General Chemistry with Doc M
Wednesday 3/23/15
Lab: 17.7-17.9

Tuesday: Quiz on Exp #8
Exp #9

Wednesday: Chap 17 (first id)

Thursday 3/31: Next review/problem club with Monsa

CK3 is April 6

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When you open partition does it mix?

\[ \Delta H \approx 0 \]
\[ \Delta G = \Delta H - T \Delta S \]
\[ \Delta S > 0 \]
\[ \Delta G < 0 \]

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\[
\text{PCl}_3(g) + C_2H_2(g) \rightarrow \text{PCl}_5(s)
\]

\[ \Delta H^\circ = -319.7 \text{ kJ/mol} \]
\[ \Delta S^\circ = -374.9 \text{ kJ/mol} \]
\[ x:1 \text{ mol} \rightarrow x:1 \text{ mol} \]

\[ \Delta G < 0 \text{ spontaneous} \]

\[ \Delta H = \text{RT} \Rightarrow \Delta H = -774.9 \text{ + 39.7} = -745 \text{ kJ} \]
1. \[ \text{N}_2 \text{O}_5 \rightleftharpoons 2\text{NO}_2 \quad \Delta H_{\text{rxn}} = 57 \text{ kJ} \quad \text{endothermic} \]
\[ \Delta S_{\text{rxn}} = 176 \text{ J/K} \quad \text{entropy favored} \]
\[ T = \frac{57221}{176} \frac{\text{kJ}}{\text{K}} \approx 324 \text{ K} \]

2. \[ 2\text{NO}_2(g) + \text{O}_2(g) \rightarrow 2\text{NO}_2(g) \quad \Delta H_{\text{rxn}} = -116 \text{ kJ} \quad \text{exothermic} \]
\[ \Delta S_{\text{rxn}} = -1810 \text{ J/K} \quad \text{entropy not favored} \]
\[ T = \frac{-116 \text{ kJ}}{-1810 \text{ J/K}} \approx 79.5 \text{ K} \]

3. \[ \text{C}_3\text{H}_8(g) + \text{O}_2(g) \rightarrow 3\text{CO}_2(g) + 4\text{H}_2\text{O}(g) \quad \Delta H < 0 \]
\[ \Delta S > 0 \]

4. \[ 3\text{O}_2(g) \rightarrow 2\text{O}_3(g) \quad \Delta H > 0 \]
\[ \Delta S < 0 \]

\[ \Delta G = \Delta H - T \Delta S \]

- (a) - (4) (+)
- (-) - (+) (-) = (+) + (+)
- (-) - (+) (+) = (-) + (-) = always negative, spontaneous
- (+) - (+) (-) = (+) + (+) = always positive, non spontaneous

\[ \Delta G \]

- \[ \text{Temp (K)} \]
\[ T = \frac{\Delta H}{\Delta S} \]
Phase changes: Type I to Type II

\[ \text{H}_2\text{O} \text{ (s)} \rightarrow \text{H}_2\text{O} \text{ (g)} \quad \Delta H^\circ = + \quad \Delta S^\circ = + \]

\[ \text{H}_2\text{O} \text{ (l)} \rightarrow \text{H}_2\text{O} \text{ (g)} \quad \Delta H^\circ = - \quad \Delta S^\circ = - \]

\[ l \rightarrow g \quad \Delta H = -285.8 \quad -241.8 \]

\[ \frac{x-1}{285.8} = \frac{x}{-241.8} \]

\[ 285.8 - 241.8 = 44.0 \text{ kJ} \]

\[ T = \frac{44.0 \text{ kJ}}{1.188 \text{ kJ K}^{-1}} = 37.0 \text{ K} \]

\[ 69.8 \text{ K} \quad 18.7 \text{ K} \]

\[ \frac{x-1}{-69.8} = \frac{x}{18.7} \]

\[ -69.8x + 18.7x = 118.8 \text{ J/K} = 97.4 \text{ °C} \]

Here's law also applies to \( \Delta S \text{calcd} \text{ and } \Delta S \text{calc} \)

*Given \( \text{S}_\text{g} + \text{O}_\text{g} \rightarrow \text{SO}_\text{g} \quad \Delta G = -380.0 \text{ kJ} \)

\[ 2\text{S}_\text{g} + 3\text{O}_\text{g} \rightarrow 2\text{SO}_\text{3} \text{g} \quad \Delta G = -742 \text{ kJ} \]

Calculate for \( 2\text{SO}_\text{2} \text{g} + \text{O}_\text{2} \text{g} \rightarrow 2\text{SO}_\text{3} \text{g} \quad \Delta G = ? \)

\[ 2\text{SO}_\text{2} \text{g} \rightarrow 2\text{S}_\text{g} + \text{2O}_\text{2} \text{g} \quad \Delta G = 600 \text{ kJ} \]

\[ 2\text{S}_\text{g} + 3\text{O}_\text{2} \text{g} \rightarrow 2\text{SO}_\text{3} \text{g} \quad \Delta G = -742 \text{ kJ} \]

\[ \Delta G = -142 \text{ kJ} \]