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A photograph of an iceberg floating in the ocean. The small, jagged tip of the iceberg is visible above the water's surface, while a much larger, smooth, and rounded mass of ice is submerged below the surface. The water is a deep blue, and the sky is a hazy, light blue. The overall image serves as a metaphor for the book's title, 'World of Chemistry Essentials', suggesting that the book provides a comprehensive view of chemistry that goes beyond the surface level.

WORLD OF CHEMISTRY

Essentials

THIRD EDITION

Joesten • Wood • Castellion

World of Chemistry *Essentials*

Third Edition

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Preface

Approach and Scope

The third edition of *World of Chemistry: Essentials* continues our tradition of providing a meaningful and easily readable text for a one-semester chemistry course for nonscience majors. The fundamental approach of this edition of *World of Chemistry: Essentials*, like that of earlier editions, is to teach the basic chemical principles within the framework of real world applications.

The enthusiasm of instructors for the earlier editions and their success with our approach has encouraged us to retain the basic structure of each chapter. The major change in this edition has been to update all of the applied topics, many of which have changed significantly in the years since the second edition was written.

Organization

Chapter 1 sets the philosophical tone for the book. It does so with an overview of two major current issues: the role of DNA in human biochemistry and concerns about the ozone hole. The foundation is laid for discussion of chemistry-related topics that are covered in the news media.

Chapters 2–5 present basic concepts essential to the study of chemistry. These chapters introduce atoms, compounds, and the symbolism of the elements; the metric system; the periodic table; nuclear changes; chemical bonding and states of matter. Among issues addressed are the role of nuclear power plants and the storage of radioactive waste at Yucca Mountain.

Chapters 6–8 focus on chemical reactions. The mole is defined, and reaction rates, equilibrium, and thermodynamics are discussed in a simple and nonquantitative manner. Acid–base reactions and oxidation–reduction reactions are explored. The need to recycle and develop green design are discussed, and the practical chemistry of acidic and basic household cleaning agents, bleaches, antioxidant vitamins, and batteries are described.

Chapters 9 and 10 introduce organic chemistry. The roles of coal and petroleum as raw materials and in energy generation are covered, as is the chemistry of polymeric materials.

Chapter 11 presents the fundamental chemical principles of biochemistry in a straightforward and accessible manner. Along the way the chemistry of soaps, detergents, shampoos, and chiral drugs is presented. The potential of genetic engineering is discussed.

(Bill Ross/Tony Stone Images)



Chapters 12–17 each focus on a major type of applied chemistry:

- Chapter 12 on food chemistry and healthy nutrition.
- Chapter 13 on chemistry in medicine and drugs.
- Chapter 14 on useful materials, including steel and semiconductors.
- Chapter 15 on water, its pollution, purification, and supply.
- Chapter 16 on air and its composition, natural and man-made.
- Chapter 17 on agriculture and the need to feed an ever-growing world population.

Special Features

Chapter opening questions highlight the most important aspects of the chapter topic.

Essential terms are boldfaced upon their first use and marginal definitions are provided.

Worked examples demonstrate how to utilize the concepts in this course in problem solving. Each Example is accompanied by one or more Exercises that are answered in Appendix F, thereby helping students to check their understanding. The Examples and Exercises, together with the Self-Tests at the end of each chapter, help students gain confidence about smaller segments of material before they try to answer questions and problems at the ends of the chapters.

End-of-chapter questions include some questions that review chapter material, others that require thought about the meaning and application of the chemical concepts, and, where appropriate, quantitative questions.

Frontiers in the World of Chemistry describe new developments related to chapter topics, developments that frequently attract attention in the media.

Science and Society essays focus on science-related societal issues that often raise difficult questions that do not have clear-cut answers.

Personal Side boxes highlight the achievements of important contributors to the science of chemistry.

The World of Chemistry boxes are based on material from *The World of Chemistry Video Series*.

