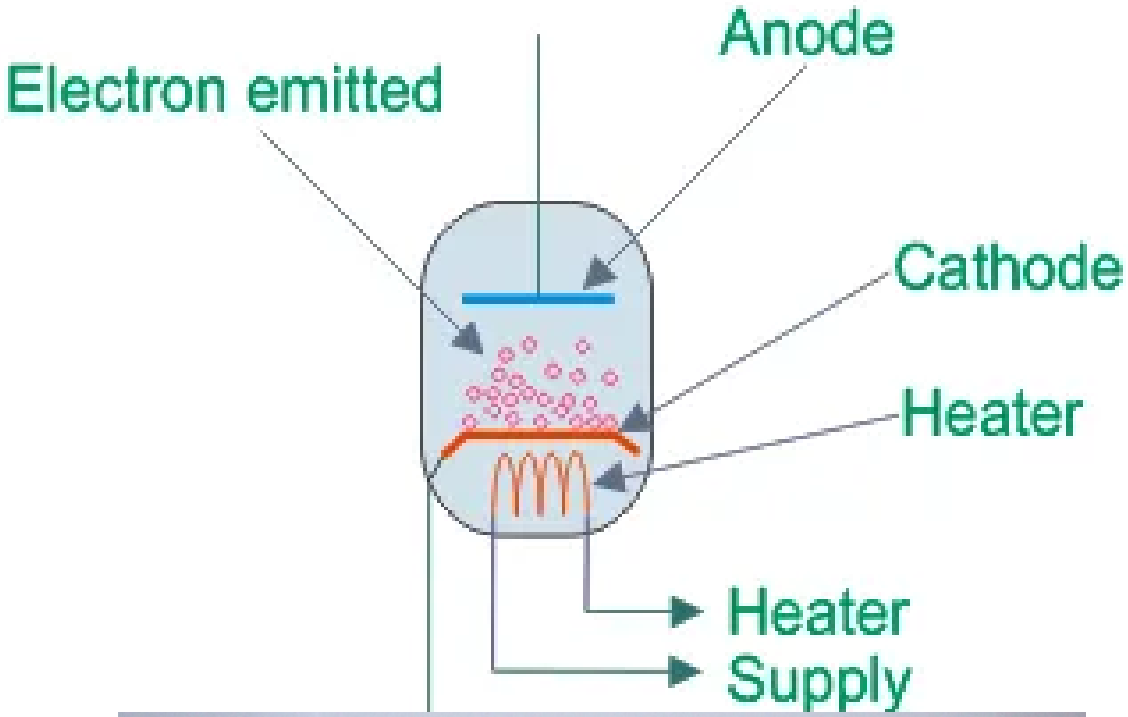
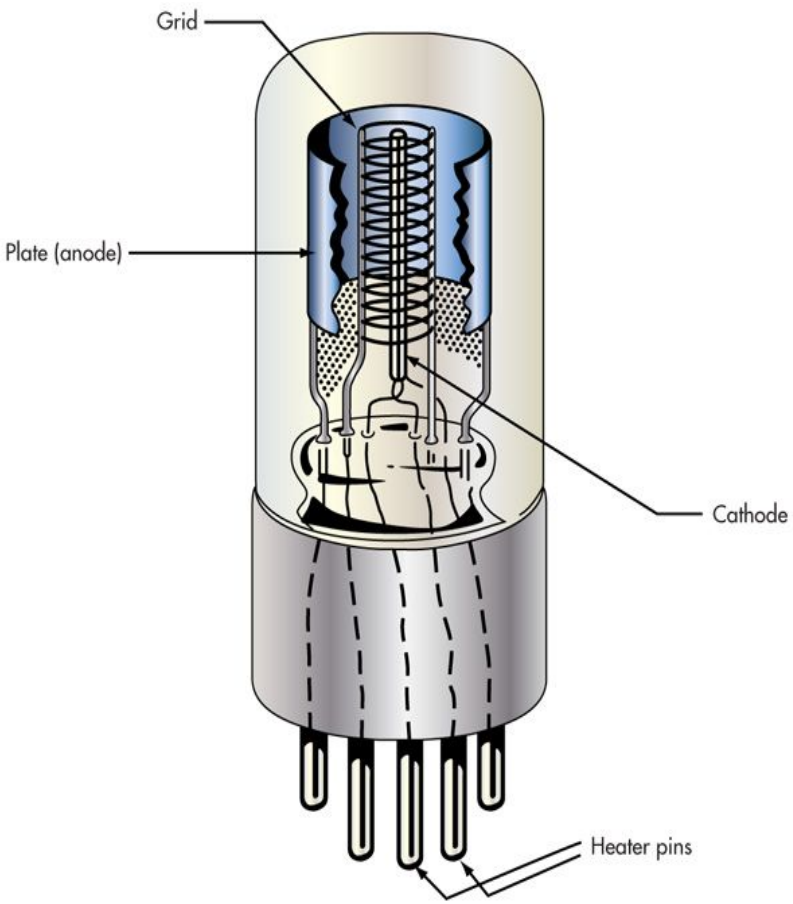
