

17.1

HYDROGEN IONS AND ACIDITY

Section Overview

Objectives

1. Identify conjugate acid-base pairs of ions, acids, or hydroxides and an appropriate equilibrium.
2. Calculate hydroxide and hydronium ion concentrations, pH, and pOH, and vice versa, for strong acids and bases.
3. Calculate the pH of weak acids.

Vocabulary

- | | | |
|-------------------|--------------------------------|--------------|
| 1. autoionization | 2. conjugate acid-base pair | 3. pH |
| 4. hydronium ion | 5. hydronium ion concentration | 6. pOH |
| 7. hydroxide ion | 8. hydroxide ion concentration | 9. weak acid |

Key Equations

- | | |
|---|---|
| 1. $\text{pH} = -\log[\text{H}_3\text{O}^+]$ (Eq. 17.1) | 2. $\text{pOH} = -\log[\text{OH}^-]$ (Eq. 17.2) |
| 3. $\text{pH} + \text{pOH} = \text{pK}_w$ (Eq. 17.3) | 4. $\text{pH} + \text{pOH} = 14.00$ (Eq. 17.4) |

Part A: Completion

Use the appropriate number to identify the relationship of the conjugate acid-base pair indicated in the partial acid-base reaction. Complete the reaction.

1. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$ (acid-base reaction)
2. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (acid-base reaction)
3. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$ (acid-base reaction)
4. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (acid-base reaction)
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8. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (acid-base reaction)
9. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$ (acid-base reaction)
10. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (acid-base reaction)

11. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$
12. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$
13. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$
14. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$
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16. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$
17. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$
18. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$
19. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$
20. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$

19 2 Hydrogen Ions And Acidity Work Sheet Answers

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