Access to **InfoTrac® College Edition**, a fully searchable online library of journals, magazines, encyclopedias, and newsletters, is offered with each book. Over 75 articles that are relevant to chapter content are cited at the ends of the chapters. (Thomson does not own the content in the InfoTrac College Edition database and articles listed are subject to change without notice.)

The **CNN CD: Everyday Chemistry** gives an up-close look at clips from the 2002 *CNN Chemistry View* videos. These clips provide newsworthy in chemistry that can be applied to the everyday world.

Accompanying Materials to *World of Chemistry: Essentials*, Third Edition

Materials for Instructor and Student

These materials are available to qualified adopters. Please contact your local Thomson•Brooks/Cole sales representative for details.

Student Study Guide with Selected Solutions, by Walt Volland, provides section-by-section lists of main topics, listing of objectives, key terms, and detailed solutions to all the odd-numbered end-of-chapter Questions for Review and Thought. In addition, the *Student Study Guide* includes suggested readings on related topics, "Bridging the Gap" home lab experiments, Internet exercises, social issue oriented assignments, crossword puzzles to build vocabulary, and a set of interactive activities designed to connect chemistry to daily life.

Instructor's Resource Manual includes two sections:

1. ***Notes to the Instructor***, by Walt Volland, includes detailed solutions to the end-of-chapter Questions for Review and Thought that do not appear in the text and *Student Study Guide with Selected Solutions*.
2. ***Printed Test Bank*** of multiple-choice questions and problems, by Walt Volland.

ExamView® Computerized Test Bank is the software version of the printed test bank. Instructors can create thousands of questions in a multiple-choice format. A command reformats multiple-choice questions into short-answer questions. Instructors can also add or modify existing problems as well as incorporate graphics. ExamView® has gradebook capabilities for recording and graphing students' grades.

The World of Chemistry Video Package. *World of Chemistry: Essentials, 2/e* is presented either as a stand alone course in chemistry for nonscience majors or as an integral part of a comprehensive telecourse package including a series of 26 thirty-minute video programs, a telecourse study guide, telecourse faculty manual, and a telecourse laboratory manual. The video series, entitled *The World of Chemistry*, was developed by the late Dr. Isadore Adler of The University of Maryland, and Dr. Nava Ben-Zvi of Hebrew University of Jerusalem and was sponsored by the Annenberg/CPB Project and corporate sponsors. The video programs feature Nobel laureate and Priestley medalist Roald Hoffmann and provide a comprehensive survey of the field of chemistry and its impact on modern society. The series was produced jointly by the University of Maryland and The Educational Film Center. For information on ordering videocassettes call 1-800-LEARNER.

In addition to the videotapes, JCE:SOFTWARE has produced two video-discs, "*The World of Chemistry: Selected Demonstrations and Animations I and II*" taken from *The World of Chemistry* videotapes. For information on these video-discs, contact: JCE: Software, John W. Moore and Jon L. Holmes, Department of Chemistry, University of Wisconsin-Madison, Madison, WI 53706.

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Nashville, Tennessee

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Media Integration Guide

Each section in the *Media Integration Guide* displays media applications that act as an aid for instructors to show everyday examples of chemistry to students. Each section includes:

- Selected articles from *InfoTrac College Edition*, a fully searchable online library of journals, magazines, encyclopedias, and newsletters that give students access to current issues in the world of chemistry.
- Video clip selections that are featured on the *CNN CD: Everyday Chemistry*, which is included with every text. This CD-ROM offers instructors an exciting and interesting way to stimulate and engage students in chemistry.
- Hyperlink examples that correlate to topics in each chapter.

Please log on to the *Brooks/Cole Web Site* at <http://www.brookscole.com/chemistry> and click on the Liberal Arts Chemistry link to the Joesten text to view additional tools. The site features Molecular Models, a Basic Math Review, Periodic Tables, Unit Conversion Tools, Constants and SI Unit References, and Hyperlinks.



