

# CONTENTS IN BRIEF

<b>Part 1</b>	<b>GENERAL CHEMISTRY</b>	<b>1</b>
Chapter 1	The Language of Chemistry	2
Chapter 2	Atomic Structure	37
Chapter 3	Molecules and Chemical Bonds	65
Chapter 4	Chemical Calculations	94
Chapter 5	The Physical Properties of Gases	120
Chapter 6	Interactions Between Molecules	148
Chapter 7	Solutions	173
Chapter 8	Chemical Reactions	202
Chapter 9	Acids, Bases, and Buffers	223
Chapter 10	Chemical and Biological Effects of Radiation	258
<b>Part 2</b>	<b>ORGANIC CHEMISTRY</b>	<b>285</b>
Chapter 11	Saturated Hydrocarbons	286
Chapter 12	Unsaturated Hydrocarbons	329
Chapter 13	Alcohols, Phenols, Ethers, and Their Sulfur Analogues	369
Chapter 14	Aldehydes and Ketones	403
Chapter 15	Carboxylic Acids, Esters, and Other Acid Derivatives	433
Chapter 16	Amines and Amides	463
Chapter 17	Stereoisomerism	495
<b>Part 3</b>	<b>BIOCHEMISTRY</b>	<b>523</b>
Chapter 18	Carbohydrates	524
Chapter 19	Lipids	556
Chapter 20	Proteins	587
Chapter 21	Nucleic Acids	622
Chapter 22	Metabolism and Enzymes: An Overview	660
Chapter 23	Carbohydrate Metabolism	678
Chapter 24	Fatty Acid Metabolism	708
Chapter 25	Amino Acid Metabolism	725
Chapter 26	Hormones and the Control of Metabolic Interrelations	739

# CONTENTS

PREFACE	XV		
<b>PART 1 GENERAL CHEMISTRY</b>	<b>1</b>		
<b>CHAPTER 1 THE LANGUAGE OF CHEMISTRY</b>	<b>2</b>		
1.1 The Composition of Matter	3		
<b>Chemistry in Depth: The Scientific Method</b>	4		
<b>Chemistry in Depth: Chromatography</b>	6		
1.2 Measurement and the Metric System	10		
1.3 Measurement, Uncertainty, and Significant Figures	12		
1.4 Scientific Notation	13		
1.5 Calculations Using Scientific Notation	15		
1.6 Calculations and Significant Figures	17		
1.7 The Use of Units in Calculations: The Unit-Conversion Method	19		
1.8 Two Fundamental Properties of Matter: Mass and Volume	21		
1.9 Density	23		
<b>Chemistry Around Us: Temperature, Density, and the Buoyancy of the Sperm Whale</b>	24		
1.10 Temperature	25		
<b>Chemistry Around Us: Density and the "Fitness" of Water</b>	26		
<b>PROFESSIONAL CONNECTIONS</b> Darlene Reuss, Environmental Health Specialist	27		
1.11 Heat and Calorimetry	29		
<b>Chemistry Around Us: Specific Heat and the "Fitness" of Water</b>	31		
<b>Summary</b>	<b>34</b>		
<b>Key Words</b>	<b>34</b>		
<b>Exercises</b>	<b>34</b>		
<b>CHAPTER 2 ATOMIC STRUCTURE</b>	<b>37</b>		
2.1 Chemical Background for the Early Atomic Theory	38		
2.2 Dalton's Atomic Theory	39		
2.3 Atomic Masses	40		
2.4 The Structure of Atoms	41		
2.5 Isotopes	43		
2.6 The Periodic Table	44		
2.7 Electron Organization Within the Atom	48		
<b>Chemistry in Depth: Absorption Spectra and Chemical Analysis</b>	51		
2.8 The Quantum Mechanical Atom	53		
2.9 Atomic Structure and Periodicity	55		
2.10 Atomic Structure, Periodicity, and Chemical Reactivity	60		
<b>Summary</b>	<b>62</b>		
<b>Key Words</b>	<b>63</b>		
<b>Exercises</b>	<b>63</b>		
<b>CHAPTER 3 MOLECULES AND CHEMICAL BONDS</b>	<b>65</b>		
3.1 Ionic Versus Covalent Bonds	66		
