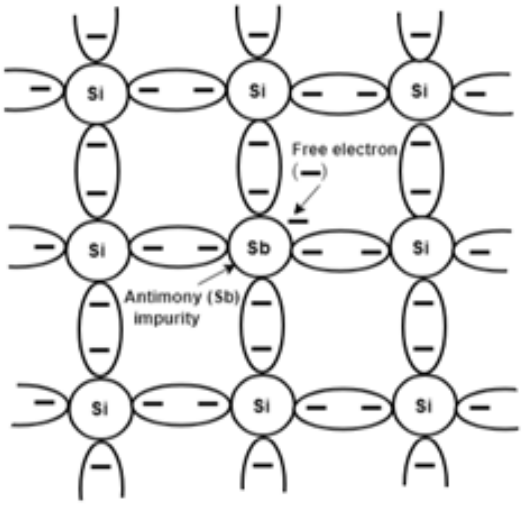
Basic Electronics Engineering

Extrinsic Semiconductor

i) N-type: A **N-type semiconductor** is defined as a type of extrinsic semiconductor doped with a pentavalent impurity element which has five electrons in its valence shell.

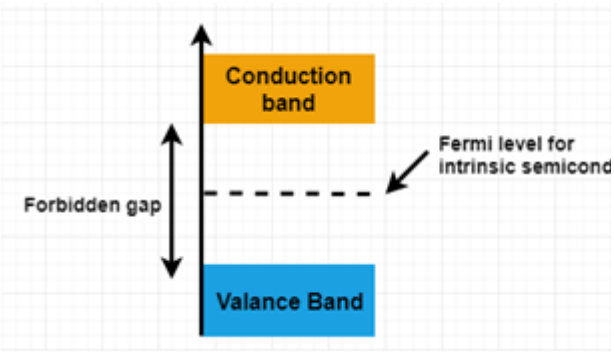
The examples of pentavalent impurities are Phosphorus (P), Arsenic (As), Antimony (Sb).

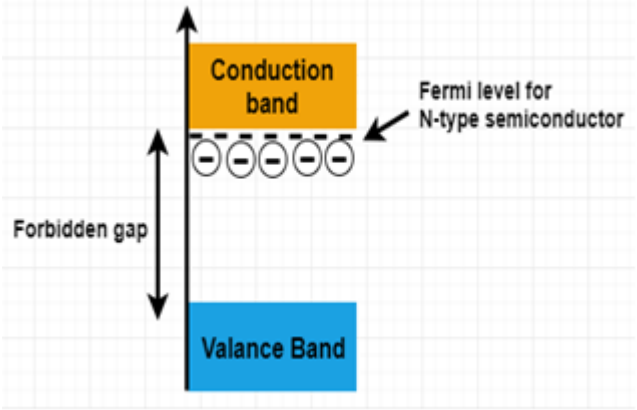
The pentavalent impurity atom makes covalent bonds with four silicon atoms and one electron is not bonded with any silicon atom. Each pentavalent impurity atom donates one electron to the N-type semiconductor hence it is called as a Donor impurities. Thus, there are more number of electrons in the N-type semiconductor.



