# Overview - Laser

1. Define Laser - coherent source of light
2. Characteristic properties of laser light - monochromatic, unidirectional, highly intense and coherent
3. Full form of laser
4. What is coherence - its two types - temporal n spatial (define and give significance)
5. Define - population inversion, lifetime of an energy state, metastable state
6. Principle of laser - Stimulated emission - emission which requires external help - happens before the lapse of lifetime of energy state
7. Spontaneous emission - happens by itself after the lapse of lifetime of energy state
8. Discuss Einstein theory of matter and radiations - relationship amongst various Einstein coefficients - define Einstein Coefficients, give their physical significance and their units.
9. Give conditions of lasing action
10. Components of laser - (i) Laser medium (should be able to achieve population inversion, can be solid, liquid, gas) (ii) Pump (device to supply energy to create population inversion) - its types ( optical, electric discharge, electric, chemical) (iii) Optical Resonator (composition - two plane parallel mirrors with common principal axis, one fully polished and other is partially polished ; working - makes the photons oscillate between two mirrors and number of photons grows, positive feedback device as well as help to select one frequency /wavelength to be amplified based on $2l=n\lambda$.
11. 3-level laser : Ground state and Lower lasing level coincide with each other; normal excited state and upper lasing level (metastable state) separately defined eg Ruby laser
12. 4-level laser : All the four levels, ground state, lower lasing level, upper lasing level and normal excited state separately defined. Continuous Output. e.g. He-Ne, $CO_2$
13. Explain construction and working (energy level diagram) of Ruby laser.
14. Explain Construction of He-Ne laser and $CO_2$ laser.
15. Explain working using energy level diagram of He-Ne laser and $CO_2$ laser.
16. Why He and Ne are mixed together?
17. How He-Ne laser is better than Ruby laser?
18. Why $CO_2$ and $N_2$ are mixed together?
19. Why He is added in the mixture of $CO_2$ and $N_2$ in $CO_2$ laser?
20. Construction and working (energy level diagram) of diode laser.
21. Applications of He-Ne laser
22. Applications of $CO_2$ laser
23. Applications of diode laser
24. Applications of lasers in general
25. Disadvantages of lasers