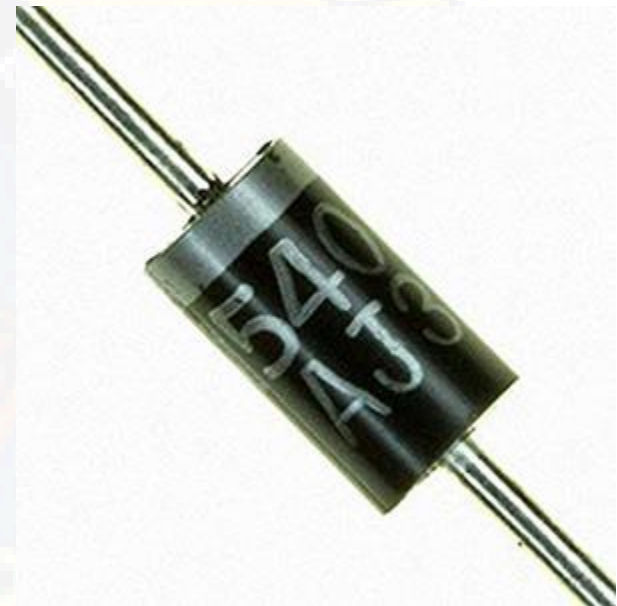




UNIT IV

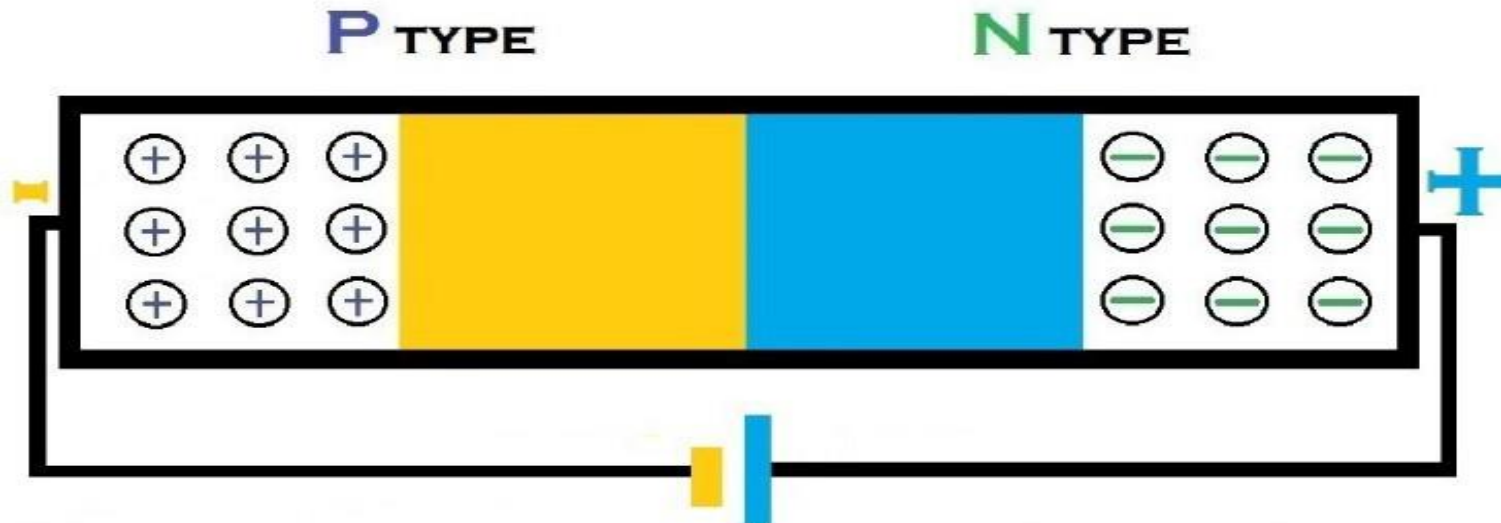


PN JUNCTION DIODE



WHAT IS PN JUNCTION

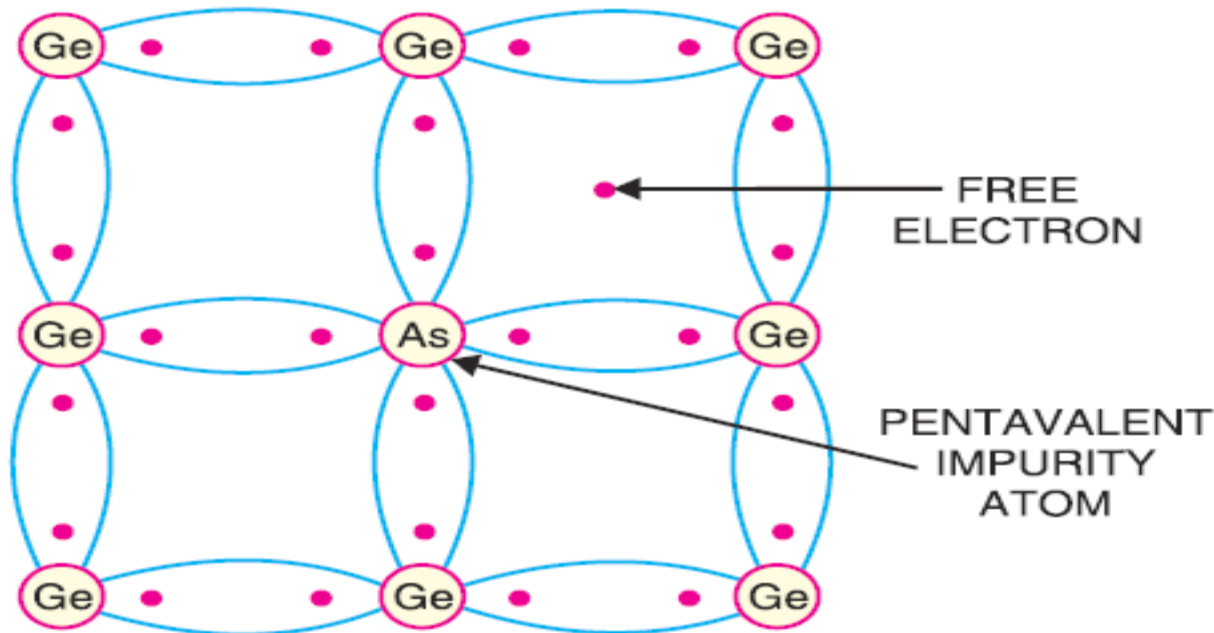
- PN-junction: When P-type semiconductor is suitably joined to N-type