UNIT IV

Optical properties of Materials

4.3.Absorption In Semiconductors , Insulators And Metals

4.3.1Absorption in Semi conductor:

In intrinsic semi conductors light energy is absorbed to produce electron hole pair. Electrons can go to conduction band if the photon energy is greater than the band gap energy.

That is $h\upsilon > E_g$

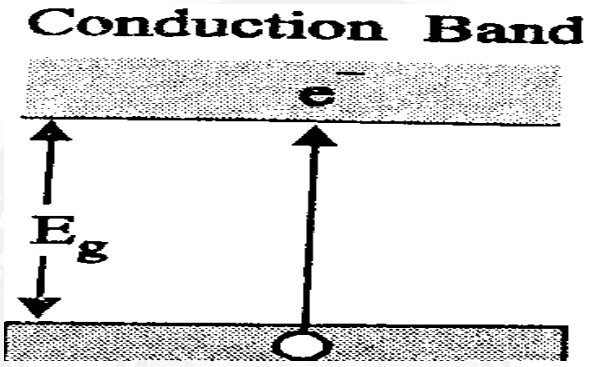

Fig4.3.1Absorption

For extrinsic semiconductor , electron transition is between donor and conduction band in n type semiconductor and for p type it is between acceptor and valence band

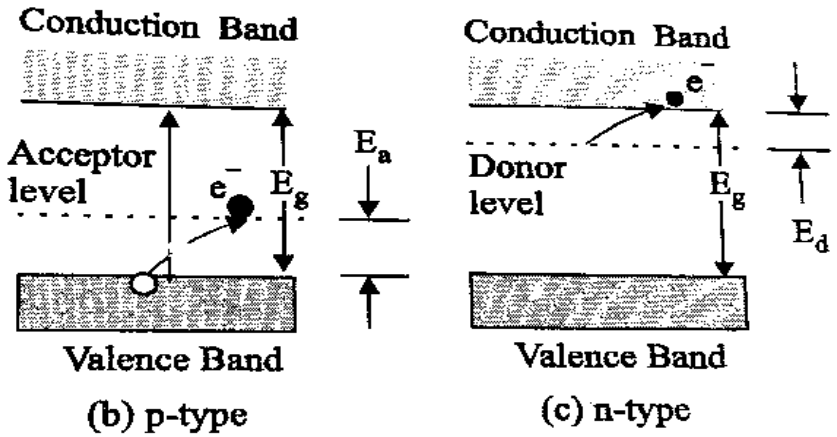

Fig 4.3.2.Absorption & emission in semiconductors

So visible light is not absorbed by materials having energy greater than 3.1ev

Emission:

When the electron moves from conduction band to valence band they emit light.

4.3.2Absorption and emission of light in metals

Incident light will be absorbed when the thickness of metal film is less than 0.1μm.

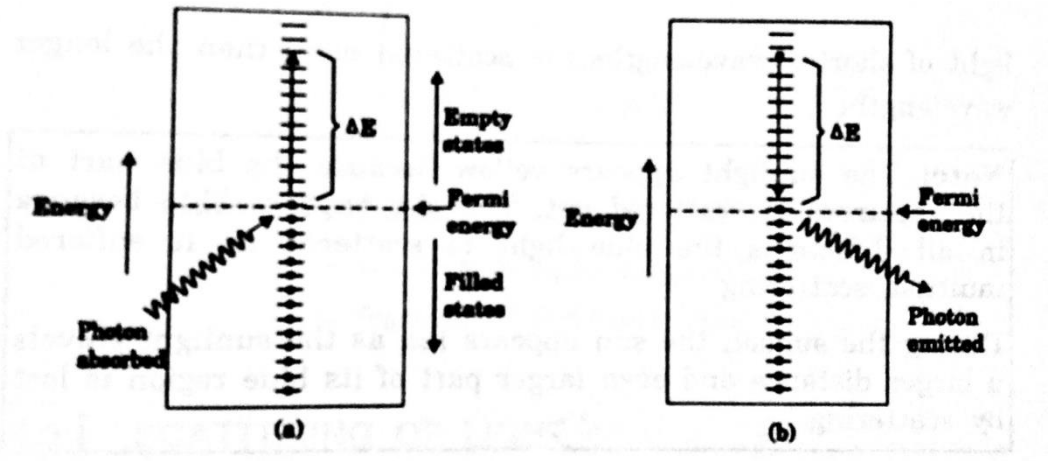

Fig 4.3.3.Absorption and emission in metals

Metals are opaque to radio waves,infra red visible and middle of uv radiation. It is transparent to x-rays and gamma rays.Thus elctron absorbs and move to higher energy state.

Emission:

Most of the absorbed radiation is emitted from the surface in the form of visible light.Reflectivity of metals is between 0.9 to 0 .95.

4.3.3.Absorption and emission in Insulators

Absorption:

In Insulator, an electron can move from valence band to conduction band if the energy of absorbed light is greater than the band gap energy

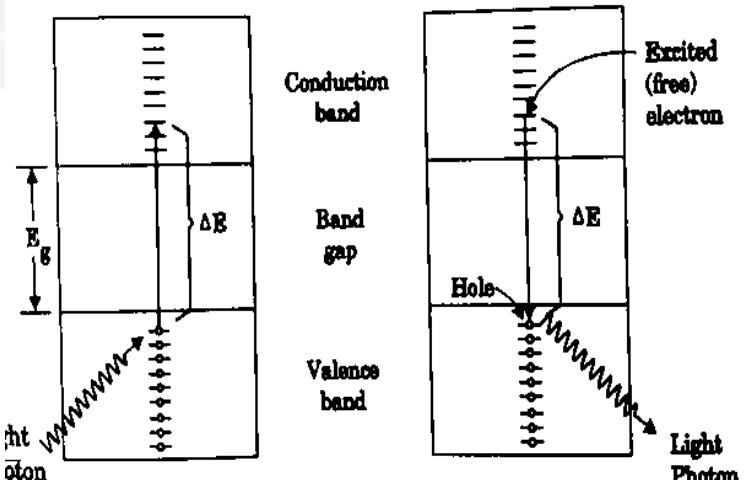

Fig 4.3.4.Absorption and emission in insulators

Emission:

When the electron moves from conduction band to valence band they emit light.