Types of semiconductor.

Intrinsic semiconductor

- Pure semiconductor (Free from impurities)
- Ex. Si, Ge
- Less conductivity

Extrinsic semiconductor

When some impurities are added in the pure semiconductor it will become extrinsic semiconductor.

Ex. Trivalent - P-type
pentavalent - N-type

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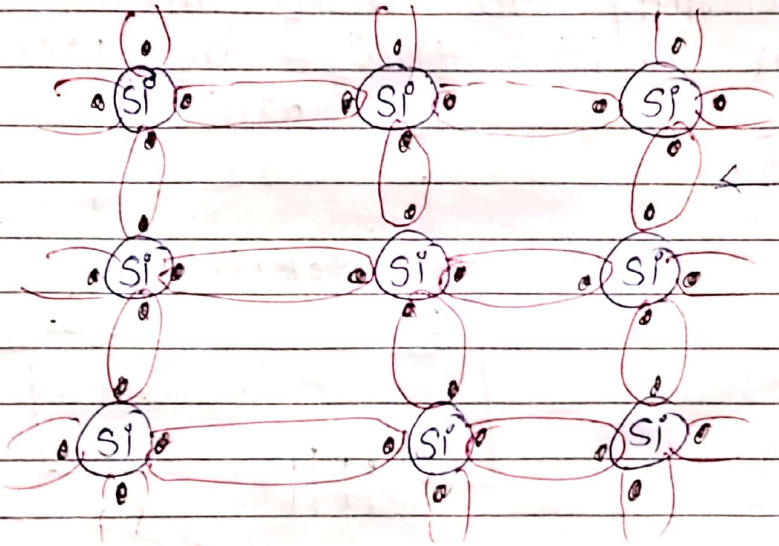
Conductivity for extrinsic conductor is very good as compare to intrinsic semiconductor

* Electric conduction in Intrinsic Semi-conductor

Silicon ⇒ Atomic NO. -14
2,8,4



- When so many atoms meet together it will make some solid or compound.
- Electrons are shared here and make co-valent bond.

[Current will flow when there is some free e^- in compound]

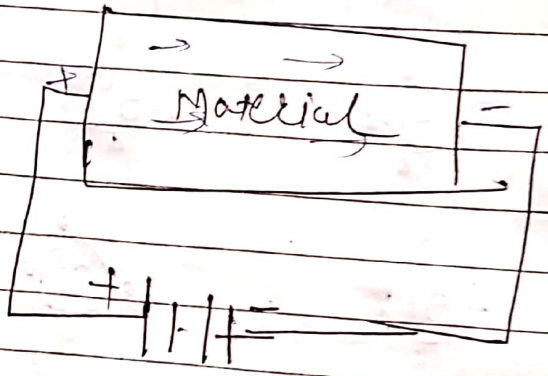
- At ~~Absolute~~ (zero) temperature electrons are not shared. means there is strong co-valent bond between them.

Note:- covalent bonds are broke because of heat at room temperature.

And there is no free electrons.

- When we put that material at room temperature (25°C)
  ↓
  Some co-valent bonds are broke and we will get some free electrons.

- Now, we apply some electric field or electricity to that material electron will flow in particular direction and we will get current.

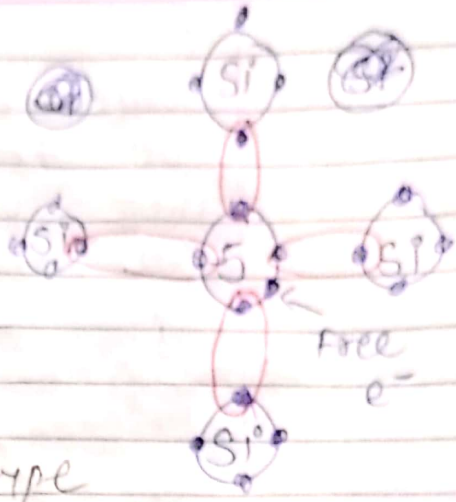


* Electric conduction in Extensic Semiconductor:-

(i) P-type semiconductor (trivalent) → ex. B (Boron)
(ii) N-type semiconductor (pentavalent) → ex. Arsenic (As).

We know that

Sb (Antimony)
Atomic No - 33
2, 8, 18, 5



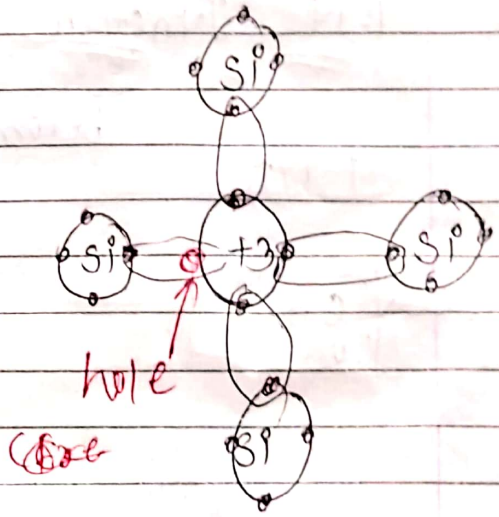
there is 5 valence electrons.

