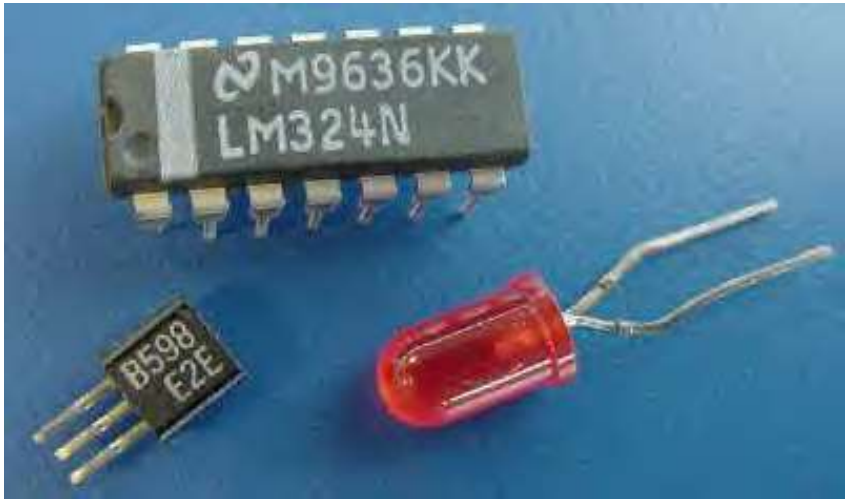
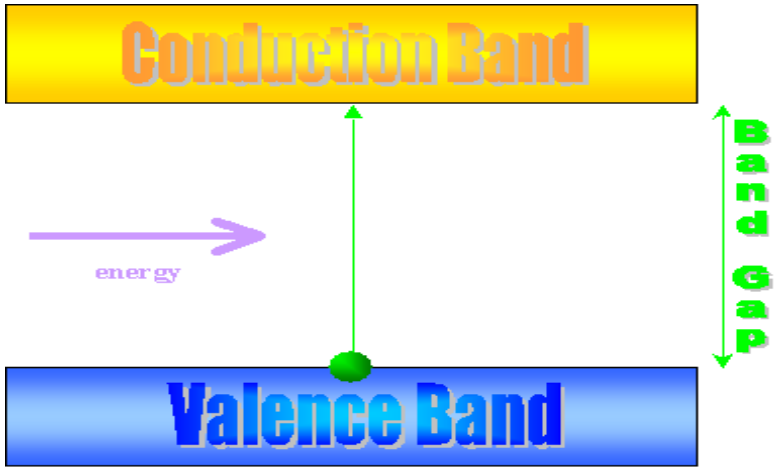
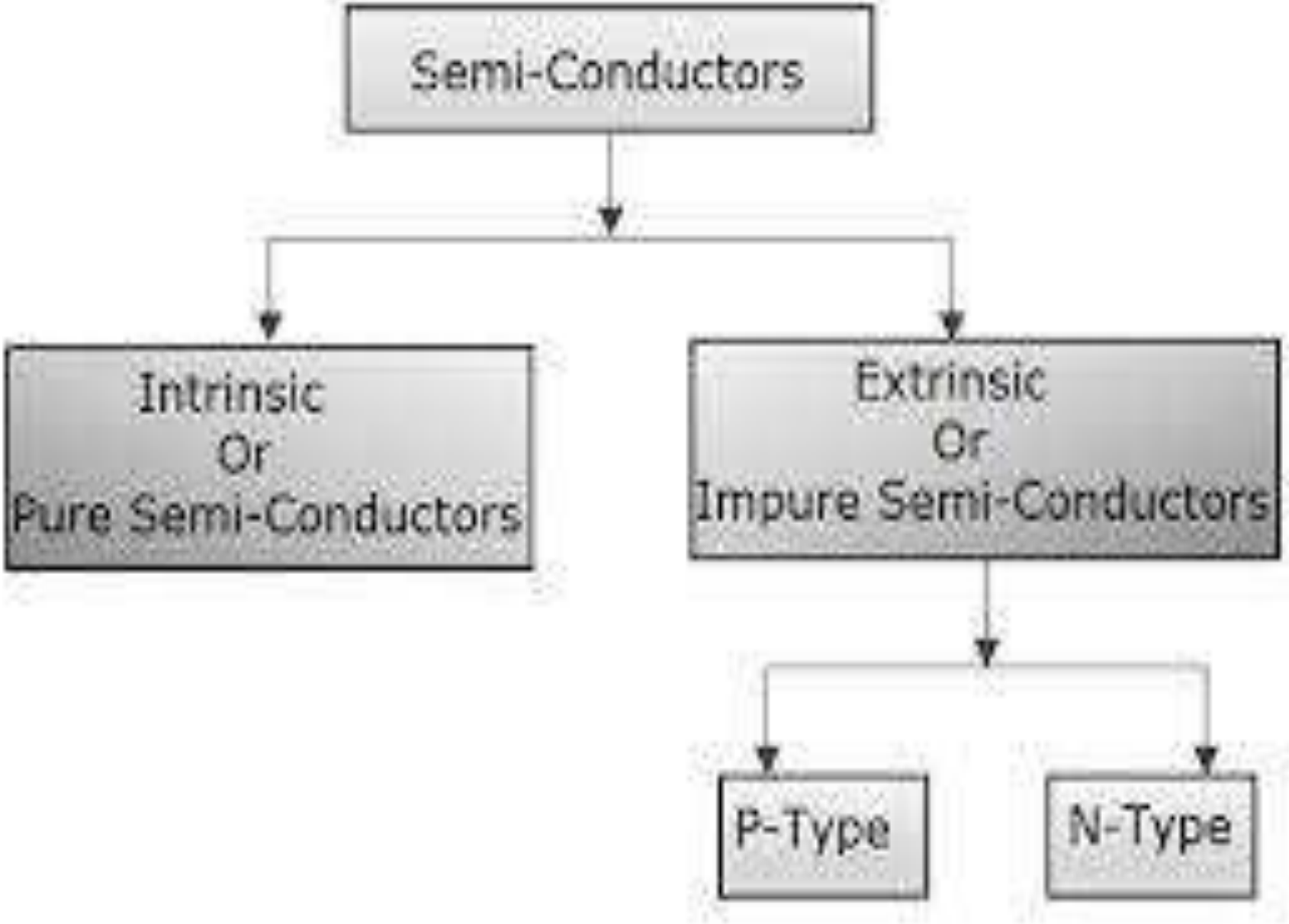
SEMICONDUCTORS