InfoTrac COLLEGE EDITION READINGS <http://infotrac.thomsonlearning.com>

CHAPTER 1

"Statistics alone don't show causes: How to spot junk science, and why you need to," *Consumers' Research Magazine*
"EU: 'Quality of life' as part of risk assessment," *On The Plate*
"The DDT ban, 30 years later," *National Post*
"Japanese scientists see recovery of ozone hole," *Ozone Depletion Network Online Today*

CHAPTER 2

"SI units revisited," *Journal of the American Dietetic Association*
"Elemental pleasures," *The Lancet*
"Appendix B. Metric and Other Physical Conversion Factors," *Monthly Energy Review*
"What's All This Perpetual Motion Stuff, Anyhow?" *Electronic Design*

CHAPTER 3

"Neon!" *National Geographic World*
"Snaring light in a crystal trap," *Business Week*
"A close, cheap shave for heavy atoms," *Science News*

CHAPTER 4

"History of lead exposure in children revealed from isotopic analyses of teeth," *Archives of Environmental Health*
"A half-life for titanium," *Science News*
"Fifteen years later. Living after Chernobyl," *UN Chronicle*

CHAPTER 5

"Photonic crystals promise telecommunications revolution," *Chemical Market Reporter*
"Diamond products: Technique produces diamond crystals," *High Tech Ceramics News*
"Carbonic acid in the gas phase and its astrophysical relevance," *Science*
"Around the bends," *Esquire*

CHAPTER 6

"Mechanical reactions," *Scientific American*
"Smog's ozone spawns funky carpet smells," *Science News*
"Antioxidant supplements reduce effects of ozone, smog," *Immunotherapy Weekly*
"The Haber-Bosch process: exemplar of 20th century chemical industry," *Chemistry and Industry*
"Your lawn is killing the planet," *Business Week*

CHAPTER 7

"Heartburn? Bloating? Gas? Why your antacid may actually be making the problem worse!" *Women's Health Letter*

"USGS study to locate areas prone to acid mine drainage," *Hazardous Waste Superfund Week*

"Acid rain still burning," *Clean Water Report*

"Whose sulfuric acid is it, anyway?" *Chemical Week*

CHAPTER 8

"Foods rich in antioxidants may reduce risk of Alzheimer's disease," *British Medical Journal*

"Vitamin E and antioxidants," *Chemistry and Industry*

"Hybrid cars roll to green future," *Insight on the News*

"Fuel cells coming, sooner than you think," *Electronic Engineering Times*

"Research sheds light on glass corrosion," *Advanced Coatings & Surface Technology*

CHAPTER 9

"Grilling, flying, having sex to be studied as possible carcinogens," *Knight-Ridder/Tribune News Service*

"Jury: gasoline with MTBE a 'defective product'," *National Petroleum News*

"Radon (environmental carcinogens)," *Ca*

"Consumer Reports finds surprises in new gasolines," *National Petroleum News*

"Marketers nailed in octane stings," *Oil Express*

"Renewable energy: A viable choice," *Environment*

CHAPTER 10

"Alcohol, vaccines, toxic medications and supplements, diet and exercise," *American Family Physician*

"Trans-fatty acids: A regulatory update," *Journal of the American Dietetic Association*

"Chemist Leo Baekeland: Setting out to make an insulator, he invented the first true plastic and transformed the world," *Time*

"Plastics, chance, and the prepared mind," *American Heritage*

"How plastics changed America," *Plastics World*

CHAPTER 11

"Genome.gov launched," *AMA, The Journal of the American Medical Association*

"Human Genome Sciences initiates clinical development of a novel anticancer drug," *Genomics & Genetics Weekly*

"Aspartame and the internet," *The Lancet*

"How safe is your kitchen?" *Prevention*

"Memo from the mole people," *Esquire*

"TRAs are the bad fatty acids," *Oils & Fats International*

CHAPTER 12

"Dietary patterns and coronary heart disease in women," *Nutrition Research Newsletter*

