ACID-BASE EQUILIBRIA

Chapter 18 Outline

Text Problems: # 15, 16, 18, 20, 45, 48, 50, 54, 55, 65, 67
+ Supplementary Questions (attached)

Text Sample Problems: The text has a number of excellent sample problems (solved in detail) in each section. I would recommend that you study these problems + the "follow up" problems, which have brief solutions at the end of the chapter.

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<td>Autoionization of Water and the pH Scale</td>
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Chapter 18
Supplementary Homework Questions

S1. Which of the following is not a conjugate acid-base pair?
   a. CH₃COOH and CH₃COO⁻
   b. CH₃NH₃⁺ and CH₃NH₂
   c. H₂SO₃ and HSO₄⁻
   d. HPO₄²⁻ and PO₄³⁻
   e. HCOOH and HCOO⁻

S2. Which of the following represents the most acidic solution?
   a. [H⁺] = 0.15 M
   b. [H⁺] = 1.0x10⁻¹⁴ M
   c. pH = 3.6
   d. [OH⁻] = 1.0x10⁻¹³ M
   e. pOH = 13.4

S3. Arrange the solutions in order of increasing acidity:
   I    a solution with [H₃O⁺] = 4.2 x 10⁻⁶ M
   II   lemonade, pH = 2.65
   III  0.25 M nitric acid
   IV   pickle juice, pH = 3.10

   a. I-IV-II-III
   b. II-IV-III-I
   c. III-II-IV-I
   d. IV-I-II-III
   e. III-II-I-IV

S4. Write the acid ionization constant expression for the ionization of the hydrogen sulfate ion, HSO₄⁻, in aqueous solution.

S5. Lactic Acid is a weak acid with $K_a = 1.4x10^{-4}$. Calculate the pH, pOH and percent protonation of a 0.05 M solution of sodium lactate. Also calculate the percent protonation of the lactate.

S6. Aniline is a weak base with $K_b = 4.3x10^{-10}$. Calculate the pH, pOH and percent dissociation (of the Anilinium ion) of a solution of 0.07 M Anilinium Bromide. Also calculate the percent dissociation of the Anilinium ion.
S7. Tellurous Acid, H$_2$TeO$_3$, is a diprotic acid with acid dissociation constants, $K_a^1 = 3.0 \times 10^{-3}$ and $K_a^2 = 2.0 \times 10^{-8}$

   a) Calculate the pH and pOH of a 1.20 M solution of Tellurous Acid (H$_2$TeO$_3$).
   b) Calculate the pH and pOH of a 0.25 M solution of potassium tellurite (Na$_2$TeO$_3$)

S8. The pH of a 0.15 M solution of Morphine (C$_{17}$H$_{19}$O$_3$N) is 10.5. Calculate the Base Equilibrium Constant, $K_b$, for Morphine.

Answers to the Supplementary Homework Questions are posted on the course web site. Questions about these Problems will be answered in Recitation.