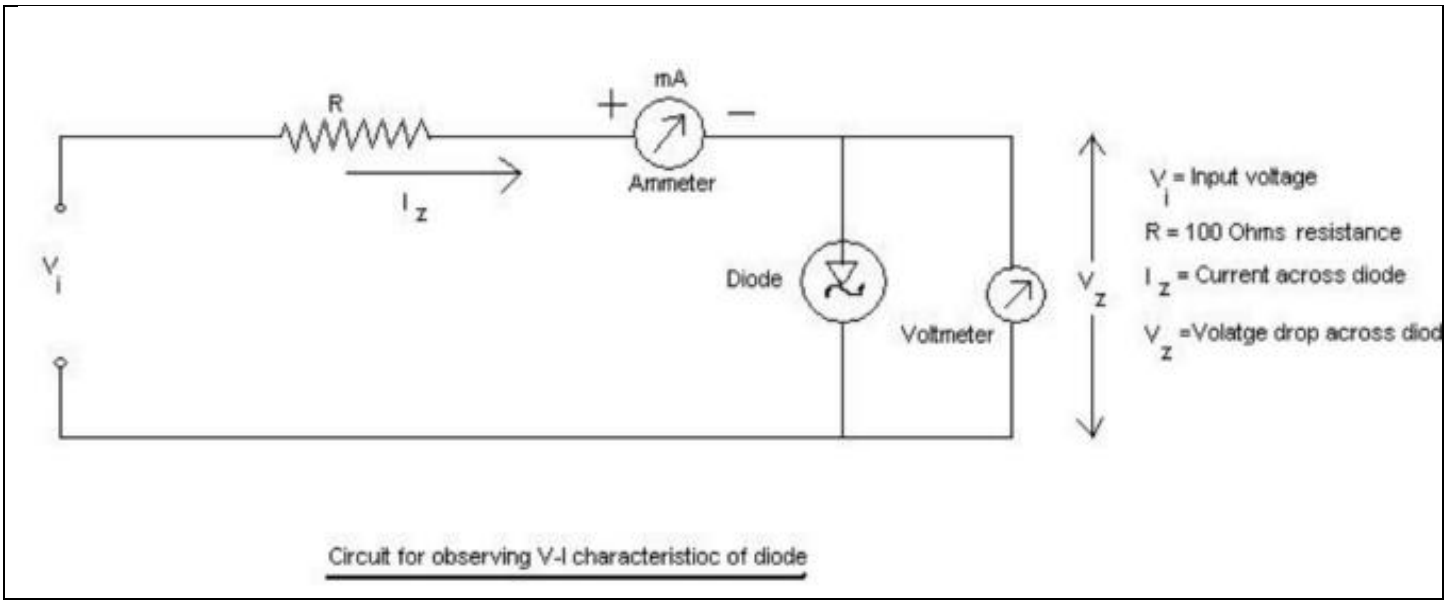
FUNCTION OF P-N JUNCTION DIODE IN FORWARD BIAS:

The positive terminal of the battery is connected to the P side(anode) and the negative terminal of the battery is connected to the N side(cathode) of a diode, the holes in the p-type region and the electrons in the n-type region are pushed toward the junction and start to neutralize the depletion zone, reducing 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 or switches signs. With increasing forward-bias voltage, the depletion zone eventually becomes thin enough that the zone's electric field cannot counteract charge carrier motion across the p–n junction, which as a consequence reduces electrical resistance. The electrons that cross the p–n junction into the p-type material (or holes that cross into the n-type material) will diffuse into the nearby neutral region. The amount of minority diffusion in the near-neutral zones determines the amount of current that may flow through the diode.





CIRCUIT DIAGRAM:



Circuit for observing V-I characteristioc of diode

OBSERVATION:

S.NO.	VOLTAGE V_{IN} (V)	VOLTAGE ACROSS DIODE V_D (V)	CURRENT ACROSS DIODE I_D (mA)
1	0	-0.3783	0
2	0.2	0.3458	0.00489
3	0.4	0.4524	0.07878
4	0.6	0.4924	0.20645
5	0.8	0.5230	0.387

6	1.0	0.5410	0.739
7	1.2	0.5564	0.786
8	1.4	0.5684	0.906
9	1.6	0.5790	1.0941
10	1.8	0.5864	1.2785
11	2.0	0.5975	1.4156
12	4	0.6344	3.525
13	6	0.6576	5.495
14	8	0.6721	7.612
15	10	0.6832	9.535
16	12	0.6920	11.553

CALCULATIONS:

- STATIC FORWARD RESISTANCE $R_{DC}=V_D/I_D$
- DYNAMIC FORWARD RESISTANCE $R_{AC}= \Delta V_D/ \Delta I_D$
- AVERAGE RESISTANCE $R_{AVG}= \Delta V_D/ \Delta I_D$

S.NO.	VOLTAGE V_{IN} (V)	STATIC RESISTANCE (ohm)	DYNAMIC RESISTANCE (ohm)
1	0	Infinite	148078
2	0.2	1270.14	1442.69
3	0.4	1185.58	313.308
4	0.6	1077.74	169.482
5	0.8	838.836	51.134
6	1.0	937.913	327.66
7	1.2	1042.17	100
8	1.4	1045.19	56.353
9	1.6	1049.17	40.1302
10	1.8	1037.7	80.9628
11	2.0	1035.74	17.4931
12	4	984.0	11.7766
13	6	986.242	6.8493
14	8	981.242	5.7723
15	10	983.726	4.3605
16	12	981.39	59.8979

AVERAGE FORWARD RESISTANCE = 942.25 Ohm

RESULT:

Analyze the V-I characteristics of a diode.