"FDA updates list of GRAS notices," *Food Chemical News*

"Appreciating antioxidants," *American Fitness*

"An eating plan and update on recommended dietary practices for the endurance athlete," *Journal of the American Dietetic Association*

"The digital calorie count," *Pittsburgh Business Times*

"Five thousand years of flavourings," *Food Manufacture*

CHAPTER 13

"Antibiotic resistance: The sky isn't falling," *Food Chemical News*

"New antibiotics may treat antimicrobial resistance," *TB & Outbreaks Week*

"Love potions and the ointment of witches: historical aspects of the nightshade alkaloids," *Journal of Toxicology: Clinical Toxicology*

"Itching for some allergy relief?" *FDA Consumer*

"Repeated cocaine use impairs region of the brain that governs self-control," *Drug Week*

CHAPTER 14

"Stainless steel: evolution and new applications," *American Metal Market*

"Photovoltaic cells assemble themselves," *Inside R&D*

"Metal extraction by bacterial oxidation," *Mining Magazine*

<p>CHAPTER 15</p> <p>"The coming water crisis," <i>U.S. News & World Report</i></p> <p>"Current issues on water disinfection," <i>Public Works</i></p> <p>"BOD: the modern alchemy," <i>Public Works</i></p> <p>"Japan's Minamata shame: mercury poison disease case just won't go away," <i>The Financial Post</i></p> <p>"Bottled Water in a Box," <i>Poptronics</i></p>	<p>CHAPTER 17</p> <p>"Environmental damage threatens world's food," <i>Resource: Engineering & Technology for a Sustainable World</i></p> <p>"Getting the dirt on dirt: the National Resource Directory," <i>Environment</i></p> <p>"Critical issues suggested by trends in food, population, and the environment for the year 2020," <i>American Journal of Agricultural Economics</i></p> <p>"A hungrier world," <i>The Ecologist</i></p> <p>"A useful poison; DDT; The virtues of DDT," <i>The Economist (US)</i></p> <p>"Genetic engineering, the farm crisis, and world hunger," <i>BioScience</i></p>
<p>CHAPTER 16</p> <p>"Flaws in the conventional wisdom on acid deposition," <i>Environment</i></p> <p>"Is there a vent in the global greenhouse?" <i>Science News</i></p> <p>"A push from above: the ozone hole may be stirring up Antarctica's climate," <i>Scientific American</i></p> <p>"Your lawn is killing the planet," <i>Business Week</i></p> <p>"Study links fine particulates and heart-related problems," <i>Air/Water Pollution Report</i></p>	

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<p>Chapter 4</p> <p>Dirt on Dirty Bomb (3:25)</p> <p>Yucca Mountain (1:47)</p>	<p>Chapter 10</p> <p>Oyster Protein (2:12)</p>	<p>Chapter 15</p> <p>Mercury Disposal (1:43)</p> <p>Toilet to Tap (1:58)</p>
<p>Chapter 8</p> <p>Healthy Coffee (1:44)</p> <p>Fuel Cell Cars (1:46)</p>	<p>Chapter 13</p> <p>Why No Vaccine? (1:47)</p> <p>Nobel Med Winners (1:52)</p>	<p>Chapter 16</p> <p>State of the Air (2:06)</p>
<p>Chapter 9</p> <p>India/Commuter (1:53)</p> <p>Alternative Energy (2:02)</p>	<p>Chapter 14</p> <p>Solar Fuel Cells (2:28)</p>	

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<p>CHAPTER 4 The Discovery of Radioactivity: The Dawn of the Nuclear Age http://www.accessexcellence.org/AE/AEC/CC/radioactivity.html Transuranium Elements http://web.fccj.org/~ethall/uranium/uranium.htm Nuclear Energy http://library.thinkquest.org/3471/nuclear_energy_body.html</p>	<p>CHAPTER 8 Types of Electrochemical Cells http://www.corrosion-doctors.org/Electrochem/cells.htm Electrochemistry: Electrolysis http://library.thinkquest.org/3659/electrochem/electrolysis.html?tskip1=1&tqtime=0925 Relative Strengths of Oxidizing and Reducing Agents http://members.aol.com/logan20/agents.html</p>	

