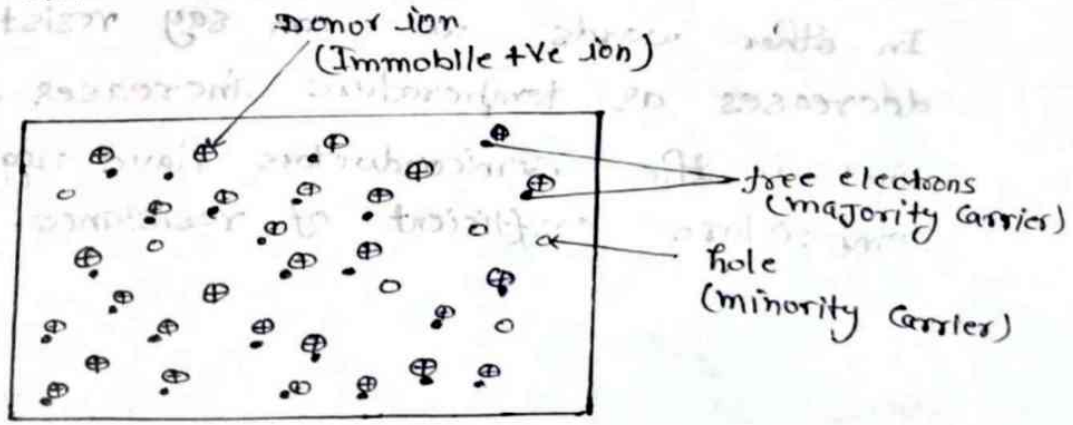
Majority and Minority Carriers →

It is clear that;

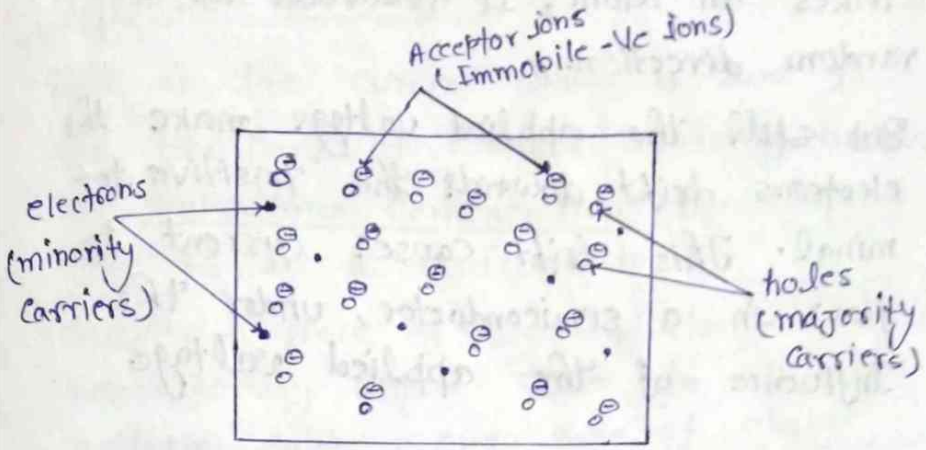
In an n-type material, free electrons are majority carrier and the holes are the minority carrier.

For the p-type material, holes are majority carrier and the free electrons are the minority carrier.

– When the fifth electron of a donor atom leaves the parent atom, the atom remaining acquires a net positive charge; hence the positive sign in the donar-ion representation. For similar reason, the negative sign appears in the acceptor ion.



n-type



p-type

Drift Current and Diffusion Current →

In a semiconductor the flow of current is due to two actions namely drift and diffusion.

