# BRIEF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ORGANIZATION OF THE HUMAN BODY</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>INTRODUCTORY CHEMISTRY</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>CELLS</td>
<td>47</td>
</tr>
<tr>
<td>4</td>
<td>TISSUES</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>THE INTEGUMENTARY SYSTEM</td>
<td>111</td>
</tr>
<tr>
<td>6</td>
<td>BONE TISSUE</td>
<td>135</td>
</tr>
<tr>
<td>7</td>
<td>THE SKELETAL SYSTEM: THE AXIAL SKELETON</td>
<td>159</td>
</tr>
<tr>
<td>8</td>
<td>THE SKELETAL SYSTEM: THE APPENDICULAR SKELETON</td>
<td>195</td>
</tr>
<tr>
<td>9</td>
<td>JOINTS</td>
<td>221</td>
</tr>
<tr>
<td>10</td>
<td>MUSCULAR TISSUE</td>
<td>257</td>
</tr>
<tr>
<td>11</td>
<td>THE MUSCULAR SYSTEM: THE MUSCLES OF THE HEAD AND NECK</td>
<td>284</td>
</tr>
<tr>
<td>12</td>
<td>THE MUSCULAR SYSTEM: THE MUSCLES OF THE TORSO</td>
<td>316</td>
</tr>
<tr>
<td>13</td>
<td>THE MUSCULAR SYSTEM: THE MUSCLES OF THE UPPER LIMB</td>
<td>336</td>
</tr>
<tr>
<td>14</td>
<td>THE MUSCULAR SYSTEM: THE MUSCLES OF THE LOWER LIMB</td>
<td>369</td>
</tr>
<tr>
<td>15</td>
<td>NERVOUS TISSUE</td>
<td>403</td>
</tr>
<tr>
<td>16</td>
<td>THE SPINAL CORD AND SPINAL NERVES</td>
<td>426</td>
</tr>
<tr>
<td>17</td>
<td>THE BRAIN AND CRANIAL NERVES</td>
<td>463</td>
</tr>
<tr>
<td>18</td>
<td>THE AUTONOMIC NERVOUS SYSTEM</td>
<td>483</td>
</tr>
<tr>
<td>19</td>
<td>SOMATIC AND SPECIAL SENSES</td>
<td>498</td>
</tr>
<tr>
<td>20</td>
<td>THE ENDOCRINE SYSTEM</td>
<td>527</td>
</tr>
<tr>
<td>21</td>
<td>THE CARDIOVASCULAR SYSTEM: THE BLOOD</td>
<td>553</td>
</tr>
<tr>
<td>22</td>
<td>THE CARDIOVASCULAR SYSTEM: THE HEART</td>
<td>571</td>
</tr>
<tr>
<td>23</td>
<td>THE CARDIOVASCULAR SYSTEM: BLOOD VESSELS AND CIRCULATION</td>
<td>594</td>
</tr>
<tr>
<td>24</td>
<td>THE LYMPHATIC SYSTEM AND IMMUNITY</td>
<td>627</td>
</tr>
<tr>
<td>25</td>
<td>THE RESPIRATORY SYSTEM</td>
<td>651</td>
</tr>
<tr>
<td>26</td>
<td>THE DIGESTIVE SYSTEM</td>
<td>677</td>
</tr>
<tr>
<td>27</td>
<td>NUTRITION AND METABOLISM</td>
<td>707</td>
</tr>
<tr>
<td>28</td>
<td>THE URINARY SYSTEM</td>
<td>726</td>
</tr>
<tr>
<td>29</td>
<td>THE REPRODUCTIVE SYSTEM</td>
<td>744</td>
</tr>
</tbody>
</table>

**APPENDIX A:** MEASUREMENTS A1

**GLOSSARY:** G1

**B:** PERIODIC TABLE B3

**CREDITS:** CR1

**C:** ANSWERS C4

**INDEX:** I1
4.3 Epithelial Tissue 79
General Features of Epithelial Tissue 80
Covering and Lining Epithelium 80
Glandular Epithelium 88
4.4 Connective Tissue 89
General Features of Connective Tissue 90
Connective Tissue Cells 90
Connective Tissue Extracellular Matrix 91
Classification of Connective Tissues 92
Types of Mature Connective Tissue 92
Connective Tissues: Diverse and Dynamic 100
4.5 Membranes 101
Mucous Membranes 101
Serous Membranes 101
Synovial Membranes 101
4.6 Muscular Tissue 102
4.7 Nervous Tissue 104
4.8 Tissue Repair: Restoring Homeostasis 105
4.9 Aging and Tissues 106
Key Medical Terms Associated with Tissues 106
MANUAL THERAPY APPLICATION
How Massage Affects Connective Tissues 100

• CLINICAL CONNECTIONS
Pap Smear 82  Marfan Syndrome 91  Tissue Engineering 99
Adhesions 105
Study Outline 106  Self-Quiz Questions 108
Critical Thinking Questions 110
Answers to Figure Questions 110