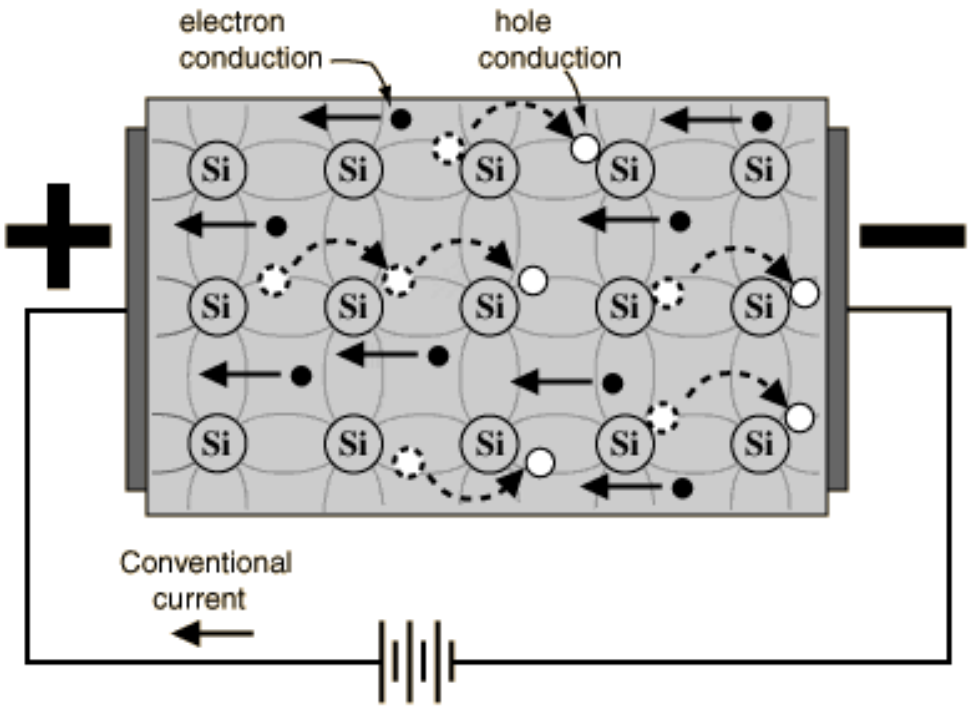




Semiconductors are the materials which have a conductivity between conductors and non-conductors or insulators . Semiconductors can be compounds such as gallium arsenide or pure elements, such as germanium or silicon. Generally have band gap of 1eV.