3.2 Ionic Bonds	67		
<b>Chemistry in Depth: On the Intensity of Electrical Fields</b>	68		
3.3 Naming Binary Ionic Compounds	73		
3.4 Polyatomic Ions	74		
3.5 Does the Formula of an Ionic Compound Describe Its Structure?	74		
3.6 Covalent Compounds and Their Nomenclature	76		
3.7 Representation of Covalent Bonds	77		
3.8 Lewis Structures of Polyatomic Ions	83		
3.9 Polar and Nonpolar Covalent Bonds	84		
3.10 Three-Dimensional Molecular Structures	86		
<b>Summary</b>	<b>91</b>		
<b>Key Words</b>	<b>92</b>		
<b>Exercises</b>	<b>92</b>		

<b>CHAPTER 4 CHEMICAL CALCULATIONS</b>	<b>94</b>	<b>PROFESSIONAL CONNECTIONS</b>	June G. Neal,	
4.1 Chemical Formulas and Formula Masses	95	Emergency Department		141
4.2 The Mole	96	Chemistry Within Us: Gas Solubility and Caisson Disease		143
4.3 Avogadro's Number	97	<b>Summary</b>		<b>145</b>
4.4 Empirical Formulas	100	<b>Key Words</b>		<b>145</b>
<b>Chemistry in Depth:</b> Determining the Composition of a Compound	101	<b>Exercises</b>		<b>145</b>
4.5 Molecular Formulas	104	<b>CHAPTER 6 INTERACTIONS BETWEEN MOLECULES</b>		<b>148</b>
4.6 Balancing Chemical Equations	104	6.1 The Three States of Matter and Transitions Between Them		149
4.7 Oxidation–Reduction Reactions	108	6.2 Attractive Forces Between Molecules		151
4.8 Stoichiometry	111	6.3 The Hydrogen Bond		153
<b>Chemistry in Depth:</b> Balancing Oxidation–Reduction Reactions by the Ion–Electron Method	112	6.4 Secondary Forces and Physical Properties		155
<b>Summary</b>	<b>117</b>	Chemistry Within Us: Surface Tension and the Digestion of Dietary Fats		158
<b>Key Words</b>	<b>118</b>	Chemistry Within Us: Respiratory Distress Syndrome		159
<b>Exercises</b>	<b>118</b>	6.5 The Vaporization of Liquids		161
<b>CHAPTER 5 THE PHYSICAL PROPERTIES OF GASES</b>	<b>120</b>	6.6 Vapor Pressure and Dynamic Equilibrium		161
5.1 Gas Pressure	121	6.7 The Influence of Secondary Forces on Vapor Pressure		162
Chemistry Within Us: Diving Time and Gas Pressure	123	Chemistry Around Us: Topical Anesthesia		163
5.2 The Gas Laws	124	6.8 Vaporization and the Regulation of Body Temperature		165
Chemistry Around Us: Manometry and Blood Pressure	125	6.9 Attractive Forces and the Structure of Solids		167
5.3 Boyle's Law	126	<b>Summary</b>		<b>170</b>
Chemistry Within Us: Breathing and the Gas Laws	128	<b>Key Words</b>		<b>170</b>
5.4 Charles's Law	129	<b>Exercises</b>		<b>170</b>
5.5 Gay-Lussac's Law	132	<b>CHAPTER 7 SOLUTIONS</b>		<b>173</b>
Chemistry Around Us: Sterilization and the Autoclave	133	7.1 General Aspects of Solution Formation		174
5.6 Avogadro's Law	134	7.2 Molecular Properties and Solution Formation		174
5.7 The Combined Gas Law	135	7.3 Solubility		176
5.8 The Universal Gas Law	136	7.4 Concentration		176
5.9 The Universal Gas Law and Molecular Mass	138	7.5 Percent Composition		178
5.10 Dalton's Law of Partial Pressures	139	7.6 Molarity		181
5.11 Gases Dissolve in Liquids	140			

7.7	Dilution	183	<b>Chemistry in Depth:</b> The Quantitative Description of Chemical Equilibrium	216	