← We know that in N-type semiconductor there is 1 free electron in atom, and so many free electrons in soild or material.

→ So because of this current will flow easily in n-type semiconductor.

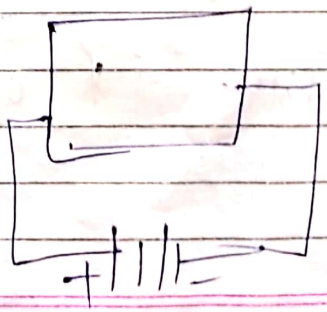
⇒ Majority carrier :- (Free electron)
Minority carrier - hole.

* P-type
B -> 5
2, 3



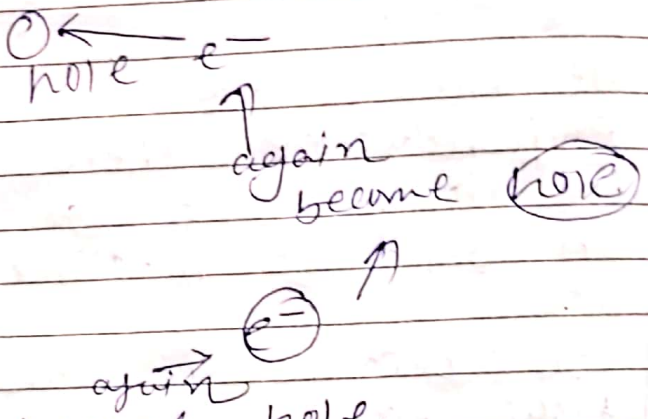
→ When we Apply electric field to this material current will flow because of hole.

- Because when electric field is apply one hole



Some electron will take place of that hole and again that place of e^- become hole and this process is continous.

$\Rightarrow$



Majority carrier

Hole

Minority carrier

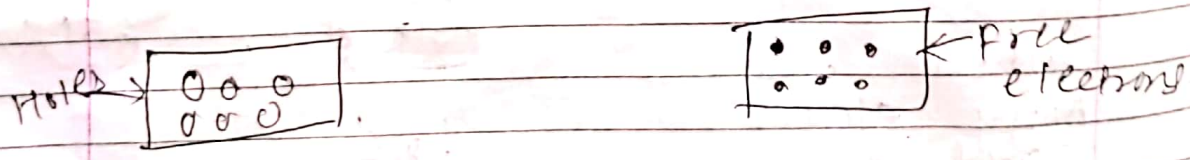
Free e^-

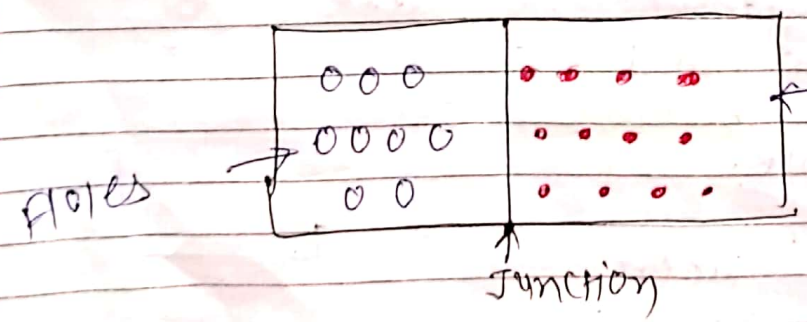
* P-N Junction.

When p-types and N-type semiconductors combine it will become P-N junction

P-type

N-type





[P-N Junction]

[unbiased diode ⇒ NO external voltage source connected]

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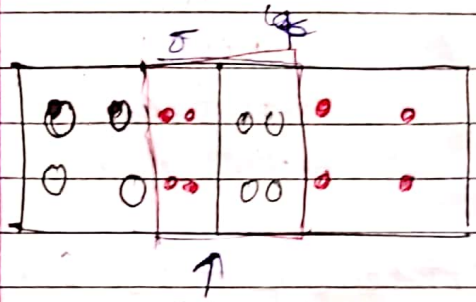
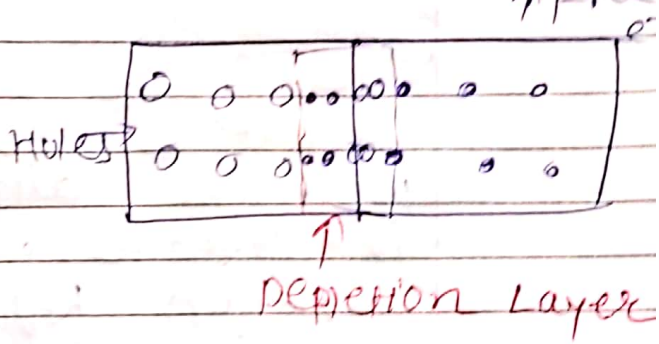
Depletion Layer

→ Formation of depletion layer occurs at junction.



Depletion Layer



Depletion Layer

- As we know that holes are positively charged and electrons are negatively charged.

due to some heat or attraction some holes are goes to the n-type and some electrons are goes to the p-type as shown in Fig.

