Barbara Perez
Macroscopic Pchem
Due: 03-24-20
Reading HW #5

5.12 Using the Fact that S is a state Function to Determine the Dependence of S on V and T.

- dS is an exact differential.. $dS = \frac{1}{T}dU + \frac{P}{T}dV$ because 1/T and P/T are > zero the entropy of a system increases with the internal energy at constant V, increases with volume at constent internal energy.
- dS can be expressed in terms of dT and dV as

$$dS = \frac{C_V}{T}dT + \frac{\beta}{K}dV$$

$$\Delta S = \int_{T_i}^{T_f} \frac{C_V}{T}dT + \int_{V_i}^{V_f} \frac{\beta}{K}dV$$

~this applies to a single-phase system $T_i, V_i \rightarrow T_f, V_f$ (no phase change occurs or chemical reaction occur in system)

5.13 The Dependence of S on T and P

- since normal reactions carried in constent pressure instead of constent vol, we need know how S varies with T and P.

$$dS = \left(\frac{\partial S}{\partial T}\right)_P dT + \left(\frac{\partial S}{\partial P}\right)_T dP$$

- S is a monotonically increasing function of temp.
- $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P = -V\beta$

$$\Delta S = \int_{T_i}^{T_f} \frac{C_P}{T}dT - \int_{P_i}^{P_f} V\beta\, dP$$

- This applies for single-phase system of pure liquid, solid, gas that goes from $T_i, P_i \rightarrow T_f, P_f$ w/ no phase change or chemical reaction in system.