semiconductor, the contact surface is called PN-junction.





N-TYPE SEMICONDUCTOR

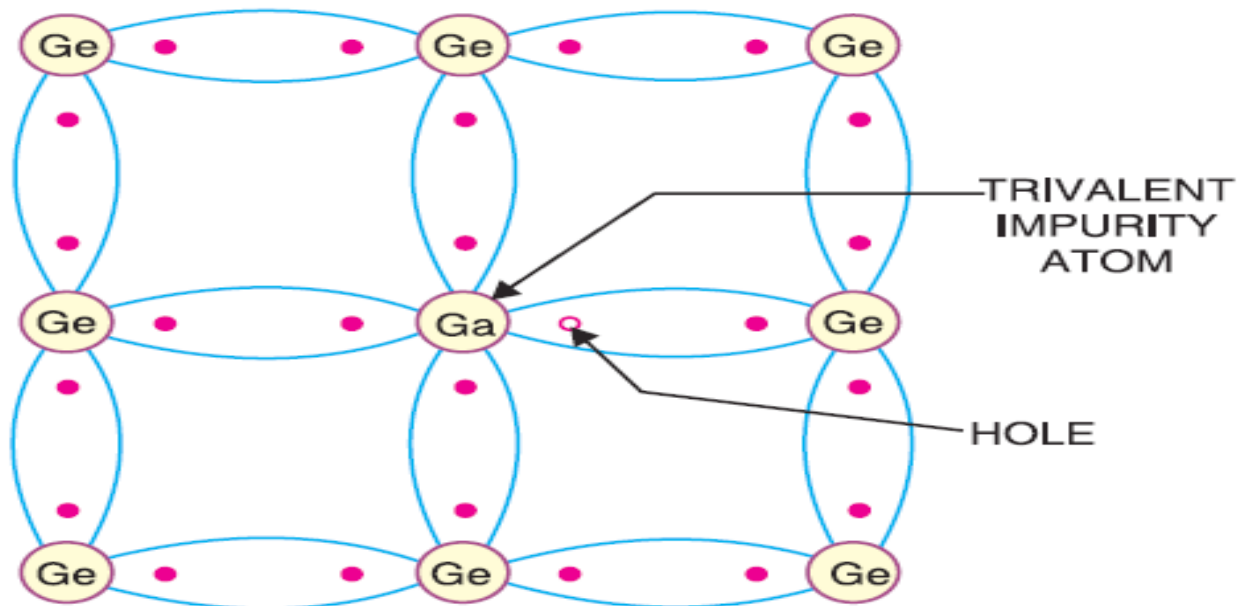
□ **N-Type**: When a small amount of pentavalent impurity is added to a pure semiconductor, it's known as a N-type semiconductor.





