

# Pumping Process in Laser

**Laser pumping** is the act of energy transfer from an external source into the gain medium of a laser. The energy is absorbed in the medium, producing excited states in its atoms. When the number of particles in one excited state exceeds the number of particles in the ground state or a less-excited state, population inversion is achieved.

- In this condition, the mechanism of stimulated emission can take place and the medium can act as a laser or an optical amplifier. The pump power must be higher than the lasing threshold of the laser.
- The pump energy is usually provided in the form of light or electric current, but more exotic sources have been used, such as chemical or nuclear reactions.

# Flashlamp pumping

Flashlamps were the earliest energy source for lasers. They are used for high pulsed energies in both solid-state and dye lasers. They produce a broad spectrum of light, causing most of the energy to be wasted as heat in the gain medium. Flashlamps also tend to have a short lifetime.

- The first laser consisted of a helical flashlamp surrounding a ruby rod.
- Quartz flashlamps are the most common type used in lasers, and, at low energies or high repetition rates, can operate at temperatures as high as 900 °C. Higher average powers or repetition rates require water cooling.