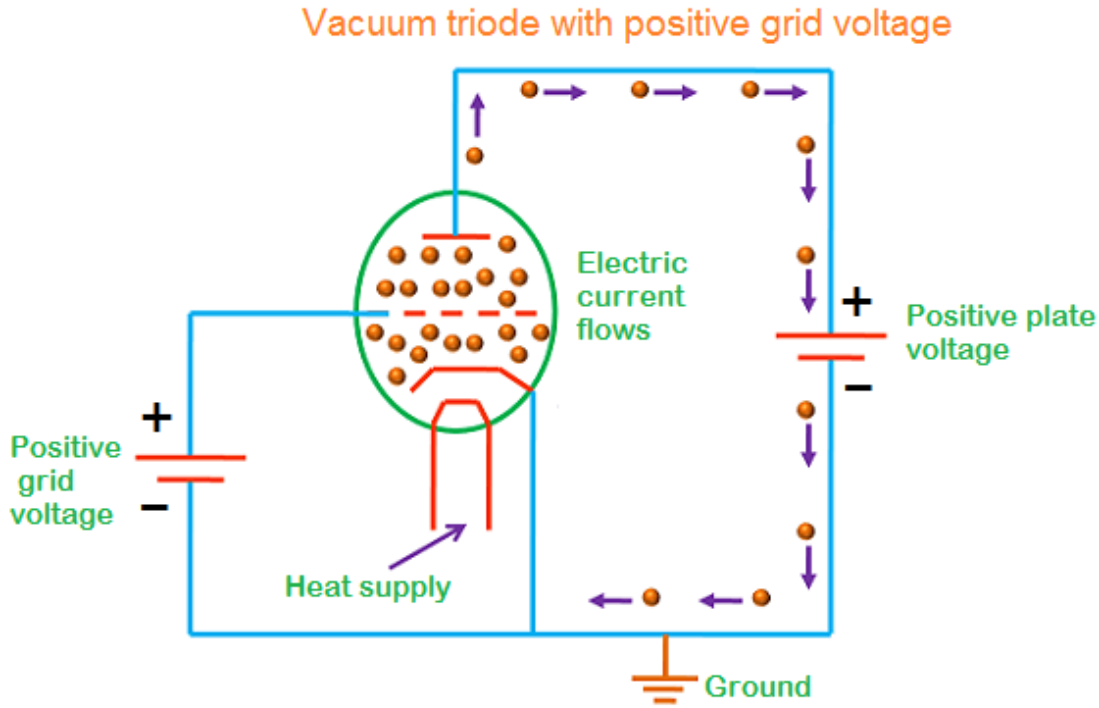
Analog Electronics