P-TYPE SEMICONDUCTOR

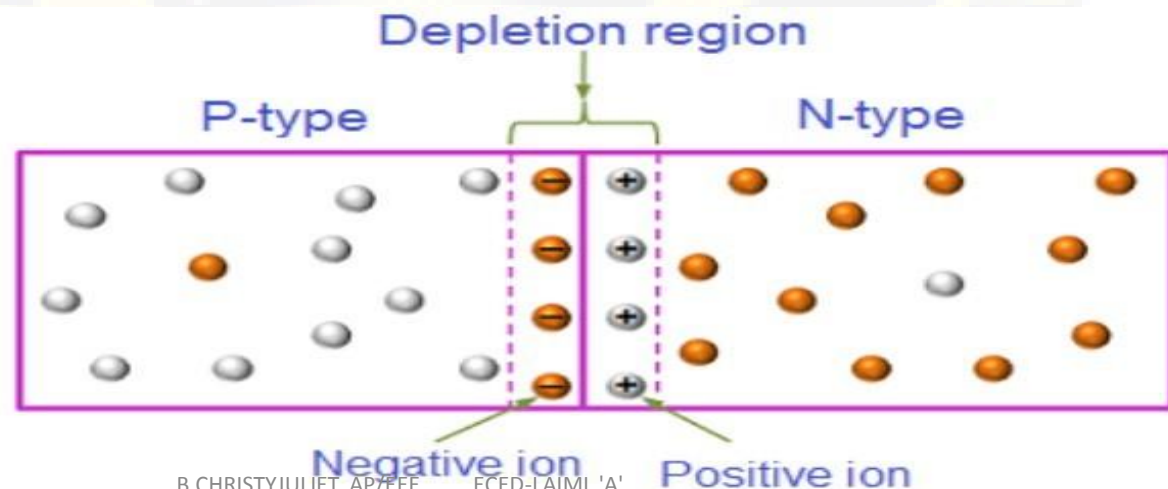
□ **P-type**: when a small amount of trivalent impurity is added to a pure semiconductor, it's called P-type semiconductor.





DEPLETION REGION

- The depletion region, also called depletion layer, depletion zone. The combining of electrons and holes depletes the holes in the P-region and the electrons in the N-region near the junction.





BIASING A PN-JUNCTION

- In relation to a PN junction, there are two bias conditions:

Biassing a PN-junction

Forward biasing

Reverse biasing



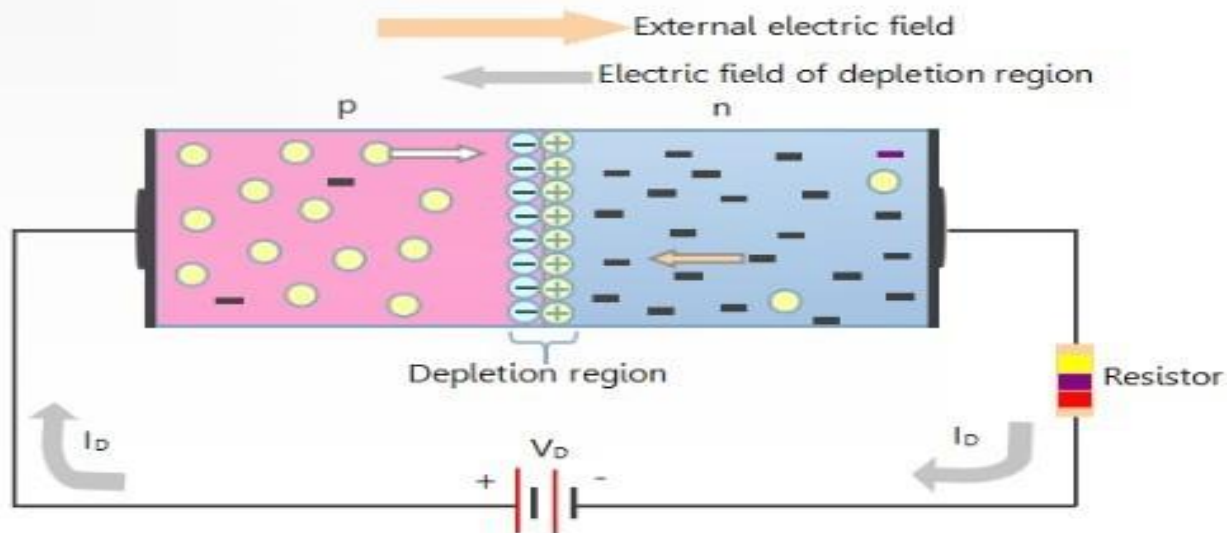
BATTERY CONNECTION

- **Forward Bias Mode:** Positive terminal connected to P-region and negative terminal connected to N-region.
- **Reverse bias mode:** Negative terminal connected to P-region and positive terminal connected to N-region.



FORWARD BIASING

- When voltage is applied across a diode in such a way that the diode allows current and the potential barrier reduced, the diode is said to be forward-biased.