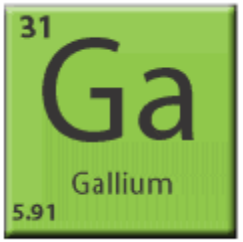

Semi-Conductors
Intrinsic
Or
Pure Semi-Conductors
Extrinsic
Or
Impure Semi-Conductors
P-Type
N-Type

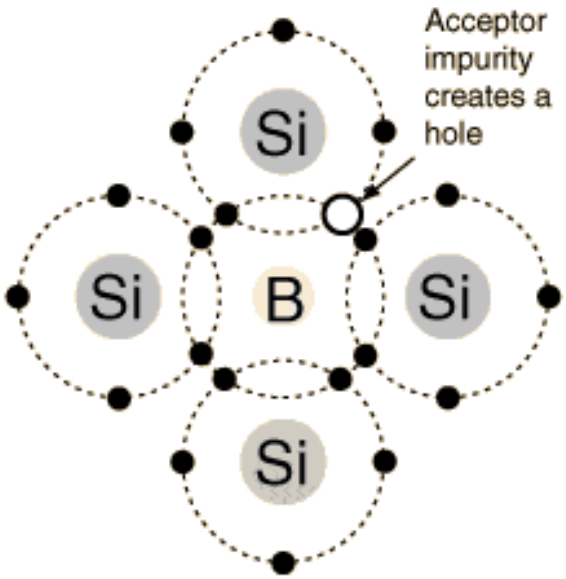
Current Flow



If a voltage is applied, then both the electron and the hole can contribute to a small current flow.

P-Type Doping



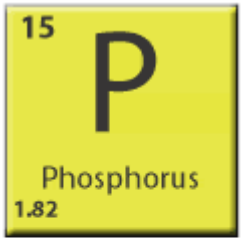


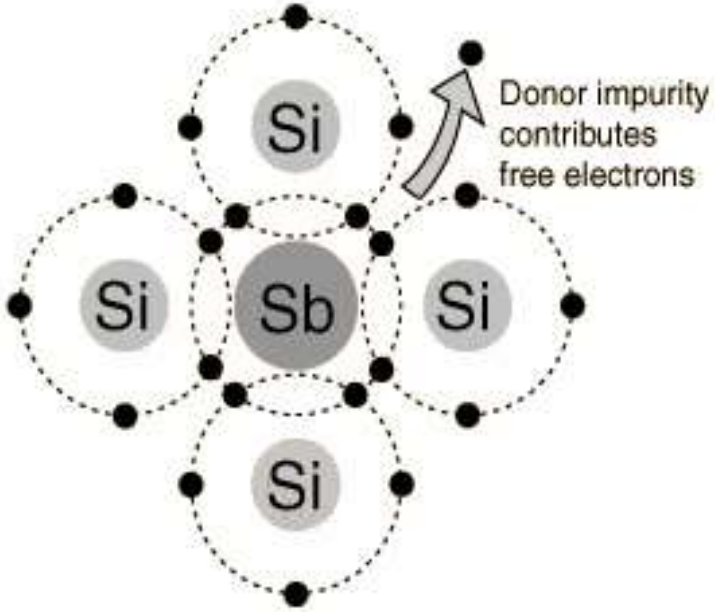
In P-type doping, boron or gallium is the dopant.

Boron and gallium each have only three outer electrons

When mixed into the silicon lattice, they form "holes" in the lattice where a silicon electron has nothing to bond to.

