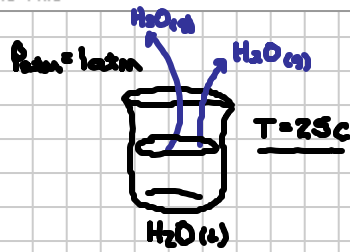


Lecture 19.3 Non Standard Gibbs Free Energy

Note Title

3/17/2012



Everyone knows that water evaporates



ΔG° -237.1 kJ/mol -228.6 kJ/mol

$\Delta G^\circ_{rxn} = (-228.6 \text{ kJ/mol}) - (-237.1 \text{ kJ/mol}) = +8.5 \text{ kJ/mol}$

pos \Rightarrow Non Spontaneous

Standard Conditions

- $T = 25^\circ\text{C}$ 😊
- Conc 1 M
- Pressures = 1 atm. $P_{H_2O} \neq 1 \text{ atm}$ ☹️

ΔG w/ correction:

$\Delta G_{rxn} = \Delta G^\circ_{rxn} + RT \ln(Q)$ Reaction Quotient

$8.314 \text{ J/mol}\cdot\text{K}$ R K \ln

$Q = \frac{P_{prod}}{P_{react}} = \frac{P_{H_2O(g)}}{1} = P_{H_2O}$

Liquid

$\Delta G_{rxn} = \Delta G^\circ_{rxn} + RT \ln P_{H_2O}$

Warm Day, Dry Day

$T = 30^\circ\text{C}$

$P_{H_2O} = 0.0050 \text{ atm}$

$\Delta G_{rxn} = \Delta G^\circ_{rxn} + RT \ln P_{H_2O}$

$\Delta G_{rxn} = 8500 \text{ J/mol} + (8.314)(303.15 \text{ K}) \ln(0.0050 \text{ atm})$

$\Delta G_{rxn} = -4854 \text{ J/mol}$ (+) \Rightarrow Spontaneous

Dry \leftarrow more negative ΔG
 .. more spontaneous.

... H_2O evaporates quickly
 Keeps us cool

Warm, humid day.

$T = 30^\circ\text{C}$

$P_{H_2O} = 0.026 \text{ atm}$

$\Delta G_{rxn} = \Delta G^\circ_{rxn} + RT \ln P_{H_2O}$

$\Delta G_{rxn} = 8500 \text{ J/mol} + (8.314)(303.15 \text{ K}) \ln(0.026)$

$\Delta G_{rxn} = -690 \text{ J/mol}$ (neg \Rightarrow spont)

Humid \leftarrow less negative ΔG
 .. less spontaneous

... H_2O Evaps. Less spont.
 We won't as cool