- By combining electrons & holes they will balanced and no further movement of e⁻ & holes will done.

- Now that region is known as Depletion Region.

- By moving p-to N and N-to p side we can see that at depletion Layer - + charge is formed.

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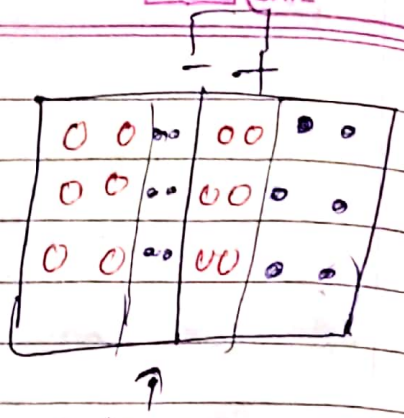
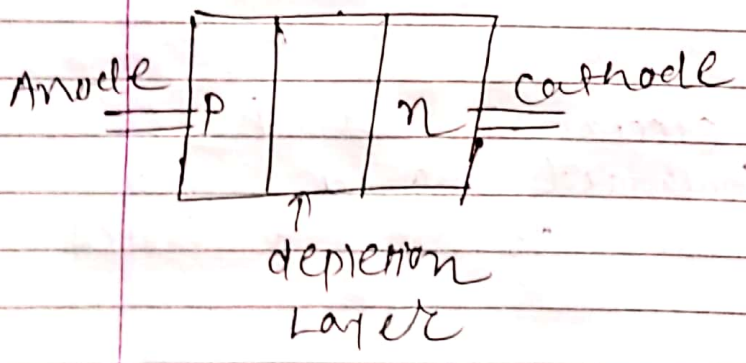
- + positive is means high potential and -ve means low potential so, potential difference is created at depletion Region.



- That potential difference is known as potential Barrier.

* What is Diode?

Diode is two terminal electronic device, which passes current only in one direction.



[Basic structure]

(Symbol)

→ One terminal is anode and other terminal is cathode.

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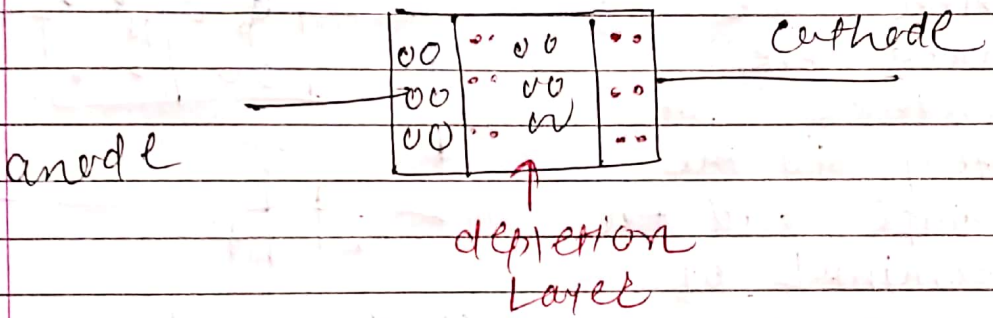
- current flows from anode to cathode.

Note! It has high resistance at one direction and low resistance at other direction.

⇒ Low resistance at direction of flow of current and high resistance at high opposite direction of flow of current.

* P-N Junction Diode :-



⇒ during formation of depletion Layer some free e^- travels, so few amount of current will flow there. and after equilibrium state no current will flow.

⇒ To Find flow of current we have to connect battery to the p-N junction diode.

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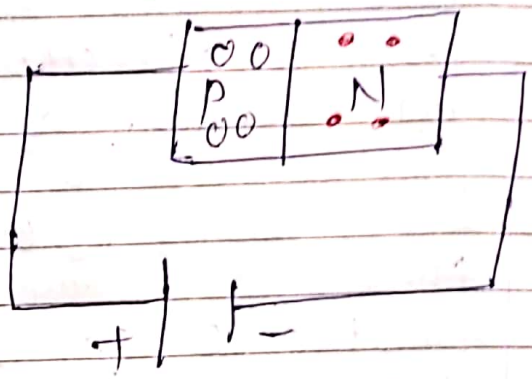
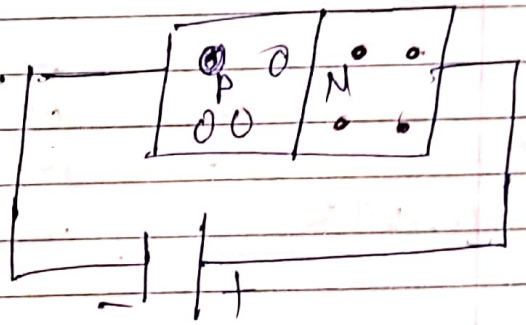
* How current will flow in p-N Junction diode, what is Forward, Reverse biasing?



- When we connect positive terminal of battery to the p-type and -ve terminal of battery to the N type then this type of connection or biasing is known as Forward Biasing.



- When we connect -ve terminal of battery to the p-type and +ve terminal of battery to the N type, this type of biasing is known as Reverse biasing.