7.8	Concentration Expressions for Very Dilute Solutions	185	8.8 Le Chatelier's Principle	217	
7.9	The Solubility of Solids in Liquids	186	<b>Chemistry Around Us:</b> Nitrogen Fixation: The Haber Process	219	
7.10	Insolubility Can Result in a Chemical Reaction	187	<b>Summary</b>	<b>220</b>	
7.11	Diffusion	188	<b>Key Words</b>	<b>220</b>	
			<b>Exercises</b>	<b>220</b>	
<b>Chemistry Within Us:</b> Diffusion and the Cardiovascular System				190	
7.12	Osmosis and Membranes	190	<b>CHAPTER 9 ACIDS, BASES, AND BUFFERS</b>	<b>223</b>	
<b>PROFESSIONAL CONNECTIONS</b> Beth Lerner Wilcox, Long-Term Care for the Elderly			9.1	Water Reacts with Water	224
7.13	Osmotic Pressure	192	9.2	Strong Acids and Strong Bases	226
7.14	Osmolarity	193	9.3	A Measure of Acidity: pH	228
<b>Chemistry Within Us:</b> Semipermeability and Urine Formation			9.4	Weak Acids and Weak Bases	233
7.15	Osmosis and the Living Cell	194	9.5	Brønsted-Lowry Theory of Acids and Bases	235
<b>Chemistry Within Us:</b> The Osmotic Pressure of Isotonic Solutions			<b>Chemistry in Depth:</b> Acid Dissociation Constants and the Calculation of pH		236
7.16	Macromolecules and Osmotic Pressure in Cells	195	9.6	Dissociation of Polyprotic Acids	240
<b>Chemistry Within Us:</b> Semipermeability and the Digestive System			9.7	Salts and Hydrolysis	241
<b>Chemistry in Depth:</b> Association Colloids, Micelles, and Protein Structure			<b>Chemistry Around Us:</b> Acid-Mine Drainage		242
	<b>Summary</b>	<b>198</b>	9.8	Buffers and Buffered Solutions	243
	<b>Key Words</b>	<b>199</b>	<b>Chemistry in Depth:</b> The Henderson-Hasselbalch Equation		
	<b>Exercises</b>	<b>199</b>	9.9	Buffer System of the Blood	246
<b>CHAPTER 8 CHEMICAL REACTIONS</b>			<b>PROFESSIONAL CONNECTIONS</b> Terri E. Weaver, Research on Sleep Apnea and Sleep Disorders		
8.1	Reaction Rates	203	9.10	Titration	249
8.2	Reactive Collisions	204	<b>Chemistry in Depth:</b> Use of Indicators in Determining pH		
<b>Chemistry Within Us:</b> The Influence of Temperature on Biological Processes			9.11	Normality	253
8.3	Catalysts	208	<b>Summary</b>		
8.4	Biochemical Catalysts	209	<b>Key Words</b>		
8.5	Chemical Equilibrium	211	<b>Exercises</b>		
8.6	Equilibrium Constants	212	<b>CHAPTER 10 CHEMICAL AND BIOLOGICAL EFFECTS OF RADIATION</b>		
8.7	Biochemical Reactions Are Connected in Sequences	215	10.1	Radioactivity	259
			10.2	Radioactive Emissions	259

10.3	Radioactive Decay	262	11.10	Chemical Properties of Alkanes and Cycloalkanes	316
10.4	Effects of Radiation	265	<b>Chemistry Around Us:</b>	Health Hazards and Medicinal Uses of Alkanes	317
<b>Chemistry Around Us:</b>	Radiocarbon Dating	267	<b>Chemistry Around Us:</b>	Greenhouse Effect and Global Warming	319
<b>Chemistry Around Us:</b>	The Ozone Layer and Radiation from Space	269	<b>Chemistry Around Us:</b>	Applications of Alkyl Halides and Some of the Problems That They Create	321
10.5	Detection of Radioactivity	271		<b>Summary</b>	<b>323</b>