N-Type



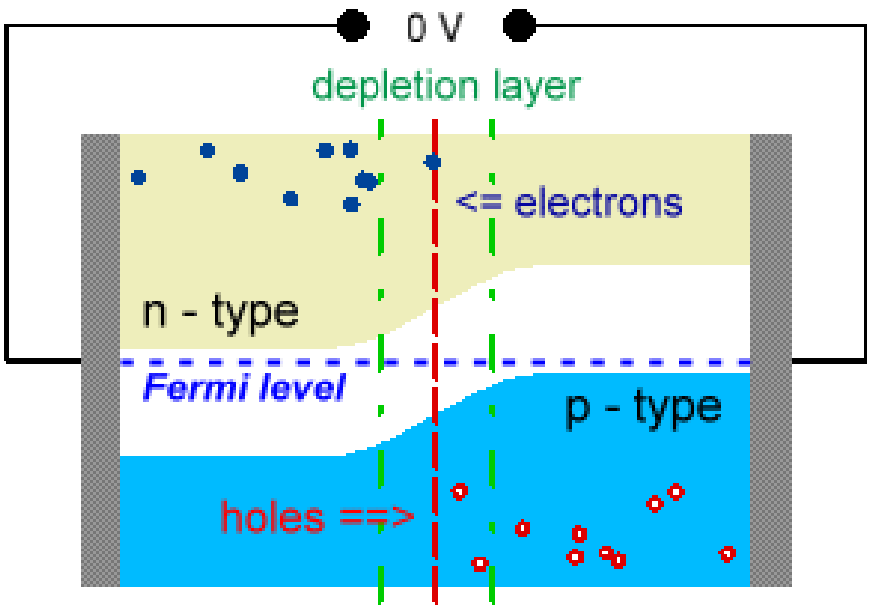


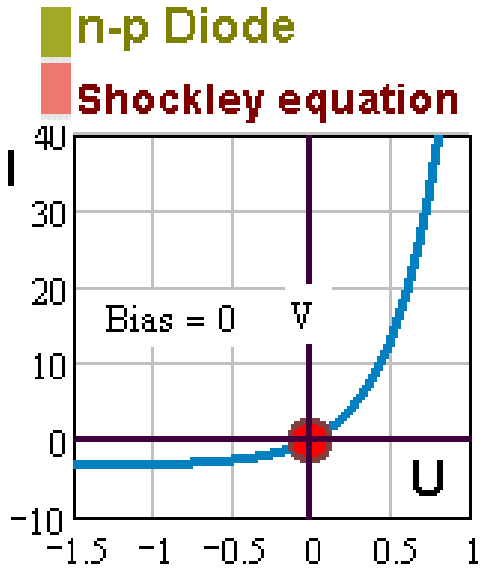
In N-type doping, phosphorus or arsenic is added to the silicon in small quantities.

Phosphorus and arsenic each have five outer electrons, so they're out of place when they get into the silicon lattice.

The fifth electron has nothing to bond to, so it's free to move around.

P-N Junction

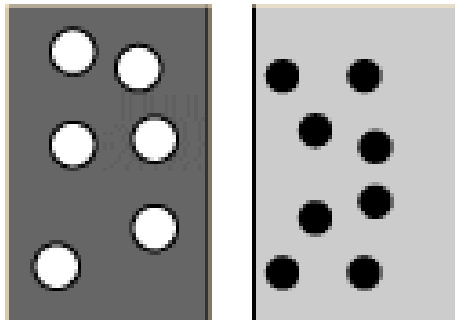




We create a p-n junction by joining together two pieces of semiconductor, one doped n-type, the other p-type.

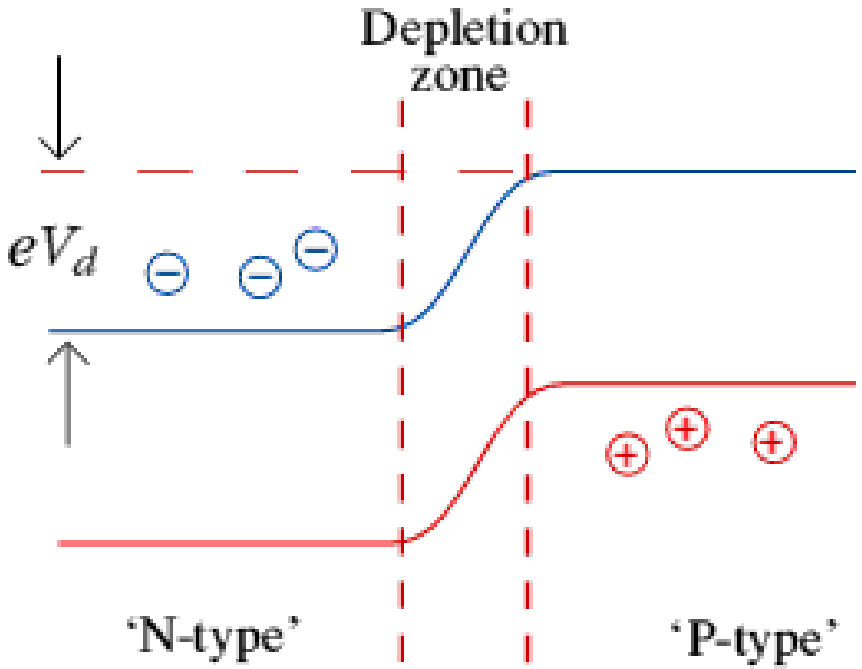
P-N Junction

In the p-type region there are holes from the acceptor impurities and in the n-type region there are extra electrons.