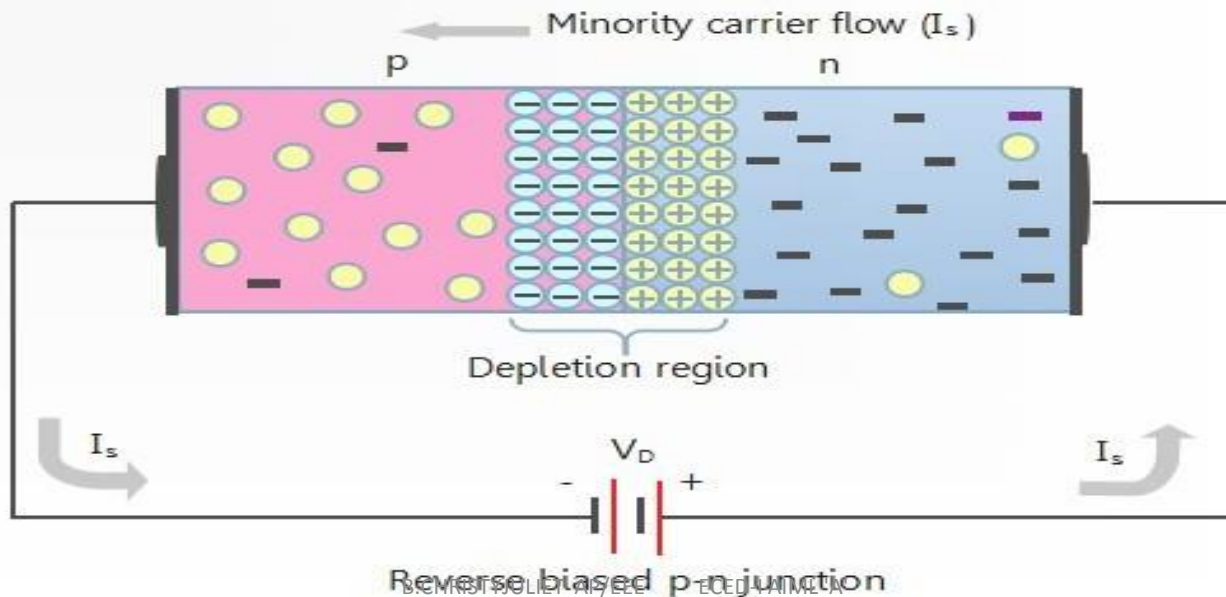


Forward biased p-n junction



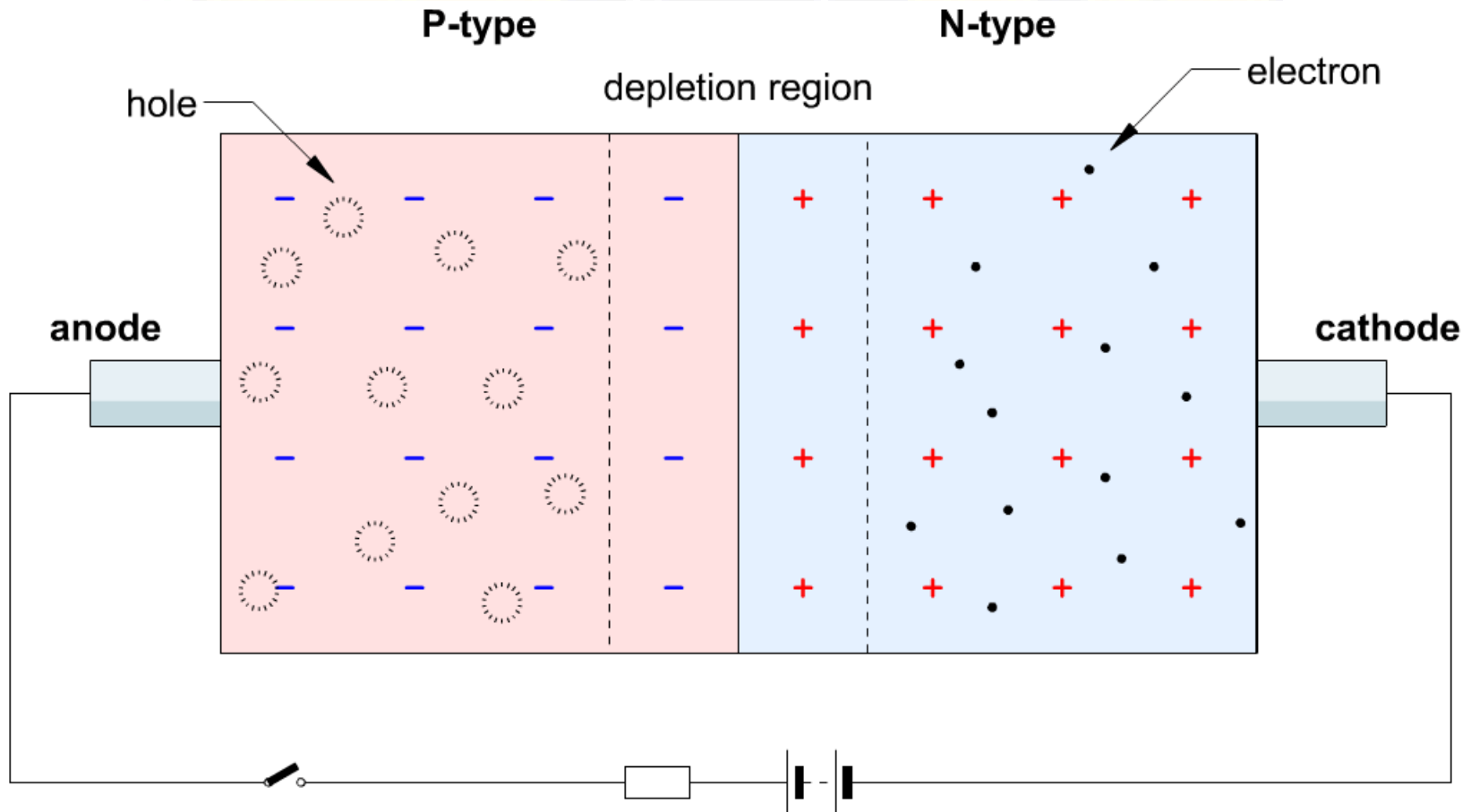
REVERSE BIASING

- When voltage is applied across a diode in such a way that the diode prohibits current and potential barrier increase, the diode is said to be reverse-biased.



