

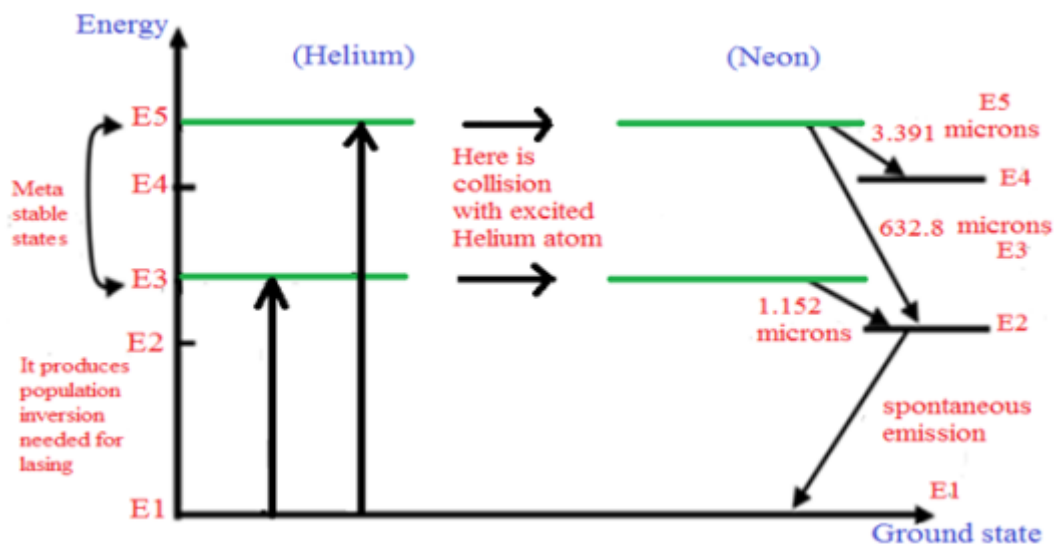
Answer on Question #60472-Physics-Optics

Discuss lasing action of a He-Ne laser.

Answer

In the He-Ne laser, light is produced by the atomic transitions within the neon atom. Since the helium does not directly produce the laser light, but it acts as a buffer gas. Its purpose is to assist the atoms of the other gas to produce lasing in a manner. When the energy from the pumping source is applied to the He-Ne gas mixture, some of the energy is observed by helium atoms, so the helium atom achieves an excited state. When the helium atom moves within the laser-tube, they collide with the neon atoms. At each collision, some of the energy of helium atom is transferred to the neon atom and raises it to an excited meta-stable state. The meta-stable state is of finite lifetime, all the state-parameters reach and hold the stationary values, this state describes the extended time spent by an isolated system in the along-lived configuration, other than system's state of least energy. When a sufficient number of neon atoms reach to this state the population inversion occurs and the lasing takes place.

This can be shown by the simplified energy level-diagram as:



In the above diagram the upward transition show, absorption of energy from the pumping source by the helium atom, whereas the downward transition shows the emission of energy or lasing presents only in neon atom.

There are three downward energy transitions for neon that produces lasing. If the transition occurs at relatively small energy step from E5 to E4 then, low energy infra-red photon is released with a wavelength 3.391 microns. And if the transition occurs at E5 to E2, which a larger energy step, then it produces the short wavelength more energetic photon at 632.8 nm, this gives us red light which is more desirable for He-Ne laser application.