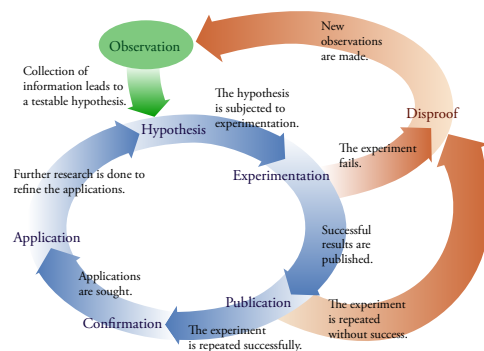


# CONTENTS

## PREFACE I

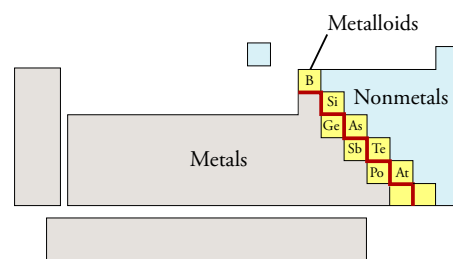
## CHAPTER 1 AN INTRODUCTION TO CHEMISTRY 3

- 1.1 An Introduction to Chemistry 3
- 1.2 Suggestions for Studying Chemistry 5
- 1.3 The Scientific Method 7
- 1.4 Measurement and Units 9
- 1.5 Reporting Values from Measurements 20



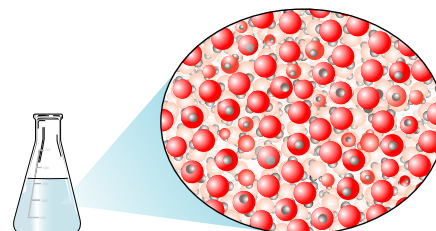
## CHAPTER 2 THE STRUCTURE OF MATTER AND THE CHEMICAL ELEMENTS 33

- 2.1 Solids, Liquids, and Gases 34
- 2.2 The Chemical Elements 38
- 2.3 The Periodic Table of the Elements 42
- 2.4 The Structure of the Elements 46



## CHAPTER 3 CHEMICAL COMPOUNDS 69

- 3.1 Classification of Matter 70
- 3.2 Compounds and Chemical Bonds 73
- 3.3 Molecular Compounds 79
- 3.4 Naming Binary Covalent Compounds 90
- 3.5 Ionic Compounds 94



## CHAPTER 4 AN INTRODUCTION TO CHEMICAL REACTIONS 125

- 4.1 Chemical Reactions and Chemical Equations 126
- 4.2 Solubility of Ionic Compounds and Precipitation Reactions 133

## CHAPTER 5 ACIDS, BASES, AND ACID-BASE REACTIONS 159

5.1 Acids 160

5.2 Acid Nomenclature 168

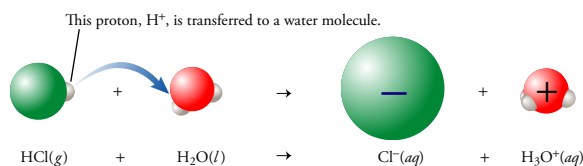
5.3 Summary of Chemical Nomenclature 171

5.4 Strong and Weak Bases 173

5.5 pH and Acidic and Basic Solutions 178

5.6 Arrhenius Acid-Base Reactions 180

5.7 Brønsted-Lowry Acids and Bases 188



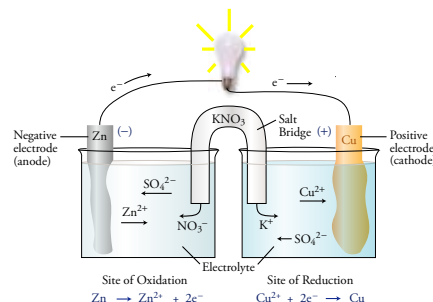
## CHAPTER 6 OXIDATION-REDUCTION REACTIONS 207

6.1 An Introduction to Oxidation-Reduction Reactions 208

6.2 Oxidation Numbers 213

6.3 Types of Chemical Reactions 218

6.4 Voltaic Cells 224



## CHAPTER 7 ENERGY AND CHEMICAL REACTIONS 249

7.1 Energy 250

7.2 Chemical Changes and Energy 263

7.3 Ozone: Pollutant and Protector 266

7.4 Chlorofluorocarbons: A Chemical Success Story Gone Wrong 270

## CHAPTER 8 UNIT CONVERSIONS 287

8.1 Unit Analysis 288

8.2 Rounding and Significant Figures 293

8.3 Density and Density Calculations 301

8.4 Percentage and Percentage Calculations 306

8.5 A Summary of the Unit Analysis Process 308

8.6 Temperature Conversions 312

**CHAPTER 9 CHEMICAL CALCULATIONS AND CHEMICAL FORMULAS 329**

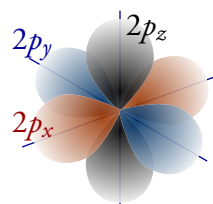
- 9.1 A Typical Problem 330
- 9.2 Relating Mass to Number of Particles 331
- 9.3 Molar Mass and Chemical Compounds 337
- 9.4 Relationships Between Masses of Elements and Compounds 342
- 9.5 Determination of Empirical and Molecular Formulas 346