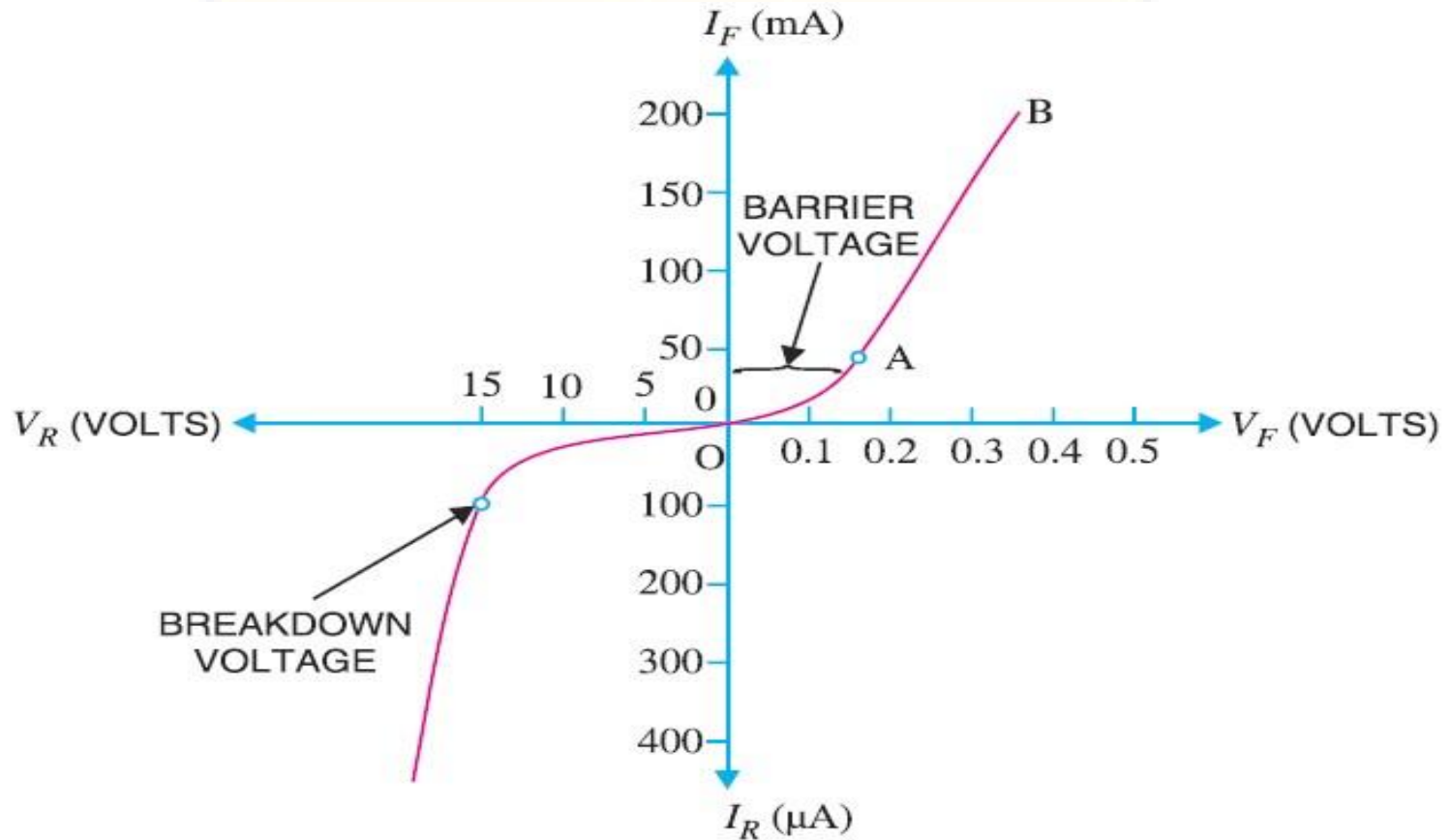


ANIMATION





V-I CHARACTERISTICS OF PN-JUNCTION



The curve drawn between voltage across the junction along x axis and current through the y axis.



IN FORWARD BIAS

- No current flows until the barrier voltage (0.3 for Ge) is overcome.
- Then the curve has linear rise and the current increase with the increase forward voltage.
- Above the 3v, the majority carriers passing the junction gain sufficient energy to knock out the electrons.
- Therefore, the forward current increase sharply.



IN REVERSE BIAS

- Junction resistance, potential barrier increase.
- When reverse voltage is increased beyond a value, called breakdown voltage.
- Reverse current increase sharply.
- Above 25 reverse voltage, destroys the junction permanently.



ADVANTAGE

- No filament is necessary.
- Occupies lesser space.
- Long life.



Applications

- Rectifiers
- Switch in dc power supplies
- Clipping Circuits
- Detectors
- Clamping Circuits