Vacuum Diode

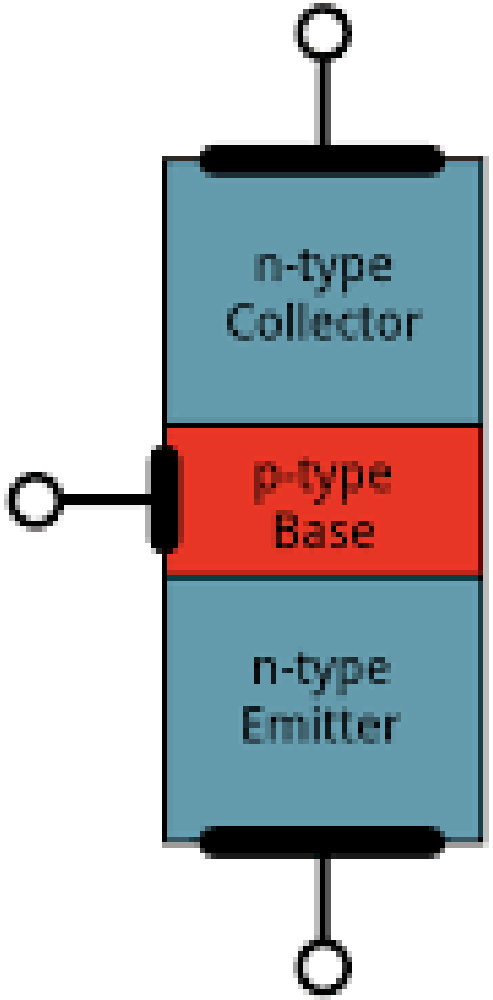


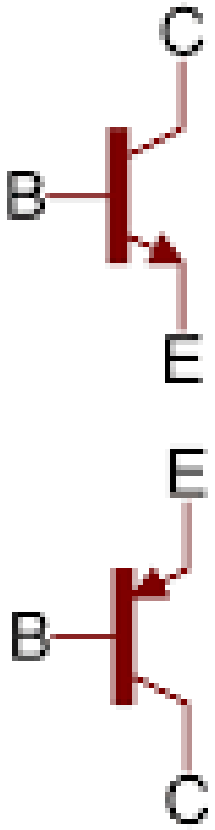
Vacuum Triode

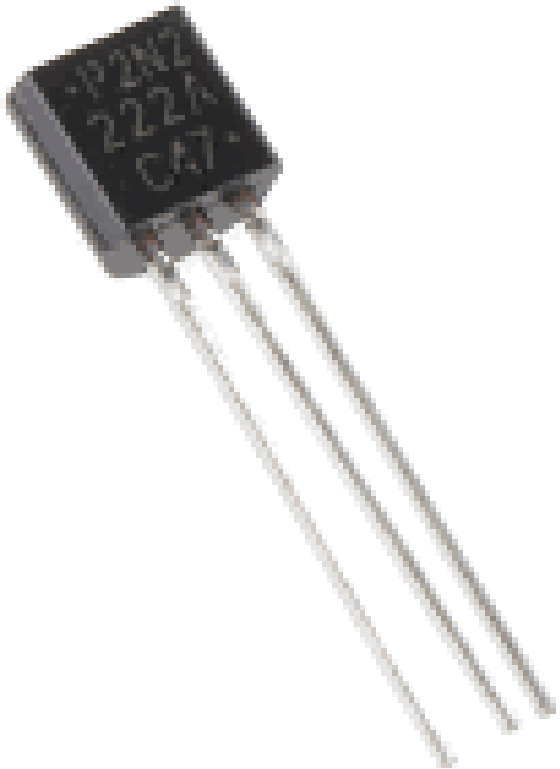




Transistor

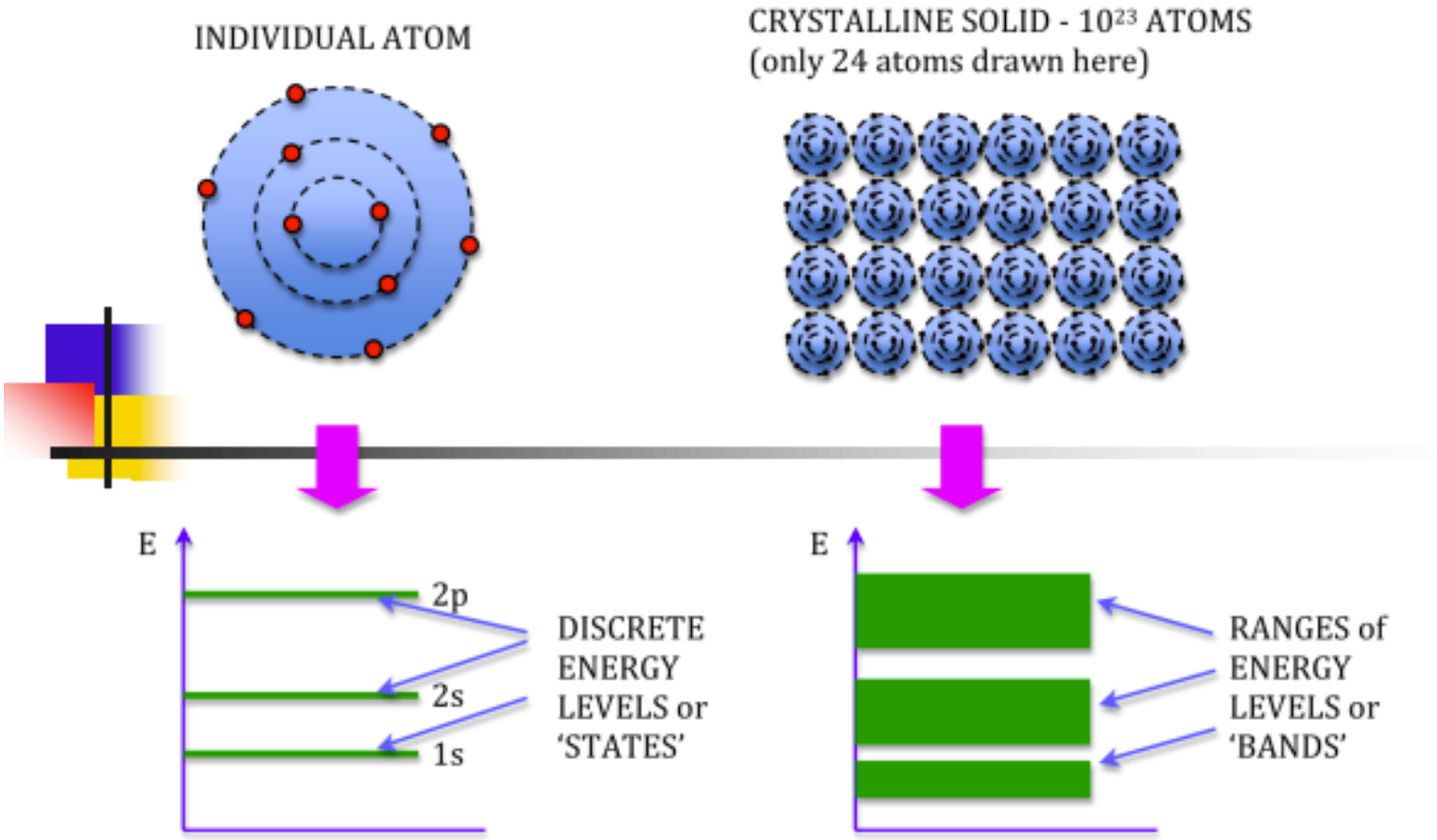




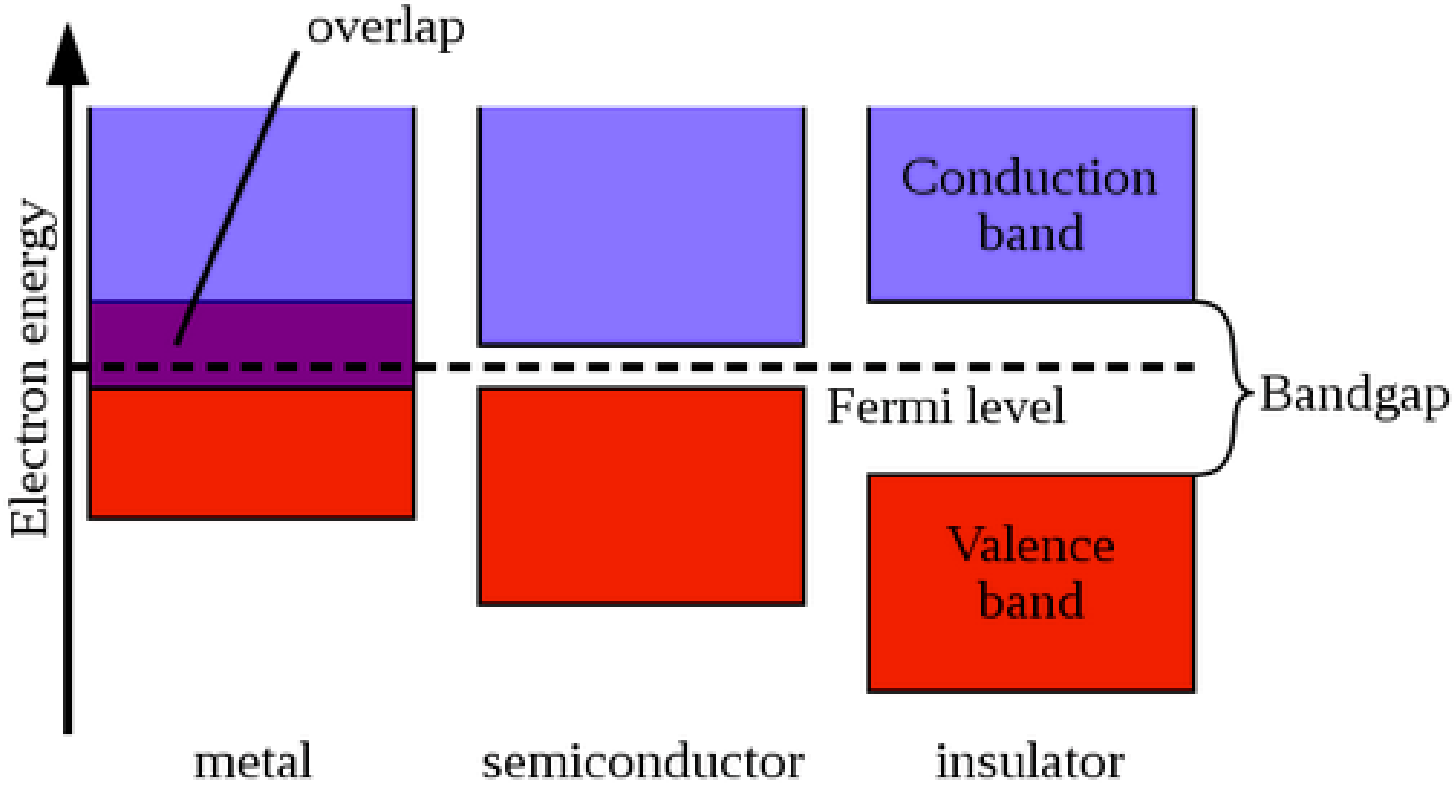


Integrated Circuit

Origin of Energy Bands in Crystals

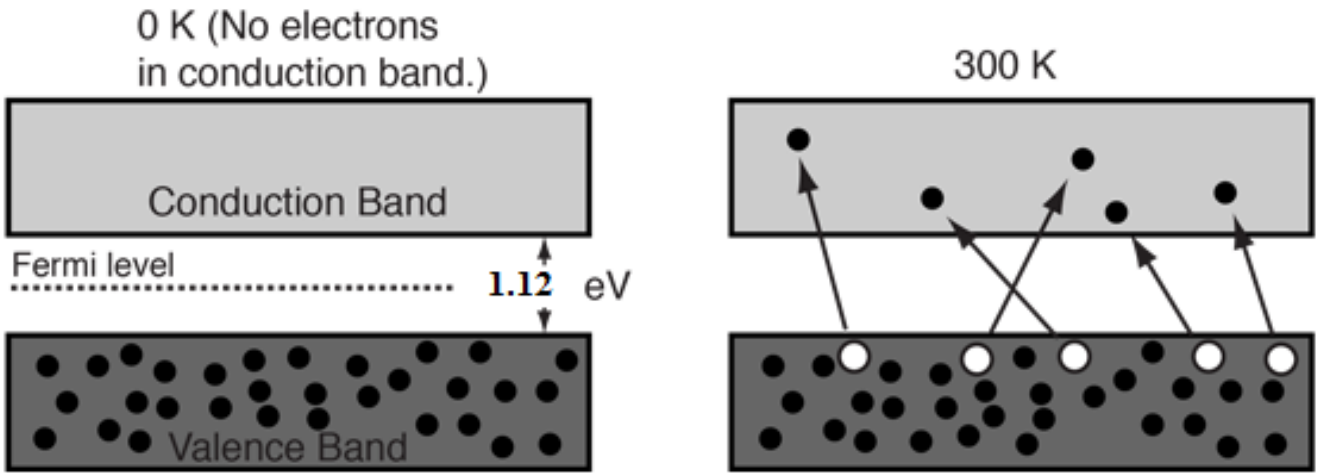


