Study notes for lecture 3 (pages 68 - 80 in the book)

The following parts are of special/central importance. (2014-01-22)

1. Helmholtz free energy is defined as $F = U - \tau\sigma$ (eq 35). At equilibrium it is at a minimum (eq 37). F balances the the energy minimization against the the demand to maximize the entropy at a specific temperature τ.
2. Work through that F is an extremum and minimum at equilibrium.
3. Work through how to derive eq 49 from the differential of F.
4. Work through the relation of F and the partition function $Z(\tau)$ eq 53 and 55.
5. Ideal Gas. Be sure to know your particle in the box from quantum mechanics.
6. The meaning of quantum concentration n_Q eq 63 and how it is used to define the classical regime.
7. Definition of Ideal classical gas and the energy of an atom eq 65.
8. Work through the example leading to eq 68. We will return this expression later in the course. Then the factor $N!$ will be treated differently. The example is a classical calculation leading to eq 68.
9. Work through the derivation of Ideal gas law eq 69-73 from the Helmholtz free energy F.
10. The Sackur–Tetrode equation 76.
11. Work through the example of entropy of mixing on pages 78-80.