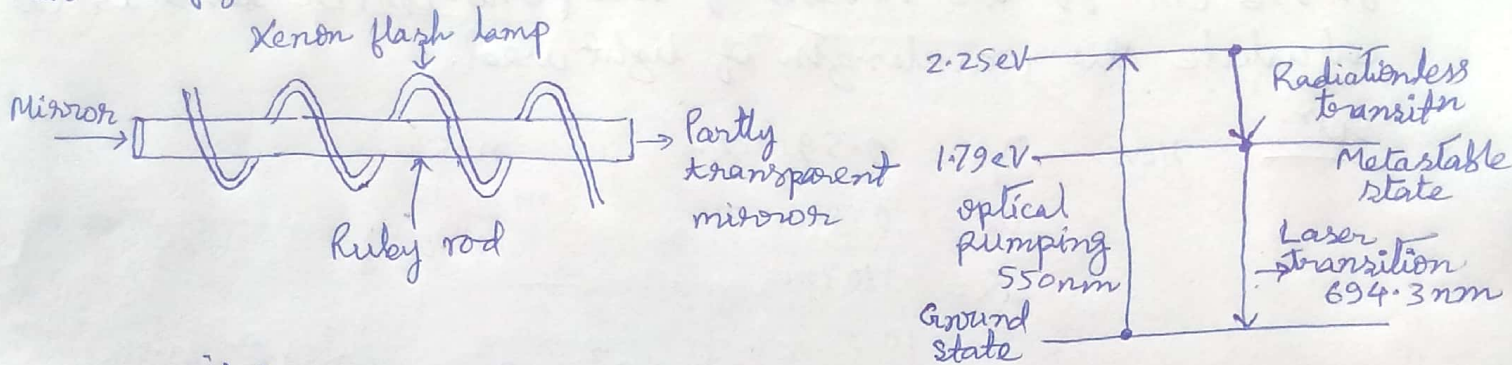


Ruby Laser: The first successful laser ruby laser is based on the three energy levels in the chromium ion Cr^{3+} shown in the figure.



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 A ruby crystal of aluminium oxide Al_2O_3 in which some of the Al^{3+} ions are replaced by Cr^{3+} ions, which are responsible for the ~~red~~ red colour. A Cr^{3+} ion has a metastable level whose lifetime is about 0.003 sec. In the ruby laser, a xenon flash lamp excites the Cr^{3+} ions to a level of higher energy from which they fall to the metastable level by losing energy to other ions in the crystal. photons from the spontaneous decay of some Cr^{3+} ions are reflected back and forth between the mirrored ends of the ruby rod, stimulating other excited Cr^{3+} ions to radiate. After a few microseconds the result is a large pulse of monochromatic, coherent red light from the partly transparent ~~end~~ end of the rod.

The rod length is made precisely an integral number of half wavelengths long, so the radiation trapped in it forms an optical standing wave. Since the stimulated emissions are induced by the standing wave, their waves are all in step with it.