CHAPTER 12

Saccharomics

<http://www.ornl.gov/hgmis/>

Facts About Vitamin A and Carotenoids

<http://www.cc.nih.gov/ccc/supplements/vita.html>

FDA Backgrounder: Olestra and Other Fat Substitutes

<http://www.fda.gov/opacom/backgrounders/olestra.html>

CHAPTER 13

Steroid Hormones

<http://www.indstate.edu/thcme/mwking/steroid-hormones.html>

Dopamine—A Sample

Neurotransmitter

<http://www.utexas.edu/research/asrec/dopamine.html>

Chemistry Is Everywhere—The Bathroom

<http://www.chemistry.dit.ie/competition01/hawkesclancy/bathroom/toothpaste.html>

CHAPTER 14

Facts About Magnesium

<http://www.cc.nih.gov/ccc/supplements/magn.html>

Superconductors

<http://superconductors.org/>

Chrysotile Asbestos: An Overview

http://www.asbestos-institute.ca/presskit/press_index.html

CHAPTER 15

The Chemistry of Water

<http://witcombe.sbc.edu/water/chemistry.html>

Arsenic Chemistry in Water

<http://ldambies.free.fr/arsenicchemistry.html>

Treatment Systems for Household

Water Supplies: Chlorination

<http://www.ext.nodak.edu/extpubs/h2oqual/watsys/ae1046w.htm>

CHAPTER 16

The Noble Gases

<http://www.nidlink.com/~jfromm/elements/noble.htm>

The Chemistry of Atmospheric Pollutants

<http://www.aeat.com/netcen/airqual/kinetics/>

Photochemical Smog

<http://royal.okanagan.bc.ca/mpidwirn/atmosphereandclimate/smog.html>

Acid Rain

<http://www.epa.gov/airmarkets/acidrain/>

CHAPTER 17

Plant Nutrients

<http://www.ncagr.com/cyber/kidswrld/plant/nutrient.htm>

What Is a “Chemical” Fertilizer?

<http://cesonoma.ucdavis.edu/hortic/fertilizers.htm>

Brief Contents

1	Living in a World of Chemistry	1
2	The Chemical View of Matter	14
3	Atoms and the Periodic Table	38
4	Nuclear Changes	70
5	Chemical Bonding and States of Matter	100
6	Chemical Reactivity: Chemicals in Action	131
7	Acid–Base Reactions	157
8	Oxidation–Reduction Reactions	174
9	Energy and Hydrocarbons	194
10	Organic Chemical and Polymers	224
11	The Chemistry of Life	259
12	Nutrition: The Basis of Healthy Living	304
13	Chemistry and Medicine	330
14	The Chemistry of Useful Materials	364
15	Water: Plenty of It, But of What Quality?	391
16	Air: The Precious Canopy	418
17	Feeding the World	446
	Appendix A: Significant Figures	475
	Appendix B: Scientific Notation	480
	Appendix C: Units of Measure, Unit Conversion, and Problem Solving	486
	Appendix D: Naming Organic Compounds	496
	Appendix E: Answers to Self-Tests and Matching Sets	503
	Appendix F: Answers to Exercises	511
	Appendix G: Answers to Selected Questions	513

(Charles D. Winters)



Contents

1 Living in a World of Chemistry 1

- 1.1 The World of Chemistry 1
- 1.2 DNA, Biochemistry, and Science 2
- 1.3 Air-Conditioning, the Ozone Hole, and Technology 6
- 1.4 Risks and the Law 9
- 1.5 What Is Your Attitude Toward Chemistry? 12

