Key Terms

acid 7.2
acid–base indicator 7.1
acidic anhydride 7.3
alkalosis 7.7
base 7.2
basic anhydride 7.3
neutralization 7.4
pH 7.5
salt 7.2
strong acid 7.4
strong base 7.4
weak acid 7.4
weak base 7.4

Review Questions

1. Define and illustrate the following terms.
   a. acid **b.** base **c.** salt
2. List four general properties of acidic solutions.
3. List four general properties of basic solutions.
4. What ion is responsible for the properties of acidic solutions (in water)?
5. What ion is responsible for the properties of basic solutions (in water)?
6. Can a substance be a Brønsted–Lowry acid if it does not contain H atoms? Are there any characteristic atoms that must be present in a Brønsted–Lowry base?
7. Give the formulas and the names of two strong acids and two weak acids.
8. Give the formulas and the names of two strong bases and one weak base.
9. Strong acids and weak acids both have properties characteristic of hydrogen ions. How do strong acids and weak acids differ?
10. Give the Brønsted–Lowry definition of an acid. Write an equation that illustrates the definition.
11. Give the Brønsted–Lowry definition of a base. Write an equation that illustrates the definition.
12. What is meant by the proton as used in acid–base chemistry? How does it differ from the proton of nuclear chemistry (Chapter 4)?
13. What is an acidic anhydride? A basic anhydride?
14. Describe the neutralization of an acid or base.
15. Describe the taste and the effect on litmus of a solution that has been neutralized.
16. Magnesium hydroxide is completely ionic, even in the solid state, yet it can be taken internally as an antacid. Explain why it does not cause injury as sodium hydroxide would.
17. What is the medical use of antacids?
18. Name some of the active ingredients in antacids.
19. What is alkalosis?
20. What is the leading chemical product of U.S. industry?
21. What are the effects of strong acids and strong bases on the skin?
22. According to the Arrhenius theory, all acids have one element in common. What is that element? Are all compounds containing that element acids? Explain.

Problems

Acids and Bases

23. Use the definitions of "acid" and "base" to identify the first compound in each equation as an acid or a base. (*Hint:* What is produced by the reaction?)
    a. $C_5H_5N + H_2O \longrightarrow C_5H_5NH^+ + OH^-$
    b. $C_6H_5OH + H_2O \longrightarrow C_6H_5O^- + H_3O^+$
    c. $CH_3COCOOH + H_2O \longrightarrow CH_3COCOO^- + H_3O^+$
24. Use the definitions of "acid" and "base" to identify the first compound in each equation as an acid or a base.
    a. $C_6H_5SH + H_2O \longrightarrow C_6H_5S^- + H_3O^+$
    b. $CH_3NH_2 + H_2O \longrightarrow CH_3NH_3^+ + OH^-$
    c. $C_6H_5SO_2NH_2 + H_2O \longrightarrow C_6H_5SO_2NH^- + H_3O^+$
25. Give formulas for the following acids.
    a. hydrochloric acid **b.** sulfuric acid
    c. carbonic acid **d.** hydrocyanic acid
26. Give formulas for the following acids.
    a. nitric acid **b.** sulfurous acid
    c. phosphoric acid **d.** hydrosulfuric acid
27. Give formulas for the following bases.
    a. lithium hydroxide **b.** magnesium hydroxide
    c. sodium hydroxide
28. Give formulas for the following bases.
    a. calcium hydroxide **b.** potassium hydroxide
    c. ammonia
29. Write the equation that shows hydrogen chloride gas reacts as a Brønsted–Lowry acid in water. What is the name of the acid formed?
30. Write the equation that shows how ammonia acts as a Brønsted–Lowry base in water.

Acidic and Basic Anhydrides

31. Give the formula for the compound formed when sulfur trioxide reacts with water. Is the product an acid or a base?
32. Give the formula for the compound formed when magnesium oxide reacts with water. Is the product an acid or a base?