1. LIQUID PROPERTIES Many liquid properties (e.g., V, H, fi, U) change slowly with pressure, and *thus these properties are often assumed constant with pressure*.

Liquid properties change with temperature, but the heat capacity does not change much with temperature.

1. Gas Properties: Properties depend on pressure and temperature for gases and the heat capactiy increases with temperature.   
   For an ideal gas, enthalpy and internal energy depend only on temperature.
2. Kinetics and Thermodynamics: Thermodynamics **cannot** be used to predict rates. For example, a chemical reaction with a Keq does not have to have a faster rate than a reaction with a small Keq. Thermodynamics can predict equilibrium states but it cannot predict the time required to reach equilibrium.
3. STEADY STATE means that properties (T, P, H, etc.) do not change with time at a given location.
4. CLAPEYRON EQUATION



1. DEFINITIONS: G = H - TS H = U + PV

μi = (∂(nG)/∂ni)P,T,nj

fugacity (fi)  (fi has units of pressure)

ai = fi/fi  γI = ai/xi

1. PHASE CHANGE: G for a component is same in each phase

dG = VdP - SdT

1. At equilibrium between 2 phases α and β,  
    Giα = Giβ fiα =fiβ μiα = μiβ
2. For equilibirum of a system, the total Gibbs free energy is minimized.
3. For an irreversible process, the total entropy change (system + surroundings) is greater than zero. ENTROPY is **not** conserved.
4. **Absolute temperature** must be used in thermodynamic calculations.