PHYS 5130 Study Guide for the Mid-term Exam

Concepts that you should be very familiar with:

Concept of a wavefunction
Fourier transforms
Meaning of the probability current density and how to use it
The density function
How to distinguish between pure and mixed states
Jones matrices and how to use them
Lorentz oscillator model and how to absorption and dispersion can be calculated from it
Einstein coefficients
Difference between absorption (B_{12}), stimulated emission (B_{21}), and spontaneous emission (A_{21})
Oscillator strength
Magnetic two-level systems, specifically the case of a static, uni-directional magnetic field with and without an oscillating transverse field
Rabi formula
Interpretation of the magnetic Bloch equations
Meaning of T_2 and T_1
Spin susceptibility (χ', χ'', and χ_0) Optical Bloch equations
Gain curve
Oscillation threshold
Concept of hole burning
Concept and simplified use of the Fresnel-Kirchoff diffraction formula
Transverse and longitudinal modes of an optical resonator
Fabry-Perot interferometers
Free-spectral range, cavity finesse, and cavity ring-down time
Schwalow-Townes relation