

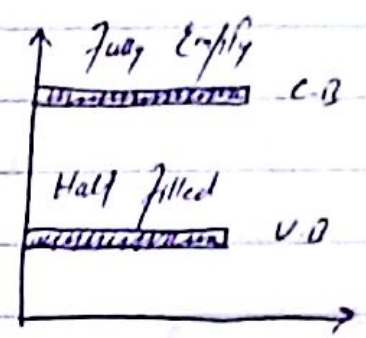
(Lecture 5) Semi-Conductors

There are two types of semi-conductors:

- Intrinsic or pure semi-conductors.
- Extrinsic or impure semi-conductors.

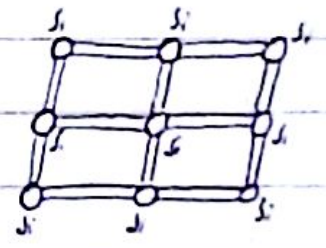
Intrinsic semi-conductors:-

- They have half-filled valence band and complete empty conduction band.



- They behave like insulator at 0°K.
- The number of electron-hole pairs is directly proportional to temperature.

$$(e^- - h) \propto \text{Temp.}$$

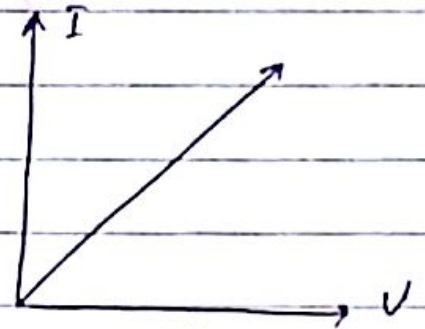


- They have complete covalent bond structure.
- Electron-hole pairs are thermally generated.
- The conductivity of material is decreased by increase in temperature.

Conduction in pure Semi-Conductor :

• Position Temperature Response

- All the conductors are Ohmic in nature.
- Semi-conductors are non-Ohmic materials.
- In Semi-conductors, we have -ve Temperature response.



Ohm's Law:-

$$I \propto V$$

$$I = \frac{1}{R} V \Rightarrow V = IR$$

Mobility of electrons and holes

- Conduction electrons have high mobility than holes in valence band.

Important Questions:-

- i) Prove that Semi-conductors are non-ohmic?
- ii) Explain Semi-conductors' conduction through Energy band diagram?