● Electron ○ Hole ⊖ Negative ion from filling of p-type vacancy. ⊕ Positive ion from removal of electron from n-type impurity.

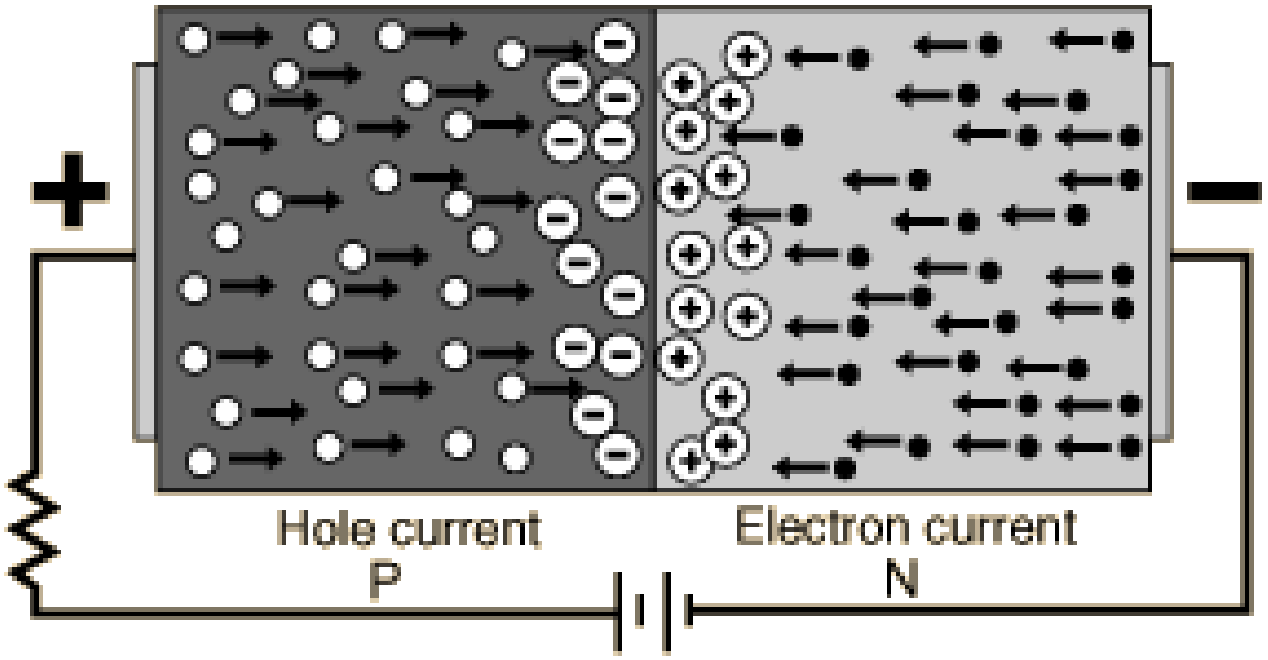
P-N Junction



This causes a depletion zone to form around the junction (the join) between the two materials.

