

## 14.1

## 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 acid solutions.

## Vocabulary

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

## Key Equations

- |   |   |
|---|---|
| 1. $\text{pH} = -\log[\text{H}_3\text{O}^+]$ (Eq. 14.1) | 2. $\text{pOH} = -\log[\text{OH}^-]$ (Eq. 14.2) |
| 3. $\text{pH} + \text{pOH} = \text{pK}_w$ (Eq. 14.3)    | 4. $\text{pH} + \text{pOH} = 14.00$ (Eq. 14.4)  |

## Part A: Completion

Use the appropriate number of significant figures in the answers to the following questions. Show calculations for all problems. Answers should include units unless otherwise specified.

1. What products are **1** formed when hydrochloric acid ( $\text{HCl}$ ) reacts with  $\text{H}_2\text{O}$ ? The concentration of these acids produced in 0.100 M  $\text{HCl}$  solution is **2**  $\text{M}$ .
2. Hydrochloric acid ionizes in  $\text{H}_2\text{O}$  as **3**  $\text{H}_3\text{O}^+$  and **4**  $\text{Cl}^-$ . The  $\text{pH}$  of a **5**  $0.100\text{-M}$  solution of  $\text{HCl}$  is **6**  $1.00$ . The  $\text{pOH}$  of a **7**  $0.100\text{-M}$  solution of  $\text{HCl}$  is **8**  $13.00$ .
3.  $\text{H}_2\text{O}$  **9** ionizes to form two  $\text{H}^+$  ions and one  $\text{OH}^-$  ion. The  $\text{pH}$  of a **10**  $0.100\text{-M}$  solution of  $\text{H}_2\text{O}$  is **11**  $7.00$ .
4.  $\text{H}_2\text{O}$  **12** ionizes to form two  $\text{H}^+$  ions and one  $\text{OH}^-$  ion. The  $\text{pOH}$  of a **13**  $0.100\text{-M}$  solution of  $\text{H}_2\text{O}$  is **14**  $7.00$ .

5. **15**  $\text{H}_2\text{O}$
6. **16**  $0.100\text{ M}$
7. **17**  $\text{H}_3\text{O}^+$
8. **18**  $\text{Cl}^-$
9. **19**  $\text{H}_3\text{O}^+$
10. **20**  $\text{OH}^-$
11. **21**  $1.00$
12. **22**  $13.00$
13. **23**  $7.00$
14. **24**  $7.00$

# 19 2 Hydrogen Ions And Acidity Answer Key

**Julius Grant**



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