

**CL39\_Q1. Describe the gain and loss processes within the active medium of laser.**

**Ans:**

Fundamentally, an electro-magnetic wave travelling through a medium may gain or lose energy depending on the state of that medium.

The stimulated emission in the medium provides for gain with an optical feedback mechanism of reflecting mirrors on both ends of the cavity. This arrangement results in multiple travel of the trapped optical beam in the medium and ideally the beam should have a high intensity after few reflections. The gain of photons as the beam progresses is given by the intensity increasing as  $I = I_0 e^{gx}$  where  $g$  is the gain coefficient.

However, there could be also losses in the medium due to absorption, scattering and the partial transmission from one of the mirrors. The reduction in the intensity due to scattering and absorption is described by  $I = I_0 e^{-\alpha x}$  where  $\alpha$  is the loss coefficient.

**CL39\_Q2. Mention the role of Brewster's windows at the ends of the discharge tube before the reflecting mirrors in a laser cavity.**

**Ans:**

Brewster's window at the ends of the discharge tube in a laser cavity ensures a polarized beam of laser.

**CL39\_Q3. State the role of end mirrors in a laser cavity.**

**Ans:**

In a laser device, the mirrors make up the optical cavity by which the photon travels multiple times across the active material, thus making more and more photons duplicate resulting in exponential growth of electromagnetic energy which partially exits the cavity because one of the mirrors is not 100% reflective.