

14.1

HYDROGEN IONS AND ACIDITY

Section Overview

Objectives

1. Identify conjugate acid-base pairs of ions, acids, or hydroxides and of aqueous concentrations.
2. Calculate hydroxide and hydronium ion concentrations and pH values and vice versa for weak acids and bases.
3. Calculate the pH of weak acid solutions.

Vocabulary

- | | | |
|-------------------|------------------------------------|-------------------|
| 1. autoionization | 2. conjugate acid-base pair | 3. weak acid |
| 4. hydronium | 5. hydroxide ion (OH^-) | 6. autoionization |
| | 7. weak base | 8. pH |

Key Equations

- | | |
|--|---|
| 1. $\text{H}_2\text{O} \rightleftharpoons \text{H}^+ + \text{OH}^-$ (14.1) | 2. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (14.2) |
| 3. $\text{pH} = -\log[\text{H}^+]$ (14.3) | 4. $\text{pOH} = -\log[\text{OH}^-]$ (14.4) |

Part A: Completion

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

1. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$ (14.1) (14.2) (14.3) (14.4)
2. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (14.1) (14.2) (14.3) (14.4)
3. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$ (14.1) (14.2) (14.3) (14.4)
4. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (14.1) (14.2) (14.3) (14.4)
5. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$ (14.1) (14.2) (14.3) (14.4)
6. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (14.1) (14.2) (14.3) (14.4)
7. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$ (14.1) (14.2) (14.3) (14.4)
8. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$ (14.1) (14.2) (14.3) (14.4)

9. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$
10. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$
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. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NO}_3^- + \text{H}_3\text{O}^+$
15. $\text{HNO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{NO}_3^+ + \text{OH}^-$
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 2 Hydrogen Ions And Acidity Answer Key

M Lipman



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