Study Guide: Principles of Lasers

1. Distinguish between spontaneous and stimulated radiation.
2. Define the basics of energy level diagrams.
3. Explain how coherent light is generated.
4. List the conditions required for gain in a laser.
5. Describe the function of each component of a laser.
6. Explain TEM modes and their significance.
7. List the types of losses in a laser cavity.
8. Define:
    a. Monochormaticity
    b. Line width
    c. Far-field divergence
    d. Near-field beam divergence
    e. Beam power transmission through an aperture
    f. Irradiance
    g. Coherence
    h. Focusability
9. Name the principal types/categories of lasers.
10. Explain how spontaneous and stimulated emissions are produced noting their differences.
11. Describe the use of mirrors with high reflectivity in a laser.
12. Why is a CW laser less efficient than a pulsed laser?
13. What are the criteria by which the efficiency of a laser cavity configuration is decided?
14. Why is it important to align the mirrors in a laser cavity?
15. Explain how a gas laser cavity can be aligned using a low-powered HeNe laser.
16. How do longitudinal modes occur in a laser beam?

17. Do all the longitudinal modes share the same gain? Is it better to have a larger or a smaller number of modes? Explain.

18. A laser has an effective output aperture diameter of 1.6 mm at 488 nm. Find the beam divergence.

19. A laser has a beam divergence of 4.2 mrads. The beam is focused by a lens of focal length 2.05 cm. Find the diameter of the focused spot.

20. Explain the terms *pulse width*, *PRT*, and *PRR*.

21. Explain the terms *Full Width at Half Maximum* and *duty cycle*.

22. What role does Helium play in a HeNe laser?