

17.1

HYDROGEN IONS AND ACIDITY

Section Overview

Objectives

1. Identify conjugate acid-base pairs of ions, acids, or hydroxides and of species associated with them.
2. Calculate hydronium and hydroxide 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. hydroxide ion | 5. hydronium ion (H_3O^+) | 6. pOH |
| 7. hydronium ion | 8. weak acid | |

Key Equations

- | | |
|--|---|
| 1. $\text{H}_2\text{O} \rightleftharpoons \text{H}^+ + \text{OH}^-$ (17.1) | 2. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2) |
| 3. $\text{pH} = -\log[\text{H}^+]$ (17.3) | 4. $\text{pOH} = -\log[\text{OH}^-]$ (17.4) |

Part A: Completion

Use the appropriate number to identify the relationship of the species indicated that are associated in the reaction. Also indicate which species acts as the conjugate acid/base.

1. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
 - a. H_2O is the conjugate base of H_3O^+ .
 - b. H_2O is the conjugate acid of OH^- .
 - c. H_3O^+ is the conjugate acid of H_2O .
 - d. OH^- is the conjugate base of H_2O .
2. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
 - a. H_3O^+ is the conjugate acid of H_2O .
 - b. OH^- is the conjugate base of H_2O .
 - c. H_2O is the conjugate acid of OH^- .
 - d. H_2O is the conjugate base of H_3O^+ .

3. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
4. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
5. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
6. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
7. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
8. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
9. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
10. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
11. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)
12. $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (17.2)

Section 19 2 Hydrogen Ions And Acidity Answer Key

**Linda Lane Lilley, Julie S. Snyder, Shelly
Rainforth Collins**

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