CHAPTER 15 LEARNING OBJECTIVES

Learning Objectives

You should be able to:

1. List the general properties that characterize acidic and basic solutions and identify the ions responsible for these properties.
2. Define the terms: Brønsted-Lowry acid and base, and conjugate acid and base.
3. Identify the conjugate base associated with a given Brønsted-Lowry acid and the conjugate acid associated with a given Brønsted-Lowry base.
4. Explain what is meant by the autoionization of water and write the ion-product constant expression for the process.
5. Define pH; calculate pH from knowledge of $[H_3O^+]$ or $[OH^-]$, and perform the reverse operation.
6. Identify the common strong acids and bases and calculate pHs of their aqueous solutions given their concentrations.
7. 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.
8. Write stepwise ionization equations and the corresponding equilibrium-constant expressions for polyprotic acids.
9. 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.
10. Recognize how amines act as weak bases and how carboxylic acids ionize in aqueous solution.
11. Determine the relationship between the strength of an acid and that of its conjugate base; calculate K_b using a given K_a, and vice-versa.
12. Explain how acid strength relates to the polarity and strength of the H—X bond.
13. Predict whether a particular salt solution will be acidic, basic, or neutral.
14. Describe how a visual acid-base indicator works; select an appropriate indicator for a given titration.
15. Explain how buffers maintain pH, how to calculate their pH, how they are prepared, and the importance of buffer capacity.
16. Calculate the change in pH of a simple buffer solution of known composition caused by adding a small amount of strong acid or base.
17. Sketch the general shapes of titration curves for 3 basic types of acid-base titration reactions: strong acid-strong base, weak acid-strong base, and weak base-strong acid. Identify the dominant species present at various points in a titration.
18. Identify the acid-base equilibrium that determines the pH of the solution at each of the following points during a given titration: (1) initial point, (2) half-equivalence point, and (3) equivalence point. Calculate the pH of the titration solution at any point.