The World of Chemistry *Discoveries by Accident* 10

2 The Chemical View of Matter 14

- 2.1 Elements—The Most Simple Kind of Matter 15
- 2.2 Chemical Compounds—Atoms in Combination 16
- 2.3 Mixtures and Pure Substances 17
- 2.4 Changes in Matter: Is It Physical or Chemical? 18
- 2.5 Classification of Matter 20
- 2.6 The Chemical Elements 25
- 2.7 Using Chemical Symbols 27
- 2.8 The Quantitative Side of Science 31

The World of Chemistry *Models and Modeling* 24

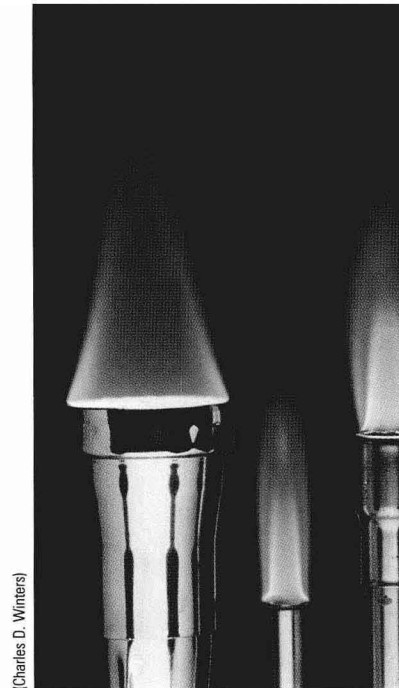
Science and Society *The Metric System* 34

3 Atoms and the Periodic Table 38

- 3.1 John Dalton's Atomic Theory 39
- 3.2 Structure of the Atom 40
- 3.3 Modern View of the Atom 45
- 3.4 Where Are the Electrons in Atoms? 50
- 3.5 Development of the Periodic Table 55
- 3.6 The Modern Periodic Table 58
- 3.7 Periodic Trends 60
- 3.8 Properties of Main-Group Elements 64

The World of Chemistry *The Scanning Tunneling Microscope* 46

The World of Chemistry *Making Glass Stronger* 65



(Charles D. Winters)

4	Nuclear Changes	70
4.1	The Discovery of Radioactivity	71
4.2	Nuclear Reactions	72
4.3	The Stability of Atomic Nuclei	75
4.4	Activity and Rates of Nuclear Disintegrations	77
4.5	Artificial Nuclear Reactions	80
4.6	Transuranium Elements	81
4.7	Radon and Other Sources of Background Radiation	82
4.8	Useful Applications of Radioactivity	85
4.9	Energy from Nuclear Reactions	87
4.10	Useful Nuclear Energy	91
	The World of Chemistry	<i>A Revision to the Periodic Table</i> 83

5	Chemical Bonding and States of Matter	100
5.1	Ionic Bonds	101
5.2	Ionic Compounds	102
5.3	Covalent Bonds	107
5.4	Shapes of Molecules	113
5.5	Polar and Nonpolar Bonding	114
5.6	Properties of Molecular and Ionic Compounds Compared	116
5.7	Intermolecular Forces	117
5.8	The States of Matter	119
5.9	Gases and How We Use Them	121
5.10	Water	122
5.11	Solutions	125
5.12	Solids	126
	Frontiers in the World of Chemistry	<i>Fullerenes</i> 111

6	Chemical Reactivity: Chemicals in Action	131
6.1	Balanced Chemical Equations and What They Tell Us	132
6.2	The Mighty Mole and the "How Much?" Question	134
6.3	Rates and Reaction Pathways: The "How Fast?" Question	138
6.4	Chemical Equilibrium and the "How Far?" Question	143
6.5	The Driving Forces and the "Why?" Question	146
6.6	Recycling: New Metal for Old	151
	The World of Chemistry	<i>A Catalyst in Action</i> 145
	The World of Chemistry	<i>Energy, Entropy, and Industrial Design</i> 150
	Frontiers in the World of Chemistry	<i>Green Design</i> 153