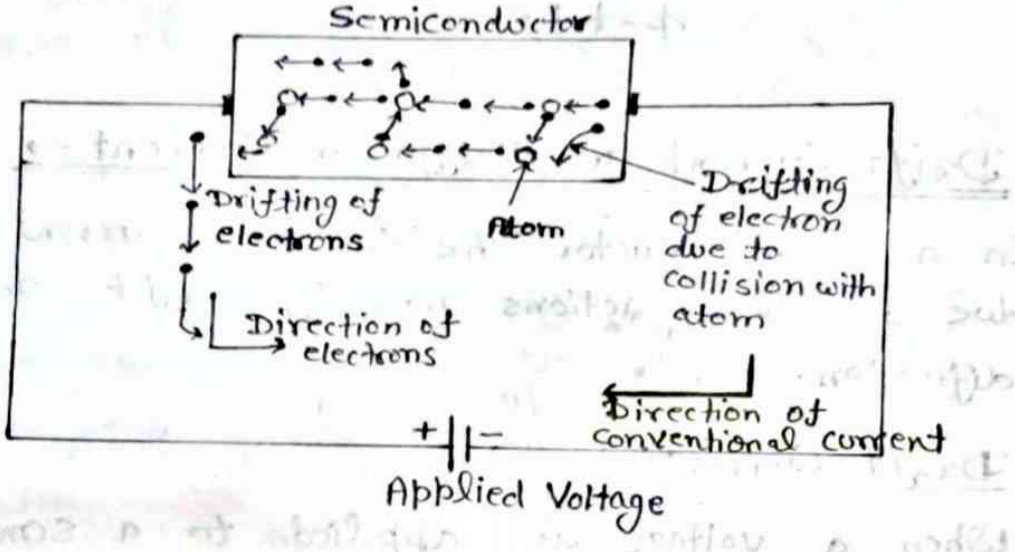
Drift Current: →

When a voltage is applied to a semiconductor, the free electrons try to move in a straight line towards the positive terminal of the battery.

The electrons, moving towards positive terminal collide with the atoms of semiconductor and connecting wires, along its way. Each time the electron

strikes an atom, it rebounds in a random direction.

But still the applied voltage make the electrons drift towards the positive terminal. This drift causes current to flow in a semiconductor, under the influence of the applied voltage.



This current produced due to drifting of free electrons is called <u>drift current</u> and the velocity with which electrons drift is called <u>drift velocity</u>.

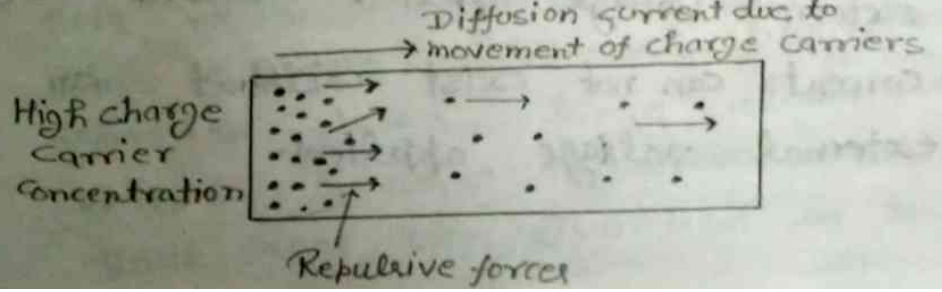
Diffusion Current :→

This is the current which is due to the transport of charges occurring because of nonuniform concentration of charged particles in a semiconductor.

consider a piece of semiconductor which is nonuniformly doped. Due to such non-uniform doping, one type of charge carriers occur at one end of a piece of semiconductor. The charge carriers are either electrons or holes of one type depending upon the impurity used.

Nonuniform concentration

Since they have the same polarity and hence experience a force of repulsion between them.



The result is that there is a tendency of the charge carriers to move gradually i.e. to diffuse from the region of high carrier density to the low carrier density. This process is called diffusion.

This movement of charge carriers under the process of diffusion constitutes a current called diffusion current.

Note:

* A diffusion current is possible only in case of nonuniformly doped semiconductors while drift current is possible in semiconductors as well as conductors.

* The diffusion current exist without external voltage applied while drift current can not exist without an external voltage applied.