Study Guide for Midterm #3; Phys 122 (Again, one page of notes allowed.)

Key concepts/material by chapter section:

7.3-7.5; Know the various quantum numbers for the quantum mechanical solution to the H-atom, including spin. Understand these new quantum numbers, the limits on their possible values, and the physical measurements they correspond to.
7.6 Selection rules for radiative transitions.

8.1 Periodic Table. Be sure to fully understand all the intricacies of WHY the periodic table is the way it is. You should be able to come up with an educated guess for exactly what sub-shells have exactly what number of electrons for any low-Z element!

9.5 and the first page of 9.6 only. Namely, the use of Maxwell-Boltzmann and Dirac statistics and knowing which type(s) of particles correspond to which type of statistics. Understand meaning an implication of the Fermi Energy; be able to figure out where the Fermi energy is from a zero-temperature energy distribution. Be able to calculate probably distributions at any energy, even if there are degeneracies.

10.2 only (not the applications, just the physics of lasers). Understand the need for population inversion, the pumping mechanisms that can get to an inversion, and the three basic interactions between photons and atoms. Understand the general physical processes that lead to the creation of a laser beam. Be able to calculate the quantum efficiency of a laser.

11.1; Concepts concerning Band Theory and how they relate to conductivity (see figure 11.6).
11.2; General concept of semiconductors, importance of small band gap, doping (p-type and n-type) and what this does to the semiconductor.

12.2 Protons and neutrons; Meaning/notation of A,Z,atomic mass unit u.
12.3,12.5 Isotopes, Binding energy
12.6,12.8: Radioactive decay (important!); decay constant vs. halflife, the activity "R" (convert to Ci units), relation between R and N, and especially Eq. 12.24.
12.7; alpha and beta decay (beta- and beta+ both)

13.1; Nuclear reaction notation; be able to determine released energy via data in Appendix 8.
13.4,13.6; Fission and Fusion (general concepts)

14.1-14.3,14.5; Know the following terminology, and symbols for each: Bosons vs. Fermions, Leptons vs. Hadrons (the latter being quarks, mesons, and baryons). Know Electron, Muon, Tau are leptons, with associated neutrinos. Know about the anti-particles; be able to tell them apart via notation. Know the up, down, and

strange quarks (and that there are 3 others, and antimatter versions). Be able to determine charge of any meson or baryon if given the quark components.

14.4: Conversation Laws: Be able to determine whether any of the following conservation laws are violated in any reaction: Spin, Charge, Lepton number (both overall and each species (electron, muon, tau)), Baryon number, Strangeness.