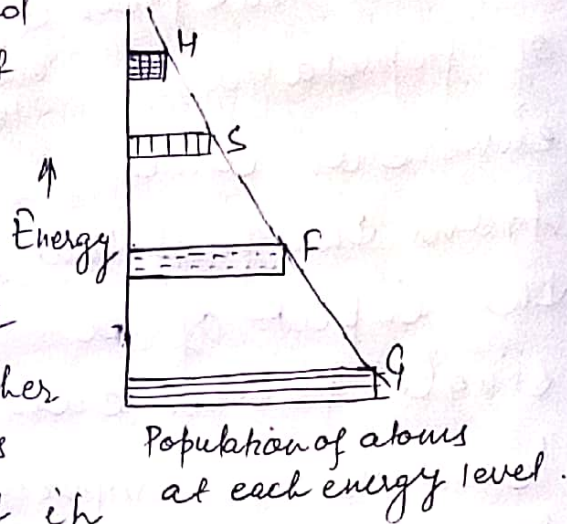


Population inversion:

These four possible energy levels called the population at the level by fig. When by some means it is arranged that population at higher energy levels is more than that in



lower energy levels process called population inversion or reversal.

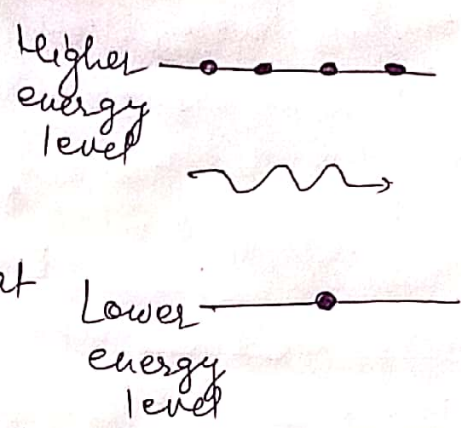
The method by which such a population inversion is affected is called pumping.

We assume an identical material with just two non-degenerate energy level 1 & 2 having population density  $N_1$  &  $N_2$ . The total number of these two atoms  $N_1 + N_2 = N_{Total}$ .

Population inversion occurs when more electrons, in a particular situation, are in a high energy state than in a lower energy state. Population inversion can be thought

of as an inversion from the standard, since electrons are typically located in lower energy states.

The true power of population inversion comes from the fact that the input of a single photon can lead to an important end result.



That is, all of higher energy electrons will "drop" to a lower energy state.

With each electron "drop" a photon that is coherent with its neighbors is released. The incoming photon does not directly interact with all of the electrons that are in higher energy levels, but it causes the release of additional photons that further interact with more of excited state electrons. Basically, population inversion leads to an "amplified" amount of simulated emission.