10.6	Measuring Radioactivity	273		<b>Summary of Key Reactions</b>	<b>324</b>
<b>Chemistry Within Us:</b>	Radiation Dosimetry and Wristwatches	275		<b>Key Words</b>	<b>324</b>
10.7	Applications	275		<b>Exercises</b>	<b>324</b>
<b>Chemistry Within Us:</b>	Radon: A Major Health Hazard	276	<b>CHAPTER 12</b>	<b>UNSATURATED</b>	
10.8	Nuclear Reactions	279	<b>HYDROCARBONS</b>		<b>329</b>
10.9	Nuclear Energy and the Biosphere	281	12.1	Alkenes	331
	<b>Summary</b>	<b>282</b>	12.2	Bonding in Alkenes	332
	<b>Key Words</b>	<b>283</b>	<b>Chemistry Around Us:</b>	Alkenes in Nature	332
	<b>Exercises</b>	<b>283</b>	12.3	Constitutional Isomers of Alkenes	334
<b>PART 2</b>	<b>ORGANIC CHEMISTRY</b>	<b>285</b>	12.4	Naming Alkenes	336
<b>CHAPTER 11</b>	<b>SATURATED</b>		12.5	Cis-Trans Stereoisomerism in Alkenes	337
<b>HYDROCARBONS</b>		<b>286</b>	<b>Chemistry Within Us:</b>	Vision and Cis-Trans Isomerism	339
11.1	Molecular and Structural Formulas	288	<b>Chemistry Around Us:</b>	Cis-Trans Isomers and Pheromones	340
11.2	Families of Organic Compounds	290	12.6	Addition Reactions of Alkenes	341
11.3	Alkanes	293	<b>Chemistry in Depth:</b>	Mechanism of Alkene Addition Reactions	346
<b>Chemistry Around Us:</b>	Natural Gas and Petroleum	296	12.7	Addition Polymerization	346
<b>PROFESSIONAL CONNECTIONS</b>	Barbara Semmel, Outpatient Physical Therapy Clinic	298	<b>Chemistry in Depth:</b>	Carbocation Stability and the Markovnikov Rule	347
11.4	Types of Structural Formulas	299	<b>Chemistry Around Us:</b>	Synthetic Addition Polymers	348
11.5	Constitutional Isomers of Alkanes	300	12.8	Oxidation of Alkenes	349
11.6	Naming Alkanes	302	12.9	Alkynes	351
11.7	Cycloalkanes	308	12.10	Aromatic Compounds	352
11.8	Cis-Trans Stereoisomerism in Cycloalkanes	310	<b>Chemistry in Depth:</b>	Bonding in Benzene	353
<b>Chemistry in Depth:</b>	Stability and Shape of Cycloalkanes	311	<b>Chemistry Around Us:</b>	Aromatic Compounds in Everyday Life	354
11.9	Physical Properties of Alkanes and Cycloalkanes	313			

12.11	Isomers and Names of Aromatic Compounds	354			
12.12	Reactions of Aromatic Compounds	357			
<b>Chemistry Around Us: Fused-Ring Aromatics</b>		360			
	<b>Summary</b>	<b>360</b>			
	<b>Summary of Key Reactions</b>	<b>361</b>			
	<b>Key Words</b>	<b>362</b>			
	<b>Exercises</b>	<b>362</b>			
<b>CHAPTER 13 ALCOHOLS, PHENOLS, ETHERS, AND THEIR SULFUR ANALOGUES</b>		<b>369</b>			
13.1	Structural Relations of Alcohols, Phenols, and Ethers	370			
13.2	Constitutional Isomerism in Alcohols	372			
13.3	Classifying and Naming Alcohols	373			
13.4	Physical Properties of Alcohols	375			
<b>Chemistry Around Us: Alcohols</b>		378			
<b>Chemistry Around Us: Types of Alcoholic Beverages</b>		379			
<b>Chemistry Within Us: Health Aspects of Alcohol Consumption</b>		380			
13.5	Acidity and Basicity of Alcohols	381			
13.6	Dehydration of Alcohols to Alkenes	381			
<b>Chemistry in Depth: Mechanism of Dehydration of Alcohols</b>		383			
13.7	Oxidation of Alcohols	384			
13.8	Phenols	388			