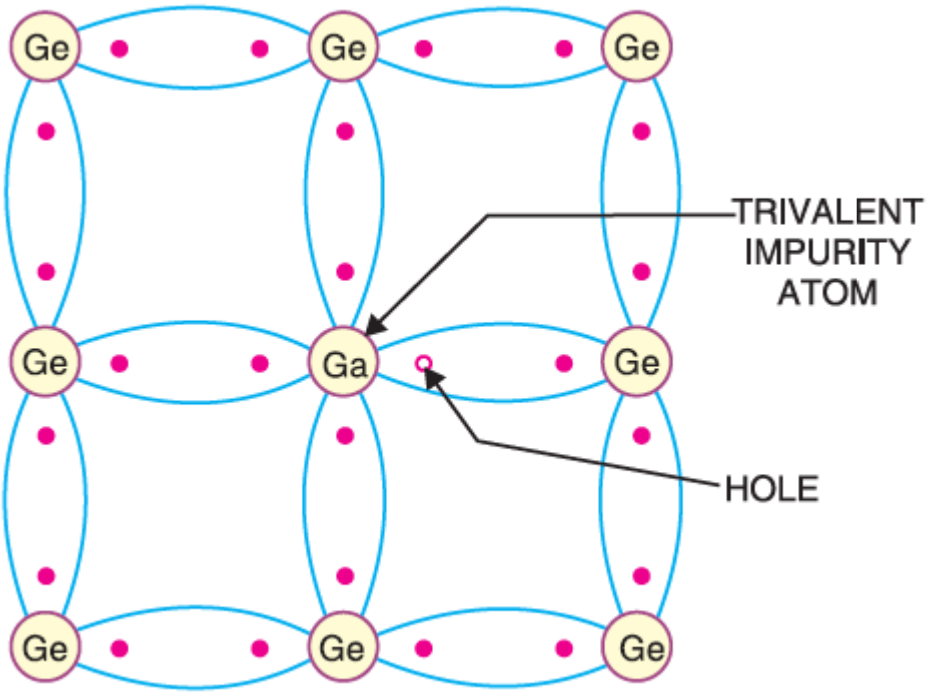
N-type Semiconductor

the N-type conductor has two types of carriers, negatively charged electrons and positively charged holes. In an N-type semiconductor the electrons are greater in number and hence they are termed as the majority carriers and the holes are termed as minority carriers as they are less in number.

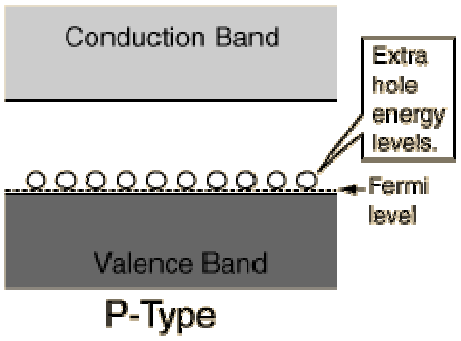




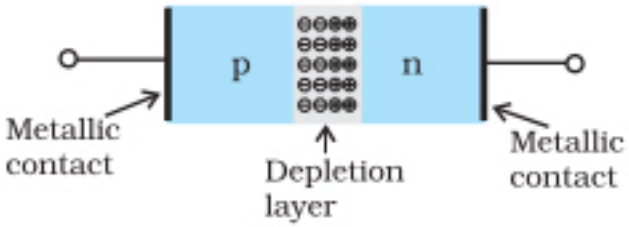
ii) P-type: The extrinsic **p-Type Semiconductor** is formed when a **trivalent impurity** is added to a pure semiconductor in a small amount, and as a result, a large number of holes are created in it. A large number of holes are provided in the semiconductor material by the addition of trivalent impurities like **Gallium** and **Indium.**



P-type semiconductor



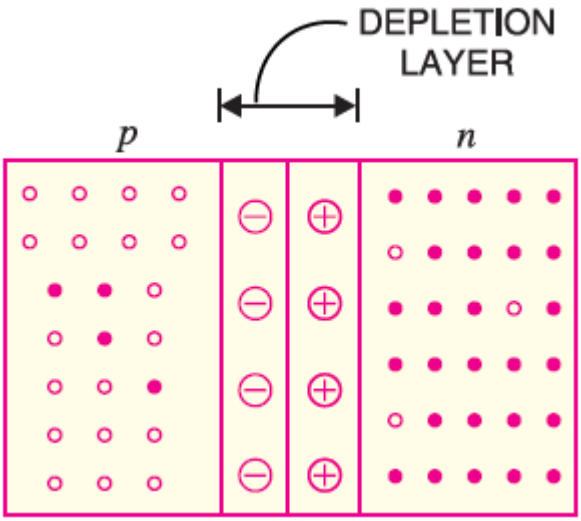
Semiconductor Diode:



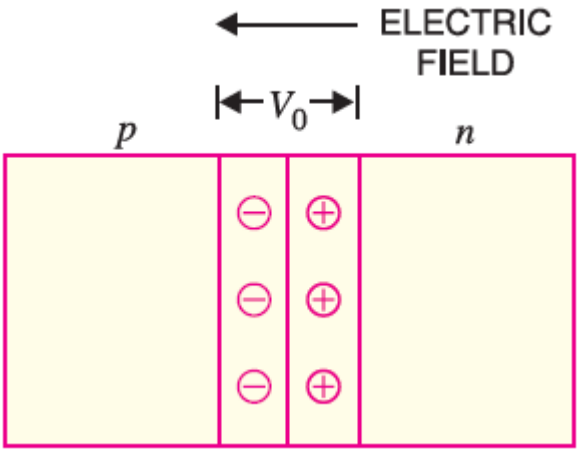
Semiconductor diode.

When a p-type semiconductor is suitably joined to n-type semiconductor, the contact surface is called ***pn*** **junction.**

Depletion Layer :



Barrier Potential:



For Silicon = 0.7 V
For Germanium = 0.3 V