7	Acid–Base Reactions	157
7.1	Acids and Bases: Chemical Opposites	157
7.2	The Strengths of Acids and Bases	161
7.3	Molarity and the pH Scale	164
7.4	Acid–Base Buffers	167
7.5	Corrosive Cleaners	169
7.6	Heartburn: Why Reach for an Antacid?	170

8	Oxidation–Reduction Reactions	174
8.1	Oxidation and Reduction	174
8.2	Oxidizing Agents: They Bleach and They Disinfect	176
8.3	Reducing Agents: For Metallurgy and Good Health	178
8.4	Batteries	181
8.5	Electrolysis: Chemical Reactions Caused by Electron Flow	189
8.6	Corrosion: Unwanted Oxidation–Reduction	190
The World of Chemistry <i>The Pacemaker Story</i>		182
Science and Society <i>Cleaner Automobiles</i>		188

9	Energy and Hydrocarbons	194
9.1	Energy from Fuels	195
9.2	Alkanes: Backbone of Organic Chemistry	196
9.3	Alkenes and Alkynes: Reactive Cousins of Alkanes	201
9.4	The Cyclic Hydrocarbons	206
9.5	Alcohols: Oxygen Comes on Board	209
9.6	Petroleum	212
9.7	Natural Gas	218
9.8	Coal	219
9.9	Methanol as a Fuel	220
Frontiers in the World of Chemistry <i>Organic Metals</i>		205

10	Organic Chemicals and Polymers	224
10.1	Organic Chemicals	225
10.2	Alcohols and Their Oxidation Products	227
10.3	Carboxylic Acids and Esters	232
10.4	Organic Chemicals from Coal	235
10.5	Synthetic Organic Polymers	237
10.6	New Polymer Materials	251
10.7	Recycling Plastics	253

Frontiers in the World of Chemistry	<i>Chemical Peels</i>	233
The World of Chemistry	<i>Discovery of a Catalyst for Polyacrylonitrile Production</i>	244
The World of Chemistry	<i>Inventor of the Poly(ethylene terephthalate) Bottle</i>	248
Frontiers in the World of Chemistry	<i>Chemistry in Outer Space</i>	253

11 The Chemistry of Life 259

11.1	Handedness and Optical Isomerism	260
11.2	Carbohydrates	264
11.3	Lipids	268
11.4	Soaps, Detergents, and Shampoos	274
11.5	Creams and Lotions	278
11.6	Amino Acids	280
11.7	Peptides and Proteins	281
11.8	Protein Structure and Function	285
11.9	Hair Protein and Permanent Waves	289
11.10	Energy and Biochemical Systems	292
11.11	Nucleic Acids	293

The World of Chemistry	<i>Molecular Architecture</i>	262
Frontiers in the World of Chemistry	<i>Chiral Drugs</i>	263
Science and Society	<i>Cis and Trans Fatty Acids and Your Health</i>	271
The World of Chemistry	<i>Unraveling the Protein Structure</i>	290

12 Nutrition: The Basis of Healthy Living 304

12.1	Digestion: It's Just Chemical Decomposition	305
12.2	Energy: Use It or Store It	306
12.3	Sugar and Polysaccharides: Digestible and Indigestible	310
12.4	Lipids, Mostly Fats and Oils	310
12.5	Proteins in the Diet	312
12.6	Our Daily Diet	313
12.7	Vitamins in the Diet	315
12.8	Minerals in the Diet	318
12.9	Food Additives	321
12.10	Some Daily Diet Arithmetic	325

Frontiers in the World of Chemistry	<i>Health Claims for Foods</i>	312
Frontiers in the World of Chemistry	<i>Olestra, A "Fat" for Calorie Counters</i>	316

13 Chemistry and Medicine 330

13.1	Medicines, Prescription Drugs, and Diseases: The Top Tens	331
13.2	Drugs for Infectious Diseases	333