<b>Chemistry Around Us: Phenols</b>		389			
13.9	Ethers	391			
<b>Chemistry Around Us: Ethers</b>		392			
13.10	Formation of Ethers by Dehydration of Alcohols	394			
13.11	Thiols	395			
	<b>Summary</b>	<b>396</b>			
	<b>Summary of Key Reactions</b>	<b>397</b>			
	<b>Key Words</b>	<b>398</b>			
	<b>Exercises</b>	<b>398</b>			
<b>CHAPTER 14 ALDEHYDES AND KETONES</b>		<b>403</b>			
14.1	Structure of Aldehydes and Ketones	404			
<b>Chemistry Around Us: Aldehydes and Ketones in Nature</b>		406			
<b>Chemistry Around Us: Important Aldehydes and Ketones</b>		408			
14.2	Naming Aldehydes and Ketones	409			
14.3	Physical Properties of Aldehydes and Ketones	411			
14.4	Oxidation of Aldehydes and Ketones	414			
14.5	Reduction of Aldehydes and Ketones	416			
<b>Chemistry in Depth: Absorption Spectroscopy (IR, NMR)</b>		418			
14.6	Hemiacetal and Acetal Formation by Reaction with Alcohol	423			
	<b>Summary</b>	<b>427</b>			
	<b>Summary of Key Reactions</b>	<b>427</b>			
	<b>Key Words</b>	<b>428</b>			
	<b>Exercises</b>	<b>428</b>			
<b>CHAPTER 15 CARBOXYLIC ACIDS, ESTERS, AND OTHER ACID DERIVATIVES</b>		<b>433</b>			
15.1	Comparison of Carboxylic Acids and Their Derivatives	434			
15.2	Synthesis of Carboxylic Acids	436			
15.3	Naming Carboxylic Acids	437			
15.4	Physical Properties of Carboxylic Acids	438			
15.5	Acidity of Carboxylic Acids	439			
<b>Chemistry Around Us: Carboxylic Acids in Nature</b>		441			
15.6	Carboxylate Salts	442			
15.7	Soaps and Their Cleaning Action	443			
<b>Chemistry Around Us: Carboxylate Salts</b>		444			
<b>Chemistry Around Us: Hard Water and Detergents</b>		445			
15.8	Esters from Carboxylic Acids and Alcohols	445			
15.9	Names and Physical Properties of Esters	447			

<b>Chemistry Within Us:</b> Aspirin and Aspirin Substitutes	448	<b>Key Words</b>	<b>489</b>
15.10 Polyester Synthesis	449	<b>Exercises</b>	<b>490</b>
15.11 Hydrolysis of Esters	450	<b>CHAPTER 17 STEREOISOMERISM</b>	<b>495</b>
15.12 Carboxylic Acid Anhydrides and Halides	452	17.1 Review of Isomerism	496
15.13 Phosphoric Acids and Their Derivatives	453	17.2 Enantiomers	497
<b>Chemistry Within Us:</b> Phosphate Esters in Biological Systems	456	17.3 Interpreting Structural Formulas of Enantiomers	502
<b>Summary</b>	<b>457</b>	17.4 Nomenclature of Enantiomers	504
<b>Summary of Key Reactions</b>	<b>457</b>	17.5 Properties of Enantiomers	505
<b>Key Words</b>	<b>458</b>	17.6 Compounds Containing Two or More Tetrahedral Stereocenters	510
<b>Exercises</b>	<b>458</b>	<b>Chemistry Within Us:</b> Senses of Smell and Taste	511
<b>CHAPTER 16 AMINES AND AMIDES</b>	<b>463</b>	<b>Chemistry Within Us:</b> Synthetic Chiral Drugs	512
16.1 Comparison of Amines and Amides	464	17.7 Cyclic Compounds Containing Tetrahedral Stereocenters	515
16.2 Classification of Amines	465	<b>Summary</b>	<b>517</b>
16.3 Naming Amines	466	<b>Key Words</b>	<b>517</b>
16.4 Physical Properties of Amines	469	<b>Exercises</b>	<b>518</b>
<b>Chemistry Within Us:</b> Opium Alkaloids	471	<b>PART 3 BIOCHEMISTRY</b>	<b>523</b>
