L99-Review

Friday, April 29, 2016 08:50

* Final Exam – cumulative from whole semester
  – must solve 5/6 problems (see midterm)
  each with a calculation & conceptual questions

4) Spin & Angular momentum
   Quantum numbers & ladder operators.
   Pauli Matrices, diagonalization,
   combination of 2 spin-½ systems;
   evolution of spin system in B-field.

5) Identical particles
   Symmetrization of multiparticle wave fn: ψ_{even}, ψ_{odd}.
   Atomic configuration
   Statistical counting of microstates from single-particle states
   Description of M-B, F-D, BE distributions..
   Blackbody spectrum, Bose-Einstein condensate, Fermi Gas.

6) Time-independant perturbation theory
   solve nondeg. & degenerate first-order energy & eigenstates
   using either operator wave functions or perturbation matrix
   [hyper] fine structure: show magnetic interaction produces $\vec{L}\cdot\vec{S}$ coupling
   identify states with good $\vec{L}\cdot\vec{S}$, $\vec{I}\cdot\vec{S}$
   Zeeman effect: states & energies in low/strong field limit.

7) Variational Principle
   problem to minime energy of parametrized state.

9) Time dependent perturbation theory:
   calculate evolution $[c_a(t), c_b(t)]$ to first order
   calculate a transition probability:
   ~~derive relation between A, B coefficients~~
   Explain Breit-Wigner line shape, selection rules.

11) Scattering
explain the relation between various waves, amplitudes, and cross sections
solve partial wave scattering amplitude.