Review Sheet for Exam on Equilibrium Chemistry

This review sheet provides a summary of topics covered in this section of the course, a list of equations that you should know, and a list of constants and other materials that are provided to you. As Chem 170 is a prerequisite for this course, you should be familiar with basic stoichiometric calculations.

Topics Covered

- reaction dynamics: thermodynamics vs. equilibria vs. kinetics
- Hess's law as it applies to equilibrium constants
- using Q and K to predict the direction of a reaction
- LeChâtelier's principle
- standard types of equilibrium reactions and their equilibrium constant expressions
- solving equilibrium problems: general approaches
- determining the pH of strong and weak acids and bases
- determining the pH of a buffer
- determining a buffer's capacity and its change in pH upon adding a strong acid or strong base
- solubility equilibria
- effect on solubility of changing pH
- complexation equilibria
- effect on solubility of metal-ligand complexation
- effect on solubility of inert ions

Equations Provided to You

- $\mathrm{pH} = -\log[\mathrm{H_3O^+}]$
- $\mathrm{p}X = -\log(X)$
- $\mathrm{pH} + \mathrm{pOH} = 14$
- $\mathrm{p}K_a + \mathrm{p}K_b = 14$
- $K_w = [\mathrm{H_3O^+}][\mathrm{OH^-}] = K_{a,HA} \times K_{b,A^-}$
- $\mathrm{pH} = \mathrm{p}K_a + \log\frac{[\mathrm{A^-}]_o}{[\mathrm{HA}]_o}$
- $\mathrm{pH} = \mathrm{p}K_a + \log\frac{(\text{mol A}^-)_o}{(\text{ mol HA})_o}$
- $\mathrm{pH} = \mathrm{p}K_a + \log\frac{(\text{mol A}^-)_o + \text{ mol OH}^-}{(\text{ mol HA})_o - \text{ mol OH}^-}$
- $\mathrm{pH} = \mathrm{p}K_a + \log\frac{(\text{mol A}^-)_o - \text{ mol H}_3\text{O}^+}{(\text{ mol HA})_o + \text{ mol H}_3\text{O}^+}$
- $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Constants and Other Materials Provided To You

- periodic table
- specific heat of water = 4.184 J/g • °C
- R = 8.314 J/K • $\mathrm{mol_{rxn}}$
- F = 96,485 C/mol $\mathrm{e^-}$ = 96,485 J/V • mol $\mathrm{e^-}$
- $K_w = 1.00 \times 10^{-14}$