

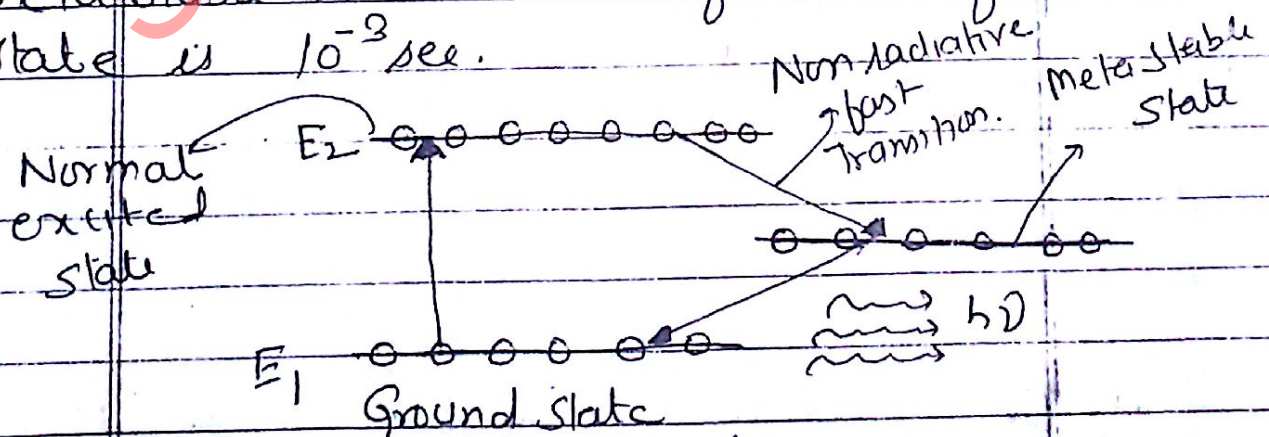
Laser Action: There are three main things which are required for laser action which are:-

(1). Active material (working substance):  
In different laser different working substance are used.

(2). Resonant cavity: Now the resonant cavity consist of cylindrical tube. At one end of the tube completely silvered mirror is attached while the other end of the tube is semi silvered is attached. So that in which high intense beam of light can build up by multiple reflection and a part of light emerge out from the semi silvered surface of the mirror.

(3). Pumping:-

In order to understand laser action, let us consider three energy level  $E_1$ ,  $E_2$  and  $E_3$ .  $E_1$  is the ground state,  $E_2$  is the normal excited state and  $E_3$  is the meta stable state. The life time of meta state is  $10^{-3}$  sec.



with the help of pumping (pumping is a device).



Through which atom are jump from ground energy state to higher energy state. Some energy is given to the material so that they (atom, electron) jump from energy state  $E_1$  to energy state  $E_2$ . Now  $E_2$  is a normal excited state. The life time of which is very small ( $10^{-8}$  sec).

So that they jump to the energy level  $E_3$  which is metastable state that is life time of  $E_3$  is large ( $\sim 10^{-3}$  sec). Thus the atom stay for a long time in this level. But on the other hand the atoms are lifted to  $E_2$  continuously. As a result population of energy state  $E_1$  decrease and  $E_3$  are increase. Thus a population inversion is achieved between  $E_1$  and  $E_3$ . Which is necessary condition for laser action.

Now if an atom from level  $E_3$  come down to  $E_1$  by spontaneous process then in this process a photon will be released. Which will incident with the atom in  $E_3$  and force them to come down so that another photon will be released in the same phase. because it is released by stimulated process. These photon traverse back and forth within cylindrical tube. otherwise compell the other atoms to come down and this process will go on. unless a high intense beam emerge out thus the laser action is achieved.