8. PN JUNCTION DIODE - FORWARD CHARACTERISTICS

AIM:

To draw I-V(forward)characteristics of a PN junction diode in forward bias.

APPARATUS REQUIRED:

A PN junction diode,A battery eliminator, a key, a voltmeter(0-3V), an ammeter (0-100mA), a rheostat,connecting wires.

THEORY:

1. Forward bias: When an external voltage is applied to a p-n junction diode in such a way that the p-side is at a higher potential with respect to the n-side, it is said to be forward biased.
2. Threshold voltage or "Cut-in" voltage: When the p-side is connected to the positive terminal of the battery and the voltage is increased, initially a negligible current flows till the applied voltage crosses a certain value. After a characteristic voltage, the diode current increases significantly (exponentially), even for a very small increase in the diode bias voltage. This voltage is called the threshold voltage or cut-in-voltage of the diode.
3. Reverse bias: When the n-region of a p-n junction diode is at a higher potential with respect to the p-region, it is said to be reverse biased. In reverse bias, the p-side of the p-n junction diode is connected to the negative of the battery.
4. Reverse saturation current: As the applied voltage is increased in the reverse biased condition, starting from zero value, the current increases, but soon becomes constant. This current is very small (a few microamperes). It is called the reverse saturation current.

PROCEDURE:

1. Note the range and least count of the given voltmeter (V) and milliammeter (mA)
2. Connect the battery, p-n junction diode, voltmeter, milliammeter, rheostat as shown in a circuit diagram.
3. Adjust rheostat slightly and slowly for each value of voltmeter and record milliammeter readings under V and I.
4. Increase the voltage in equal steps and note the corresponding ammeter reading and note them.
5. Plot V-I graph.
6. Note down the cut in or knee voltage of the given diode.
7. Calculate the dynamic resistance from the graph.

PRECAUTIONS:

1. Make all connections neat,tight and clean.
2. Current should be passed for minimum time.
3. Never increase the value of the voltage too much across the diode.

SOURCES OF ERROR:

1. The connections may not be tight.
2. The terminals may not be correctly connected.
3. The PN junction diode may be faulty.
4. The forward supply voltage may cross the limit of tolerance.

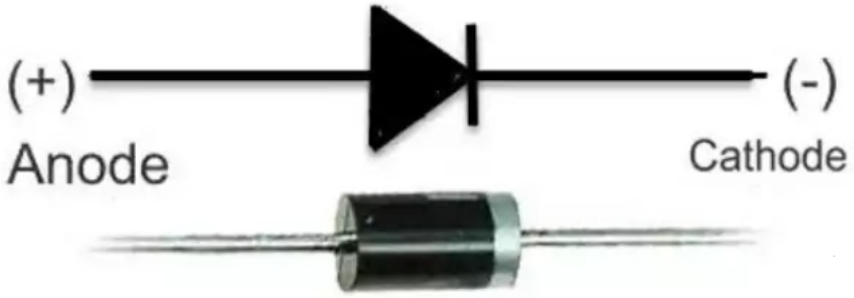
RESULT:

1. The V-I characteristics of a given PN junction diode is drawn.

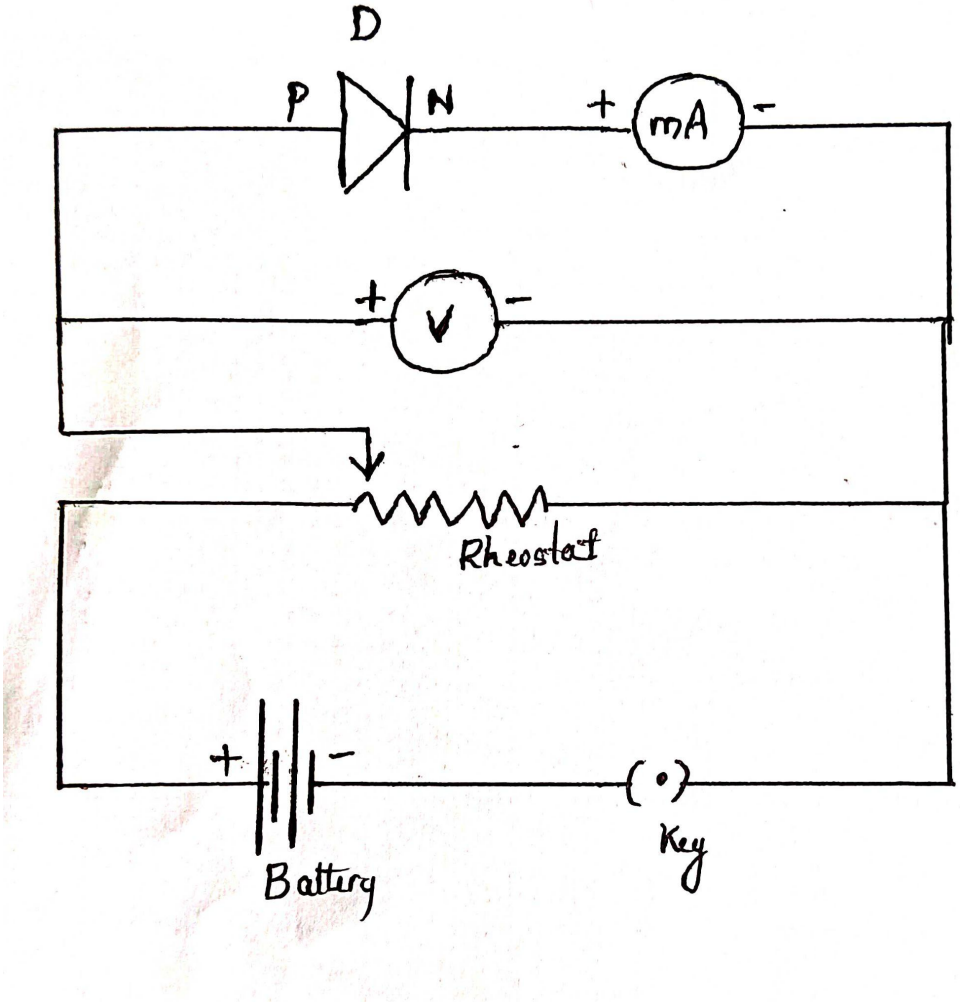
2. The knee voltage of the given diode = ...V