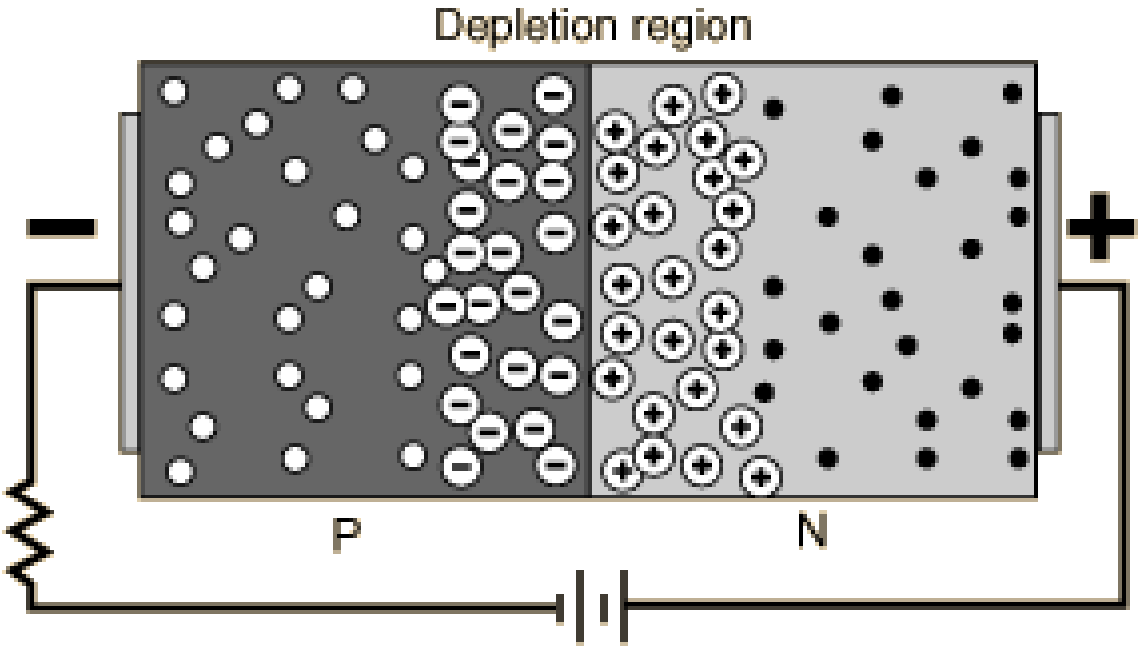
This zone controls the behavior of the diode.

Forward Biasing



Forward biasing the p-n junction drives holes to the junction from the p-type material and electrons to the junction from the n-type material.

Reverse Biasing



The application of a reverse voltage to the p-n junction will cause a transient current to flow as both electrons and holes are pulled away from the junction.

