

16: Acid-Base Equilibria

OVERVIEW OF THE CHAPTER

16.1, 16.2 Acids and Bases in Water: Bronstead-Lowry Definition

Review: Acids and bases (4.3); hydrogen bond (11.2)

Learning Goals: You should be able to:

1. List the general properties that characterize acidic and basic solutions.
2. Define the terms Bronstead-Lowry acid and base, and conjugate acid and base.
3. Identify the conjugate base associated with a given
4. Bronstead-Lowry acid and the conjugate acid associated with a given Bronstead-Lowry base.

16.3, 16.4 Acids and Bases: The Role of Water and the pH Scale

Learning Goals: You should be able to:

1. Describe the autoionization of water and write the ion-product constant expression for the equilibrium.
2. Define pH and calculate pH from a knowledge of $[H^+]$ or $[OH^-]$, and perform the reverse operation.

16.5 Strong Acid and Base Solutions: pH Calculations

Review: Concentration units (13.4); strong electrolytes (4.1).

Learning Goals: You should be able to identify the common strong acids and bases and calculate the pHs of their aqueous solutions given their concentrations.

16.6, 16.7 Weak Acid and Base Solutions: pH Calculations

Review: Use of quadratic formula (see Appendix in the text); weak electrolytes (4.2); equilibrium calculations (15.6)

Learning Goals: You should be able to:

1. Calculate the pH for a weak acid solution in water, given the acid concentration and K_a ; calculate K_a given the acid concentration and pH.
2. Calculate the pH for a weak base solution in water, given the base concentration and K_b ; calculate K_b given the base concentration and pH.
3. Calculate the percent ionization for an acid or base, knowing its concentration in solution and the value of K_a or K_b .

16.8, 16.9**Salt Solutions: Hydrolysis**

Review: Ions (2.7); hydration (13.1).

Learning Goals: You should be able to:

1. Determine the relationship between the strength of an acid and that of its conjugate base.
2. Calculate K_b from a knowledge of K_a , and vice versa.
3. Predict whether a particular salt solution will be acidic, basic, or neutral.
4. Calculate the pH of a salt solution given the appropriate equilibrium constant and concentrations.

16.10**Factors Affecting Acid-Base Strength**

Review: Bond strength (8.8); electronegativity (8.4); polarization (8.4); Lewis structures (8.5, 8.6).

Learning Goals: You should be able to:

1. Explain how acid strength relates to the polarity and strength of the H-X bond.
2. Predict the relative acid strengths of oxyacids and justify your order of acid strengths.

16.11**The Lewis Model of Acids and Bases**

Review: Hydration (13.2); Lewis structures (8.5, 8.6).

Learning Goals: You should be able to:

1. Define an acid or base in terms of the Lewis concept.
2. Predict the relative acidities of solutions of metal salts from a knowledge of metal-ion charges and ionic radii.