Review for the Final Exam

Below you will find a list of topics that you will be responsible for knowing for the Final as well as a list of topics that will not be covered. Remember that you are allowed <u>two</u> formula sheets for the test!

Although I've tried to cover everything, anything not explicitly mentioned is your responsibility

<u>Everything listed on the Review Sheet for Exam 1</u>

<u>Everything listed on the Review Sheet for Exam 2</u>

<u>Chapter 7</u>

- Schrodinger equation in three dimensions
    - solutions
    - energies
        o degeneracy
- Schrodinger equation in spherical coordinates
    - central potentials
    - separation of variables
    - solutions to spherical equation of the 3DSE
        o spherical harmonics (note: I will give specific solutions on the test)
    - quantization of angular momentum
        o angular momentum operator
        o quantum numbers l,m
        o vector representation of angular momentum
    - solution to the radial equation
        o radial functions (note: I will give specific solutions on the test)
        o energies
        o principle quantum number n
        o degeneracy
    - selection rules
- Hydrogen atom wave functions
    - normalization
    - probabilities $P(r)dr = |\Psi|^2\ 4\pi r^2\ dr$
    - ground and excited states, continuum states
- electron spin
    - spin quantum number
- total angular momentum
    - addition of angular momentum: $\mathbf{J} = \mathbf{L} + \mathbf{S}$
-Pauli Exclusion Principle

Not covered: magnetic moments, Stern-Gerlach experiment, spin-orbit coupling, Schrodinger equation for two or more particles, ground states of atoms, excited states of atoms

Chapter 8

 Classical Statistics*
- Boltzmann distribution
- Density of states, $g(E)$
- Maxwell distribution of molecular speeds
- Maxwell distribution of kinetic energy
- Heat capacities of gases and solids

Quantum Statistics
- Bose-Einstein and Fermi-Dirac distribution functions
- Finding the density of states

Not included: Bose-Einstein condensation, photon gas, quantization of energy states of matter, understanding specific heats of gases, properties of a Fermion gas

*Note: even though I will give the integrals on the exam, the math is sufficiently dense that you should spend the time you need to understand it.

Chapter 14

The Sun
- Solar luminosity, solar constant
- Effective temperature, T_E
- Proton-proton cycle

Stellar evolution
- Hertzsprung-Russell diagram
- Relationships between stellar mass, luminosity, radius, and lifetime

Cataclysmic events
- Novae
- Supernovae

Final states of stars
- white dwarfs
- neutron stars and pulsars
- black holes

Hubble's Law
- expansion of the universe

Not included: Active sun, stars, parallax method, galaxies, gravitation and cosmology, cosmogenesis