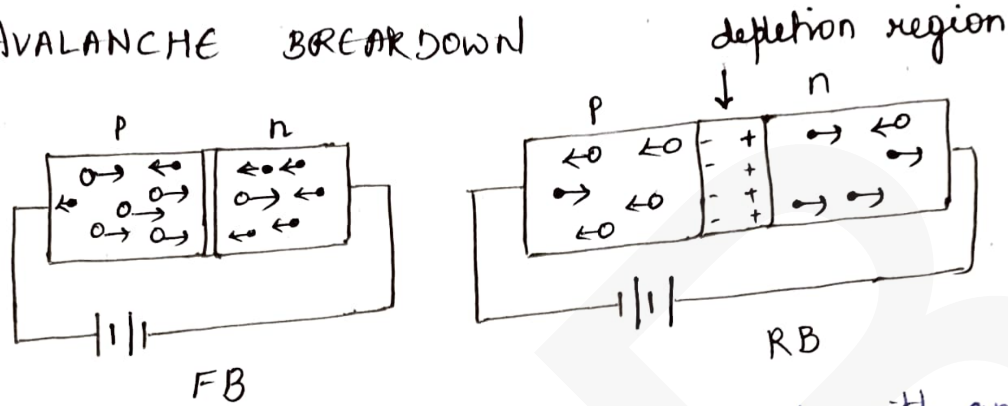
ZENER AND AVALANCHE BREAKDOWN IN pn JUNCTION DIODE

AVALANCHE BREAKDOWN



* When a p type material is in contact with an n-type material, depletion region develops at their junction. The depletion region is devoid of mobile carriers.

* When pn jn is forward biased, the depletion region gets thinner & thinner and current flows due to majority carriers.

* Along with majority carriers, minority carriers i.e. electrons in p type & holes in n type exists.

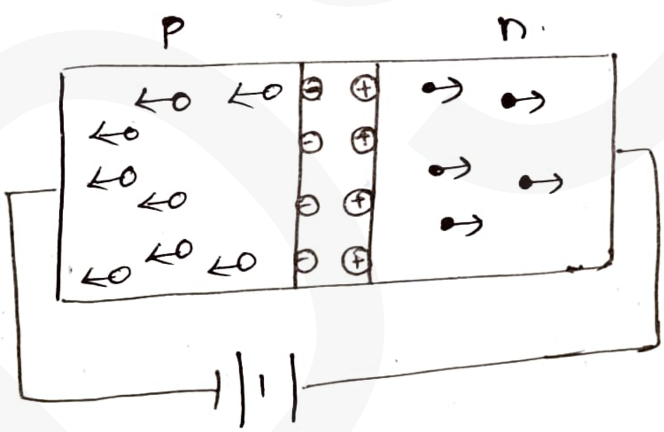
* During the reverse bias, the width of the depletion region increases. As the magnitude of reverse voltage increases, the e-field across the junction increases. This accelerates the minority carriers. These carriers collide with atoms knocking off the valence e^-. Thus two free e's are produced as a result of impact collision. These two free electrons

further knocks off two more electrons and a chain reaction starts. This increases the reverse current flow in the PN junction. This process is Avalanche breakdown.

* After the breakdown the junction cannot regain its original state & diode burns off.

ZENER BREAKDOWN

* A normal p-n junction diode doesn't operate in breakdown region because the excess current permanently damages the diode.



* Zener diode is specially designed diode to work under ~~rev~~ zener breakdown region. It has heavily doped p & n regions. Heavy doping results in thin depletion region.

* When a zener diode is reverse biased, a strong e.field is developed across thin depletion region.
* This strong e.field breaks the covalent bonds thus sets ē's free. ~~These ēs are a~~
* As we keep on increasing voltage (reverse), high current starts to flow as a result of ē tunneling across the barrier.
* This flow of current occurs at voltage much before the reverse breakdown voltage thus preventing the diode from breakdown.
* This phenomenon ~~of large current flow is~~ is ~~breakdown, occurring at voltage~~ zener breakdown.