16.5 Basicity of Amines	472	<b>CHAPTER 18 CARBOHYDRATES</b>	<b>524</b>
<b>Chemistry Within Us:</b> Drugs for Controlling Blood Pressure	473	18.1 Introduction to Carbohydrates	526
<b>Chemistry Within Us:</b> Other Amines and Amides with Physiological Activity	474	18.2 Monosaccharides	527
<b>PROFESSIONAL CONNECTIONS</b> Rose Eva Constantino, Psychiatric Mental Health Nursing	476	18.3 Cyclic Hemiacetal Structures	531
16.6 Amine Salts	477	18.4 Chemical and Physical Properties of Monosaccharides	534
<b>Chemistry Within Us:</b> Cocaine: Free Base Versus Amine Salt	479	<b>Chemistry Within Us:</b> How Sweet Is It?	535
16.7 Classification of Amides	480	18.5 Disaccharides	538
16.8 Synthesis of Amides	481	<b>Chemistry Within Us:</b> Hereditary Problems of Lactose Utilization	543
16.9 Polyamide Synthesis	483	18.6 Polysaccharides	544
16.10 Naming Amides	484	<b>Chemistry Around Us:</b> Plastics and Textile Fibers from Cellulose	549
16.11 Physical and Basicity Properties of Amides	485	<b>Chemistry Within Us:</b> Dietary Fiber	550
16.12 Hydrolysis of Amides	486	18.7 Photosynthesis	551
<b>Summary</b>	<b>488</b>	<b>Summary</b>	<b>552</b>
<b>Summary of Key Reactions</b>	<b>489</b>	<b>Key Words</b>	<b>553</b>
		<b>Exercises</b>	<b>553</b>

<b>CHAPTER 19 LIPIDS</b>	<b>556</b>	<b>CHAPTER 21 NUCLEIC ACIDS</b>	<b>622</b>
19.1 Classification of Lipids	557	21.1 Nucleotides	623
19.2 Fatty Acids	558	21.2 Nucleic Acid Formation from Nucleotides	626
19.3 Structure and Physical Properties of Triacylglycerols	561	21.3 Three-Dimensional Structure of Nucleic Acids	628
19.4 Chemical Reactions of Triacylglycerols	562	21.4 Information Flow from DNA to RNA to Polypeptide	633
Chemistry Within Us: Noncaloric Fat	565	21.5 Replication	633
19.5 Waxes	567	21.6 Transcription	636
19.6 Amphipathic Hydrolyzable Lipids	567	21.7 Translation	638
19.7 Steroids: Cholesterol, Steroid Hormones, and Bile Salts	571	21.8 Mutations	643
Chemistry Within Us: The Menstrual Cycle and Contraceptive Drugs	573	Chemistry Within Us: Cancer and Cancer Therapy	646
Chemistry Within Us: Anabolic Steroids	574	21.9 Antibiotics	647
19.8 Eicosanoids	575	21.10 Viruses	648
19.9 Fat-Soluble Vitamins	576	21.11 Recombinant DNA Technology	650
19.10 Biological Membranes	577	Chemistry Within Us: HIV and AIDS	650
<b>Summary</b>	<b>582</b>	<b>Summary</b>	<b>655</b>
<b>Key Words</b>	<b>582</b>	<b>Key Words</b>	<b>656</b>
<b>Exercises</b>	<b>583</b>	<b>Exercises</b>	<b>656</b>
<b>CHAPTER 20 PROTEINS</b>	<b>587</b>	<b>CHAPTER 22 METABOLISM AND ENZYMES: AN OVERVIEW</b>	<b>660</b>
20.1 $\alpha$ -Amino Acids	589	22.1 Cell Structure	661
20.2 Zwitterionic Structure of $\alpha$ -Amino Acids	591	22.2 General Features of Metabolism	664
Chemistry Within Us: Proteins in the Diet	592	22.3 Stages of Catabolism	664
20.3 Peptides	594	22.4 Transformation of Nutrient Chemical Energy into New Forms	665
20.4 Chemical Reactions of Peptides	599	22.5 Enzymes	669
