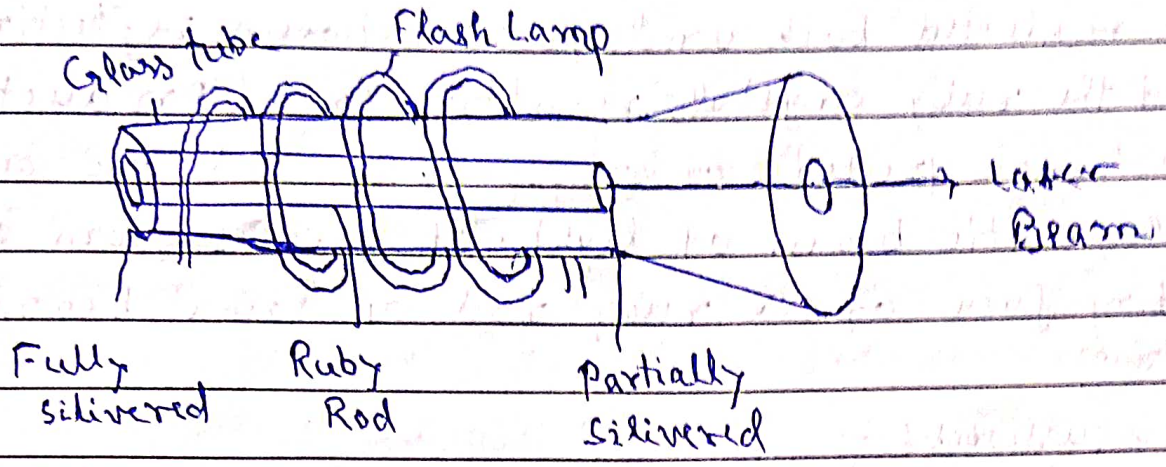
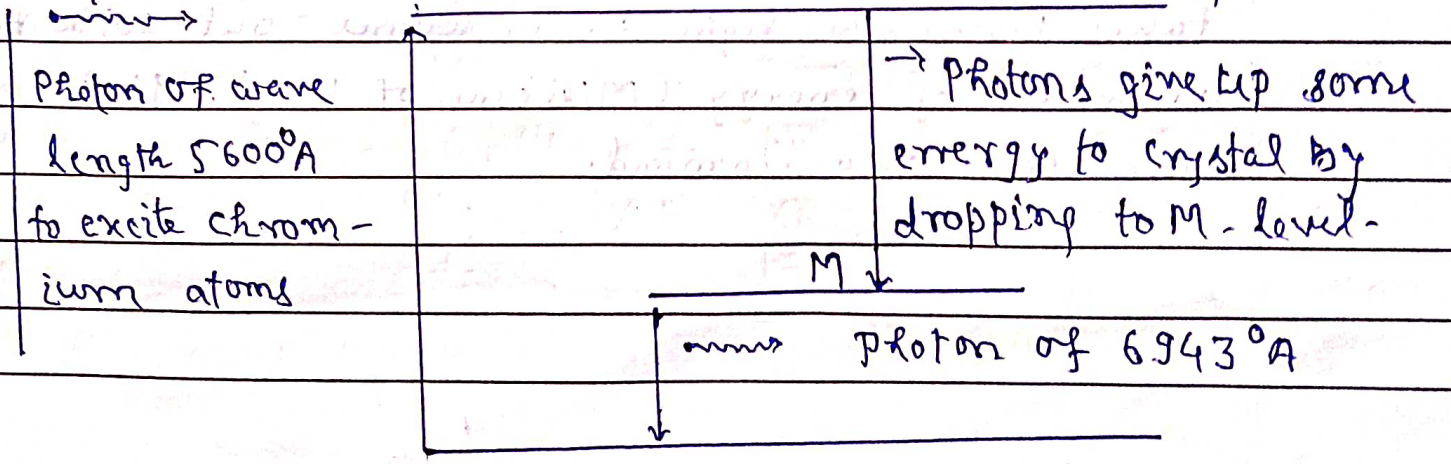
(b) Ruby Laser: (Solid State Laser) :—



Ruby laser is capable for generating very high power for very short interval of time. It is arrangement for Ruby laser shown in figure.

It consists of a small cylinder of pink synthetic ruby (having ruby crystal doped with 0.05% chromium), about 0.5 cm in diameter and few cm long. It is surrounded by a cylindrical reflector, a coolant and a spiral xenon flash lamp acting as a pump.



When the external light is flashed on, the ultraviolet light and the broad band of yellow green light from the xenon is absorbed by some of chromium atoms in ruby rod. Thus they get excited raising their level to E. From higher state E, they don't return to ground state in single jump. The first return to a metastable state M and energy difference is transmitted to the crystal in form of heat. The population of excited atoms at M level goes on increasing and a transition occures from M to G level emitting out photons. Light is reflected back and forth between reflecting ends of the ruby crystal, resulting in the production of a large pulse of coherent, parallel and intense mono chromatic beam of light. It escapes from semi reflecting face of the ruby rod as laser beam.

Discussions:—

(i) During operation of ruby laser, very high temper. is produced. To prevent it from over heating, it is surrounded by a liquid nitrogen container serving as coolant.

(ii) High power ruby laser (Q-spoiling):—

A fast acting shutter is interposed between one end of ruby rod and the mirror. So that internal reflections do not take place. In the mean time many atoms go to higher level due to pumping function. Now as a shutter is quickly removed laser action takes place. The light beam comes out with tremendous amount of energy (Millions of Watt). It is used to burn holes in a diamond.

Properties and applications of Laser light :-

1) Laser light is highly monocromatic, powerful, directional and coherent. It is capable of propagation over long distances.

2) It has got wide medical applications. It is used in the treatment of detached retina and cancer.

3) It has enabled the technique of producing three dimensional picture of an object.

4) Laser can be used for forecasting earth quakes.

5) A suitable telescope with a laser can be used to get clear photograph of the moon.

6) It has got wide applications in industries.

7) Laser can be modulated to transmit hundreds of messages at a time on radio, television and telephone.

8) When a beam of powerful laser is focussed by a lens, it can produce extremely high temperature enough to melt and vaporize metals in a millionth of a second.