Diode Characteristics

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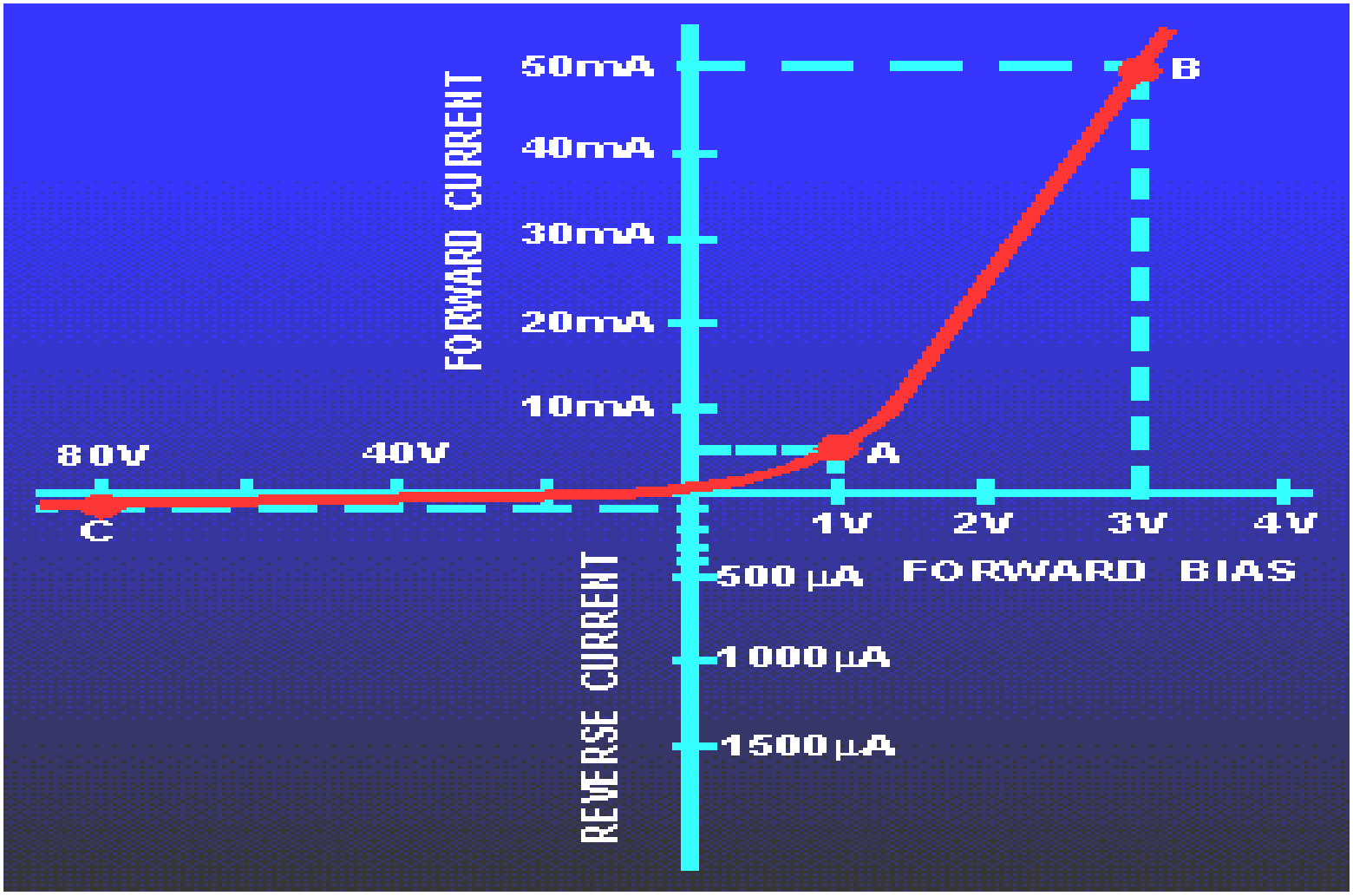
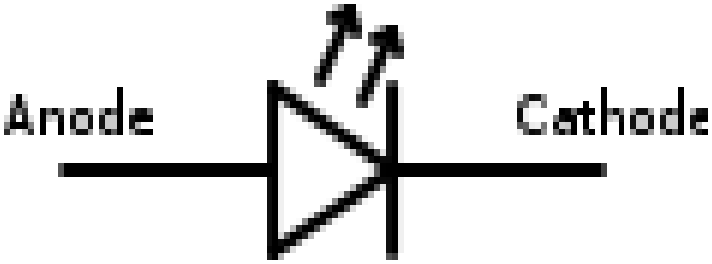
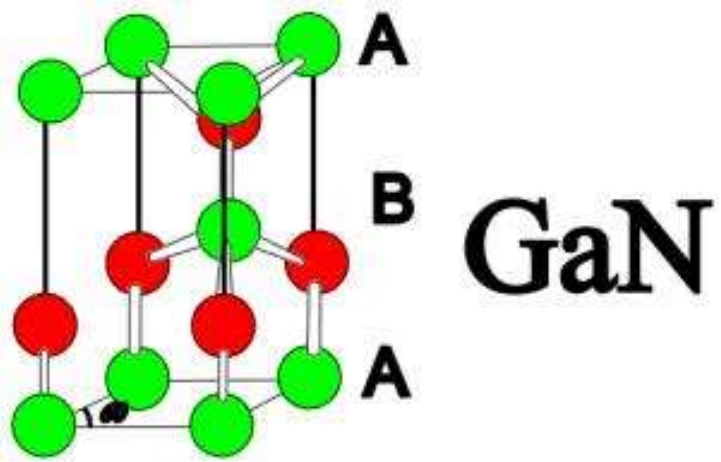


