5.60 Thermodynamics & Kinetics
Spring 2008

These equations will be provided on Exam 2:

R = 8.314 J K^{-1} mol^{-1} = 0.08314 L bar K^{-1} mol^{-1}

T(K) = T(°C)+273.15

1Pa = 10^{-5}bar

Temperature change $\Delta S = C_V \ln \frac{T_2}{T_1}$ or $C_p \ln \frac{T_2}{T_1}$ $\left(\frac{\partial S}{\partial T}\right)_p = \frac{C_p}{T}$ $\left(\frac{\partial S}{\partial T}\right)_V = \frac{C_V}{T}$

Reversible phase change, e.g. $\Delta S_{\text{vap}} = \frac{q_p^{\text{rev}}}{T_b} = \frac{\Delta H^{\text{vap}}}{T_b}$

$\Delta S_{mix} = -nR\left(X_A \ln X_A + X_B \ln X_B\right)$

H = U + pV A = U – TS G = U + pV – TS

$U(S,V) \Rightarrow dU = TdS - pdV$

$H(S,p) \Rightarrow dH = TdS + Vdp$

$A(T,V) \Rightarrow dA = -SdT - pdV$

$G(T,p) \Rightarrow dG = -SdT + Vdp$

$\Delta G^o_{rxn} = -RT \ln K_p$ $\Delta G = \Delta G^o_{rxn} + RT \ln Q$

$\ln K_2 = \ln K_1 + \frac{\Delta H^o_{rxn}}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

$\mu_i(\text{g},T,p) = \mu_i^o(g,T) + RT \ln p_i$ (p in bar) $S(p,T) = S^o(T) - nR \ln p$ (p in bar)

$\left(\frac{dp}{dT}\right)_{coexist} = \left(\frac{\Delta \bar{S}}{\Delta \bar{V}}\right)_{\alpha \to \beta}$

$\left(\frac{dp}{dT}\right)_{coexist} = \left(\frac{\Delta \bar{H}}{T\Delta \bar{V}}\right)_{\alpha \to \beta}$