**CHAPTER 10 CHEMICAL CALCULATIONS AND CHEMICAL EQUATIONS 367**

- 10.1 Equation Stoichiometry 368
- 10.2 Real-World Applications of Equation Stoichiometry 376
- 10.3 Molarity and Equation Stoichiometry 385

**CHAPTER 11 MODERN ATOMIC THEORY 413**

- 11.1 The Mysterious Electron 414
- 11.2 Multi-Electron Atoms 424

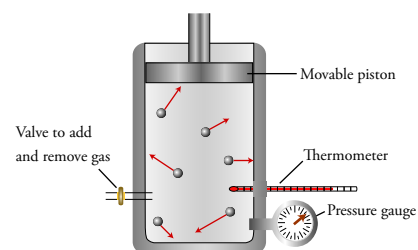


**CHAPTER 12 MOLECULAR STRUCTURE 447**

- 12.1 A New Look at Molecules and the Formation of Covalent Bonds 448
- 12.2 Drawing Lewis Structures 455
- 12.3 Resonance 465
- 12.4 Molecular Geometry from Lewis Structures 467

**CHAPTER 13 GASES 483**

- 13.1 Gases and Their Properties 484
- 13.2 Ideal Gas Calculations 494
- 13.3 Equation Stoichiometry and Ideal Gases 502
- 13.4 Dalton's Law of Partial Pressures 509

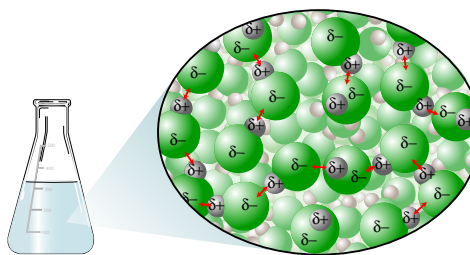


**CHAPTER 14 LIQUIDS: CONDENSATION, EVAPORATION, AND DYNAMIC EQUILIBRIUM 533**

14.1 Changing from Gas to Liquid and from Liquid to Gas—An Introduction to Dynamic Equilibrium 534

14.2 Boiling Liquids 542

14.3 Particle-Particle Attractions 547



**CHAPTER 15 SOLUTION DYNAMICS 573**

15.1 Why Solutions Form 574

15.2 Fats, Oils, Soaps, and Detergents 584

15.3 Saturated Solutions and Dynamic Equilibrium 588

15.4 Solutions of Gases in Liquids 594

**CHAPTER 16 THE PROCESS OF CHEMICAL REACTIONS 609**

16.1 Collision Theory: A Model for the Reaction Process 610

16.2 Rates of Chemical Reactions 616

16.3 Reversible Reactions and Chemical Equilibrium 621

16.4 Disruption of Equilibrium 634

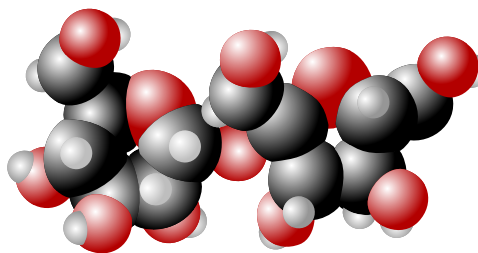
**CHAPTER 17 AN INTRODUCTION TO ORGANIC CHEMISTRY, BIOCHEMISTRY, AND SYNTHETIC POLYMERS 657**

17.1 Organic Compounds 658

17.2 Important Substances in Food 674

17.3 Digestion 688

17.4 Synthetic Polymers 690

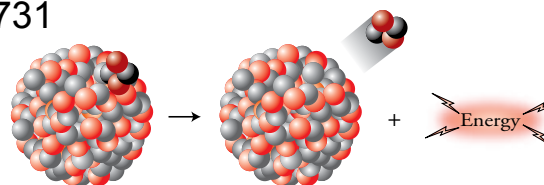


**CHAPTER 18 NUCLEAR CHEMISTRY 715**

18.1 The Nucleus and Radioactivity 716

18.2 Uses for Radioactive Substances 731

18.3 Nuclear Energy 737



**APPENDIX A MEASUREMENT AND UNITS A-1**

**APPENDIX B SCIENTIFIC NOTATION A-4**

**ANSWERS TO SELECTED PROBLEMS A-6**

**PHOTO CREDITS C1**

**GLOSSARY/INDEX G-1**