3. The dynamic resistance of the given diode = ...Ω

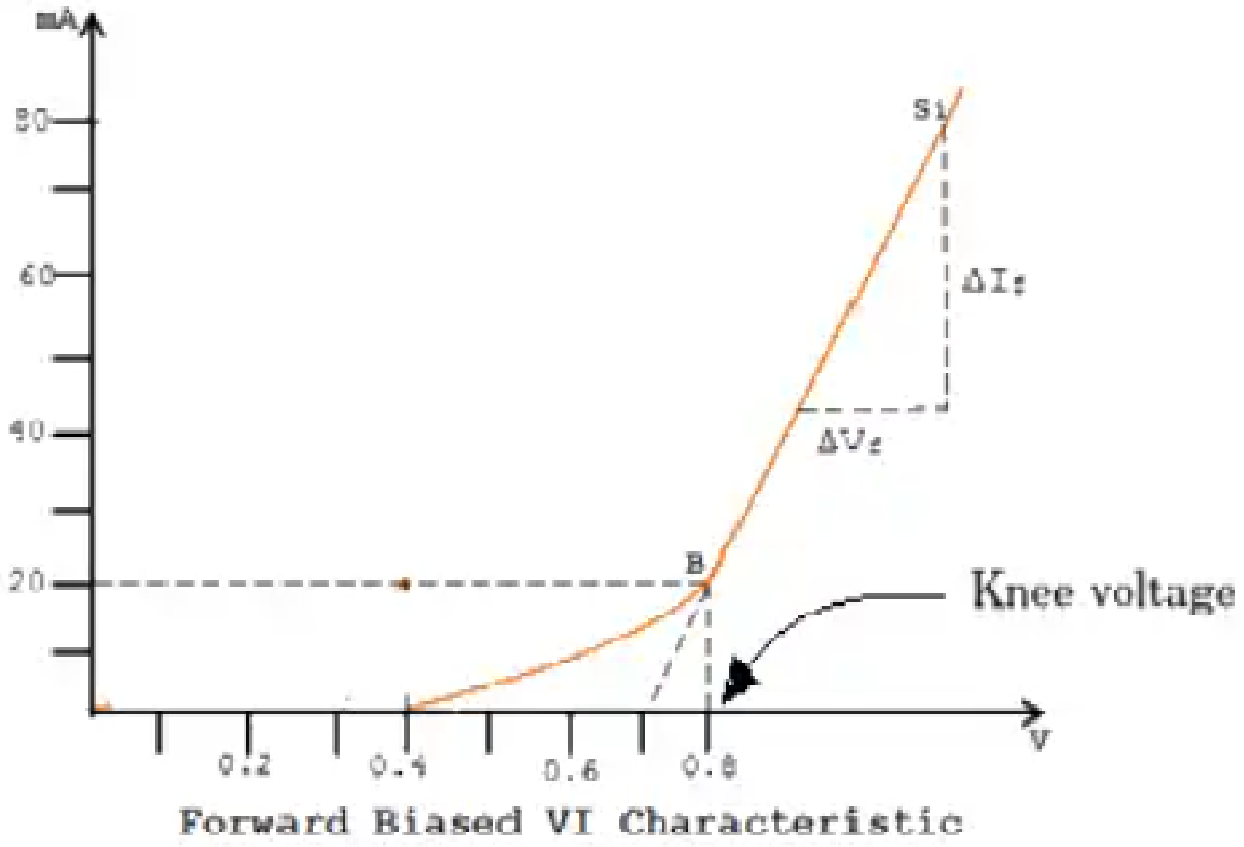
Circuit Symbol



CIRCUIT DIAGRAM:



Model Graph



Forward Biased VI Characteristic

OBSERVATIONS & TABULATIONS;

LC of the milliammeter = ...mA

LC of the voltmeter = ...V

Sl.No	Forward Voltage,V_f (V)	Forward Current,I_f (mA)

Calculation

The knee voltage of the given diode = ...V

The dynamic resistance of the given diode = ----------Ω