Metal, Semiconductor and Insulator – Energy Band structure

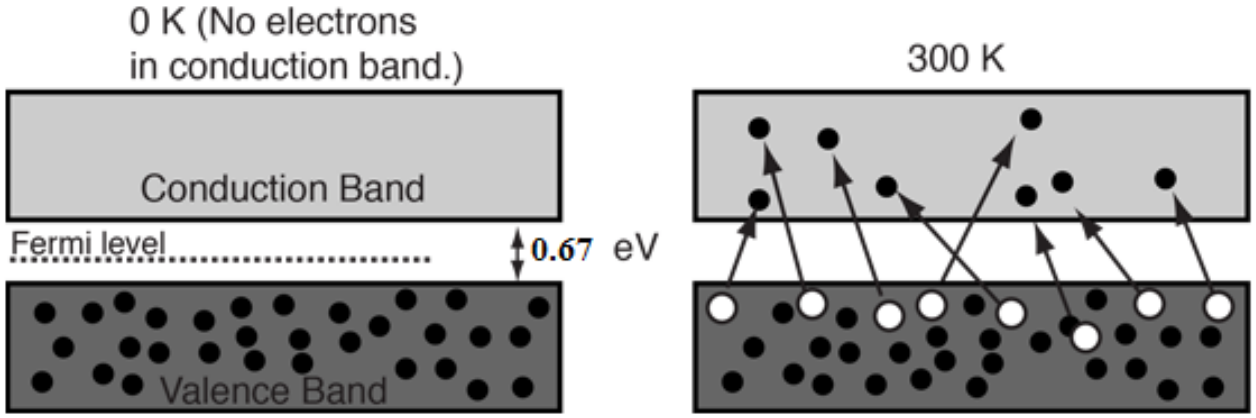


Normally, band gap of semiconductor < 4.0 eV and insulator > 4.0 eV

Silicon Band structure



Germanium Band structure



Why Silicon is preferred over Germanium in semiconductor industry although band gap of silicon is more?

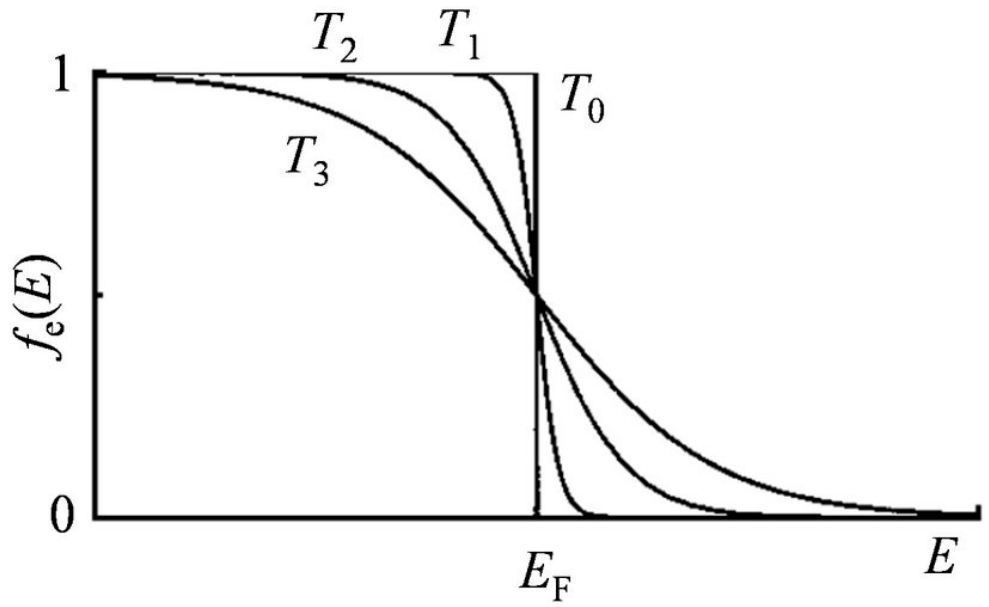
Fermi Energy

If f(E) is the probability of occupancy of the state with energy E:

$$f(E) = \frac{1}{e^{(E - E_F)/kT} + 1}$$

Explain the symbols

E_F is the Fermi Energy



a. At T=0 K,

i. f(E) = 1, if $E<E_F$

ii. f(E) = 0, if $E>E_F$

b. At T> 0K,

f(E) >0 for $E> E_F$

When $E=E_F$, f(E) =1/2

Simple Semiconductor: Si, Ge, C etc.

Compound Semiconductor: SiC (IV-IV), SiGe (IV-IV), GaAs (III-V), nO (II-VI) etc.

Intrinsic (or pure) and Extrinsic (or doped) semiconductor:

In Intrinsic semiconductor, no. of electrons = no. of holes but in extrinsic semiconductor they are different

What is the difference of Intrinsic and Extrinsic semiconductor in terms of conductance at different temperatures?