20.5 Three-Dimensional Structure of Proteins	600	22.6 Enzyme Classification	671
20.6 Fibrous Proteins	606	22.7 Enzyme Activity	672
Chemistry Around Us: Permanent Waving of Hair	608	22.8 Control of Enzyme Activity	673
20.7 Globular Proteins	609	22.9 High-Energy Compounds	674
20.8 Mutations: Sickle-Cell Hemoglobin	612	<b>Summary</b>	<b>675</b>
20.9 Denaturation	614	<b>Key Words</b>	<b>676</b>
Chemistry Within Us: Diabetes Mellitus and Insulin	615	<b>Exercises</b>	<b>676</b>
<b>Summary</b>	<b>616</b>		
<b>Key Words</b>	<b>617</b>		
<b>Exercises</b>	<b>617</b>		

<b>CHAPTER 23 CARBOHYDRATE METABOLISM</b>	<b>678</b>		
23.1 Glycolysis	679	25.3 Amino Group and Ammonia Transport	728
23.2 Chemical Transformations in Glycolysis	681	25.4 Urea Cycle	730
23.3 Pentose Phosphate Pathway	683	25.5 Oxidation of the Carbon Skeleton	733
23.4 Formation of Acetyl-S-CoA	684	25.6 Heritable Defects in Amino Acid Metabolism	735
23.5 Citric Acid Cycle	687	25.7 Biosynthesis of Amino Acids	736
23.6 Reactions of the Citric Acid Cycle	688	<b>Summary</b>	<b>737</b>
23.7 Replenishment of Citric Acid Cycle Intermediates	691	<b>Key Words</b>	<b>737</b>
23.8 Gluconeogenesis	691	<b>Exercises</b>	<b>738</b>
23.9 Glycogenesis	693	<b>CHAPTER 26 HORMONES AND THE CONTROL OF METABOLIC INTERRELATIONS</b>	<b>739</b>
23.10 Glycogenolysis	694	26.1 Unicellularity Versus Multicellularity	740
23.11 Electron-Transport Chain	696	26.2 Hormones and Communication Between Cells	741
23.12 Enzymes of the Electron-Transport Chain	698	26.3 Digestive Processes	742
23.13 Production of ATP	699	26.4 Nutrition	745
23.14 Mitochondrial Membrane Selectivity	701	26.5 Metabolic Characteristics of the Major Organs and Tissues	750
23.15 Energy Yield from Carbohydrate Catabolism	704	Chemistry Within Us: Nerve Anatomy	752
<b>Summary</b>	<b>705</b>	<b>PROFESSIONAL CONNECTIONS</b> Gerald Bennett, Psychiatric Nurse and Health Science Educator	755
<b>Key Words</b>	<b>706</b>	26.6 Metabolic Responses to Physiological Stress	760
<b>Exercises</b>	<b>706</b>	26.7 Blood: The Mass-Transport System of the Body	763
<b>CHAPTER 24 FATTY ACID METABOLISM</b>	<b>708</b>	26.8 Transport of Oxygen	765
24.1 Fatty Acid Mobilization	709	26.9 Transport of Carbon Dioxide	768
24.2 Fatty Acid Oxidation	710	26.10 Transport of Lipids	771
24.3 Ketone Bodies and Cholesterol	713	<b>Summary</b>	<b>773</b>
24.4 Biosynthesis of Fatty Acids	714	<b>Key Words</b>	<b>773</b>
Chemistry Within Us: Atherosclerosis	716	<b>Exercises</b>	<b>774</b>
24.5 Biosynthesis of Triacylglycerols	720	<b>ANSWERS TO PROBLEMS FOLLOWING IN-CHAPTER WORKED EXAMPLES</b>	<b>P-1</b>
24.6 Biosynthesis of Membrane Lipids	721	<b>ANSWERS TO ODD-NUMBERED EXERCISES</b>	<b>E-1</b>
<b>Summary</b>	<b>723</b>	<b>GLOSSARY</b>	<b>G-1</b>
<b>Key Words</b>	<b>723</b>	<b>ILLUSTRATION CREDITS</b>	<b>C-1</b>
<b>Exercises</b>	<b>723</b>	<b>INDEX</b>	<b>I-1</b>
<b>CHAPTER 25 AMINO ACID METABOLISM</b>	<b>725</b>		
25.1 An Overview of Amino Acid Metabolism	726		
25.2 Transamination and Oxidative Deamination	727		