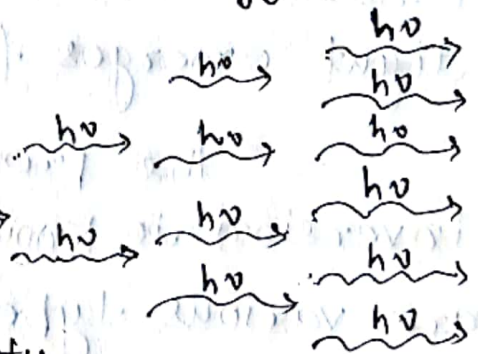


Principle of Laser action:

The word 'LASER' stand for Light Amplification by Stimulated Emission of Radiation. It is a device to produce a strong monochromatic, collimated and highly coherent beam of light. When a substance is irradiated with light of frequency ν which coincides with one of the frequencies of the atoms of the substances, two processes take place-

- (i) An absorption transition of atoms from a lower energy level m to a higher energy level n , such that $\nu = (E_n - E_m)/h$
- (ii) Stimulated emission transition from higher energy level n to lower energy level m .

In the first process photons from the incident beam are absorbed by the atoms thus leading to decrease in the intensity of the beam.



In the second process, additional photons coherent with the incident photons are emitted thus leading to an increase in the intensity. The net change in the intensity of the light beam depends on which of the two processes predominates.

Under ordinary conditions of thermal equilibrium the number of atoms in higher energy state n is considerably smaller than the number in lower energy state m , so that there is very little stimulated emission compared with absorption. If however, by some means a larger number of atoms are made available in the higher energy state, stimulated emission is promoted. The situation in which the number of atoms in the higher energy state exceeds that in the lower state is known as 'population inversion'. When this is achieved the photons in the light beam passing through the atoms go on multiplying by repeated stimulated emission. Hence a strong coherent beam of light emerges from the substance.

The process of achieving population inversion is known as pumping of atom. There are various types of pumping process, but the most natural is the 'optical pumping' which is utilised in Ruby Laser.