We discussed how to read and how to do problems. We stressed the differences between the new ideas and your old ideas. You need help in summarizing, so that you can study from your brief notes, referring to the book if you need further clarification. Here is how I would summarize the main ideas of chapter 1. Compare this with your summarizations. This should help you summarize the next chapters better.

Equil (equilibrium) – properties independent of time, and with no heat fluxes.
Changes – not equil
System + surroundings = universe
Homogenous, heterogeneous (e.g., water and ice at equil)
Intensive, extensive (depends on size)
State variables – define the system at equil
Mole – number of molecules /Avogadro's constant
    n – number of moles
Zeroth law of thermo:
    If A is in thermal equil with B, and B with C, then A is in equil with C.
Isotherm: plot of P vs V at constant T
Boyle's Law: PV = const if T, n are constant
Eq (equation) of state: eq relating properties at equil
Pressure: force/area. Units in mks is Pa.
    1 bar = 10^5 Pa.
    Atm = 1.01325 Pa

Partial pressures – Dalton's Law:

$$P = \Sigma P_{i.} . \ P_{i.} \text{ is the partial pressure of the species i}$$

$$P_{i.} = y_{i.} P, \text{ where } y_{i.} = n_{i.} / n \text{ - mole fraction}$$

Real gases. Z is compressibility. $Z = \frac{P\bar{V}}{RT}$.
If Z > 1, then it is harder to compress than an ideal gas with the same T,V.
Z increases with P, except at low P (p. 12). For P = 0, Z = 1.

Phases: Solid (s), liquid (ℓ), gas (g).
    Triple point: s, ℓ, g at equil
    Critical: ℓ and g are the same for $T > T_c$

Van der Waals:

$$\left(P + {}^{a}\!/\!{}_{\bar{V}^2}\right)\left(\bar{V} - b\right) = RT$$

a and *b* are constants. Values for different substances given in tables.
b is related to the size of molecules, which is zero for an ideal gas. Increases Z.
a has to do with the attraction between molecules, which is zero for an ideal gas. Decreases Z. Look at the figure.

Degrees of freedom, p. 22.

Partial molar volume

V_i is $\frac{\partial V}{\partial n_i}$, where T, P, and n_j are constant.

$V = \overline{V_i} n_i$.

Proven from Euler's theorem for homogenous functions

$V(\lambda n_i) = \lambda V(n_i)$, for λ constant.

The volume depends upon the number of moles of all species.

$\overline{V} = \overline{V}_i y_i$, where y_i are mole fractions.

Dr. S. Aranoff, 2/12/2008