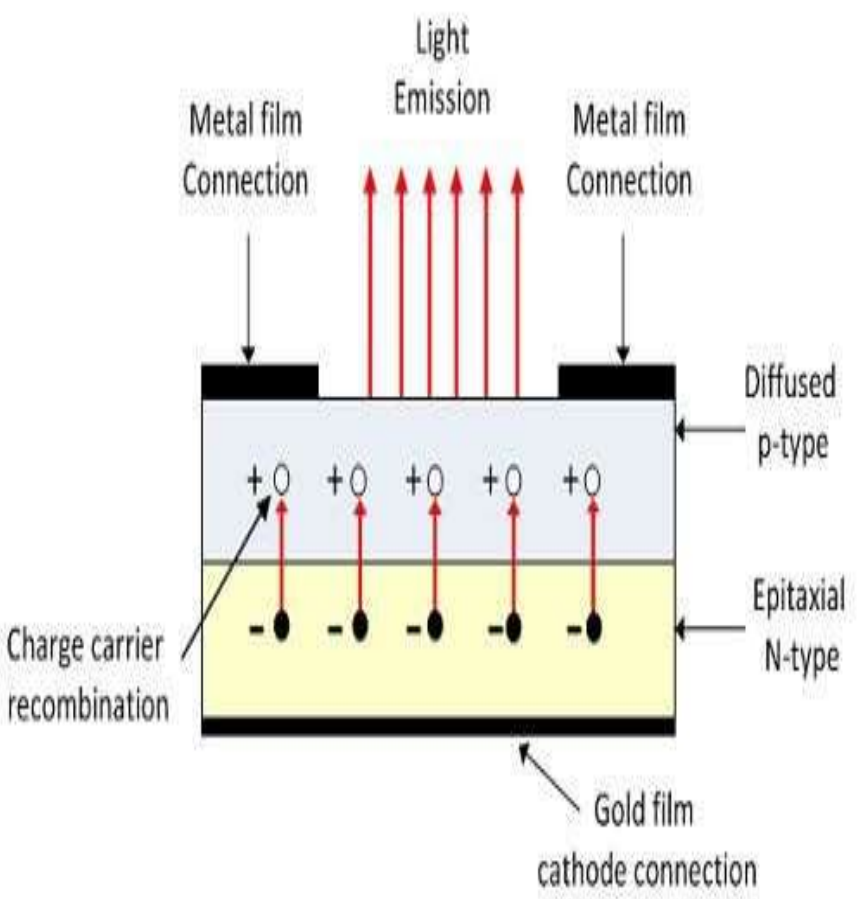
Light Emitting Diodes

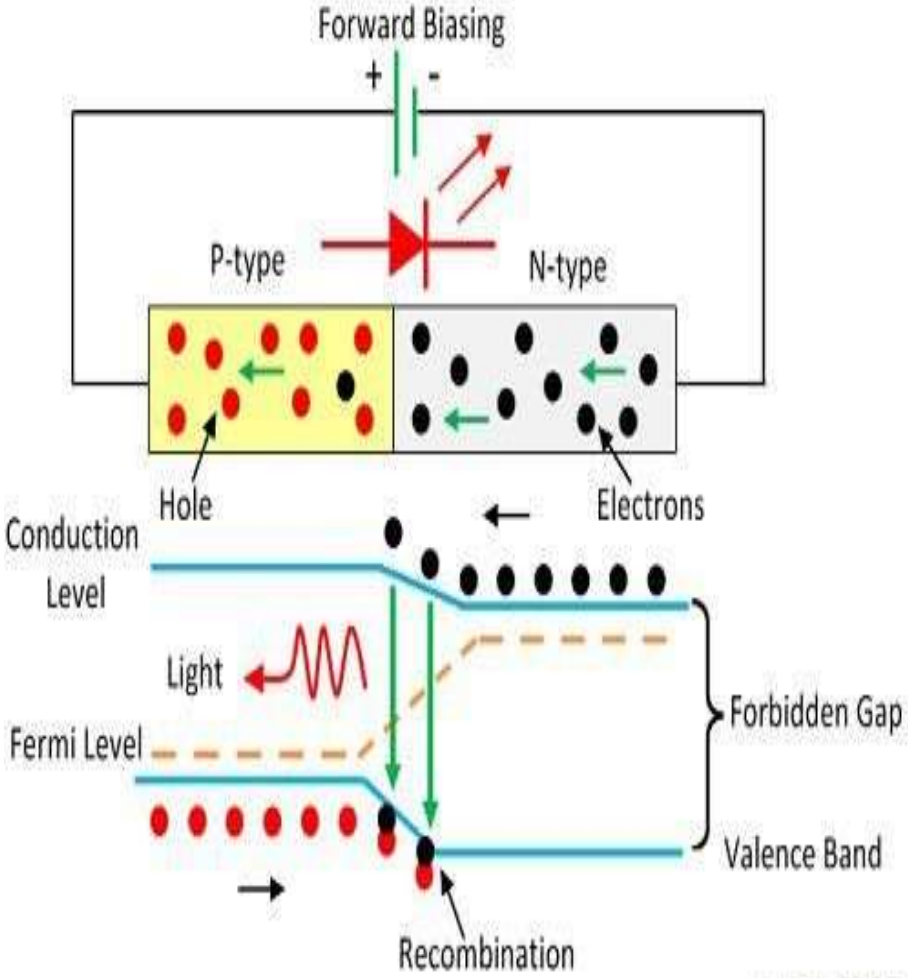
The lighting emitting diode is a p-n junction diode. It is a specially doped diode and made up of a special type of semiconductors. When the light emits in the forward biased, then it is called a light-emitting diode.





Construction and working Of LED





Thanks