

Need of Population Inversion:-

Einstein

Pointed out that two processes are equal probable under normal circumstance. Among two process (Spontaneous emission & Stimulated emission) which predominate over other depends upon the number of atom in the two levels. When $N_1 > N_2$ then absorption predominated over emission which occur in normal material. On the other hand when $N_1 < N_2$ then emission dominated over the absorption. This type of material in which $N_2 > N_1$ is possible are called active material and this state is called Population inversion.

Achievement of Population Inversion:-

Let us suppose that

N_1 be the number of atom in the energy level E_1 and N_2 be the number of atom in the energy level E_2 and N_0 be the number of atom in ground energy state.

The according to maxwell Boltzmann Law. The the number of atom (N_1) in the energy level E_1 is given by :- $N_1 = N_0 e^{-E_1/1KT}$ — (1)

Similarly The number of atom N_2 in the energy level E_2 is given by maxwell distribution law $N_2 = N_0 e^{-E_2/1KT}$ — (2)

In case of normal condition $N_1 > N_2$. But But When energy given from outside then in such a case number of atom in the higher energy state (N_2) greater than (N_1). So that Population Inversion is achieve only when number of atom (N_2) is much greater in higher energy state (E_2) than number of atom (N_1) in the energy state (E_1).

Pumping :- The process through which electron or atom are jump from the energy level E_1 to the energy level E_2 are called pumping.