5 THE INTEGUMENTARY SYSTEM 111
5.1 Structure of the Skin 112
Epidermis 113  Keratinization and Growth of the Epidermis 116
Dermis 116  Skin Color 117
5.2 Accessory Structures of the Skin 118
Hair 118  Skin Glands 121  Nails 122
5.3 Types of Skin 123
5.4 Functions of the Skin 124
5.5 Maintaining Homeostasis: Skin Wound Healing 125
Epidermal Wound Healing 125  Dermal Wound Healing 125
5.6 Skin Conditions Important to Therapists 127
Skin Cancer 127  Burns 128  Pressure Ulcers 129
5.7 Aging and the Integumentary System 130
Key Medical Terms Associated with the Integumentary System 130
Exhibit 5.1 The Integumentary System and Homeostasis 131
MANUAL THERAPY APPLICATIONS
Physiological Effects of Massage 127
Assessing Skin Lesions 129

• CLINICAL CONNECTIONS
Skin Grafts 115  Skin and Mucous Membrane Color as a Diagnostic Clue 118

Study Outline 132  Self-Quiz Questions 133
Critical Thinking Questions 134  Answers to Figure Questions 134

6 BONE TISSUE 135
6.1 Functions of Bone and the Skeletal System 136
6.2 Structure of Bone 136
6.3 Histology of Bone Tissue 138
Compact Bone Tissue 139
Spongy Bone Tissue 139
6.4 Blood and Nerve Supply of Bone 141
6.5 Bone Formation 142
Intramembranous Ossification 142
Endochondral Ossification 142
6.6 Bone Growth 145
Growth in Length 145
Growth in Thickness 146
6.7 Bones and Homeostasis 147
Bone Remodeling 147
Factors Affecting Bone Growth and Bone Remodeling 148
Fracture and Repair of Bone 148
Bone’s Role in Calcium Homeostasis 151
6.8 Aging and Bone Tissue 152
Key Medical Terms Associated with Bone Tissue 154
MANUAL THERAPY APPLICATIONS
Treatments for Fractures 151
Effects of Exercise on Bone 152

• CLINICAL CONNECTIONS
Bone Scan 141  Remodeling and Orthodontics 147  Rickets and Osteomalacia 148  Hormonal Abnormalities that Affect Height 148
Osteoporosis 153

Study Outline 154  Self-Quiz Questions 155
Critical Thinking Questions 157  Answers to Figure Questions 158

7 THE SKELETAL SYSTEM: THE AXIAL SKELETON 159
7.1 Divisions of the Skeletal System 160
7.2 Types of Bones 160
7.3 Bone Surface Markings 162
7.4 Skull 162
General Features and Functions 163  Cranial Bones 164
Facial Bones 170  Nasal Septum 173  Orbits 174
Foramina 174  Unique Features of the Skull 174
7.5 Hyoid Bone 177
7.6 Vertebral Column 177
Normal Curves of the Vertebral Column 179  Intervertebral Discs 179  Parts of a Typical Vertebra 179  Regions of the Vertebral Column 180
7.7 Thorax 186
Sternum 186  Ribs 186
7.8 Disorders of the Axial Skeleton 189
Abnormal Curves of the Vertebral Column 189  Spina Bifida 190
Key Medical Terms Associated with Axial Skeleton 191

Study Outline 192  Self-Quiz Questions 193
Critical Thinking Questions 194  Answers to Figure Questions 194
9.6 Selected Joints of the Body 236
Exhibit 9.1 Temporomandibular Joint 238
Exhibit 9.2 Shoulder Joint 240
Exhibit 9.3 Elbow Joint 243
Exhibit 9.4 Hip Joint 244
Exhibit 9.5 Knee Joint 246
Exhibit 9.6 Ankle Joint 249
9.7 Factors Affecting Contact and Range of Motion at Synovial Joints 251
9.8 Arthroplasty 252
9.9 Aging and Joints 253
Key Medical Terms Associated with Joints 253

MANUAL THERAPY APPLICATIONS
Treatment for Frontal Headaches 165 Sinusitis 175
Herniated (Slipped) Disc 179 Rib Fractures, Dislocations, and Separations 189
Treatment of Scoliosis 190

• CLINICAL CONNECTIONS
Cleft Palate and Cleft Lip 172 Temporomandibular Joint Syndrome 173 Fractures of the Vertebral Column 191

Study Outline 191  Self-Quiz Questions 192
Critical Thinking Questions 193  Answers to Figure Questions 193

8  THE SKELETAL SYSTEM: THE APPENDICULAR SKELETON 195
8.1 Pectoral (Shoulder) Girdle 196
Clavicle 196 Scapula 197
8.2 Upper Limb (Extremity) 199
Humerus 199 Ulna and Radius 201 Carpals, Metacarpals, and Phalanges 202
8.3 Pelvic (Hip) Girdle 205
Ilium 206 Ischium 206 Pubis 207 False and True Pelves 207
8.4 Comparison of Female and Male Pelves 209
8.5 Comparison of Pectoral and Pelvic Girdles 210
8.6 Lower Limb (Extremity) 211
Femur 211 Patella 213 Tibia and Fibula 214
Tarsals, Metatarsals, and Phalanges 215 Arches of the Foot 217
Exhibit 8.1 The Skeletal System and Homeostasis 218
Key Medical Terms Associated with Appendicular Skeleton 219

MANUAL THERAPY APPLICATION
Patellofemoral Stress Syndrome 213

• CLINICAL CONNECTIONS
Fractured Clavicle 197 Cartilage Implants 215
Flatfoot and Clawfoot 217

Study Outline 219  Self-Quiz Questions 219
Critical Thinking Questions 220  Answers to Figure Questions 220

9  JOINTS 221
9.1 Joint Classifications 222
9.2 Fibrous Joints 222
Sutures 222 Syndesmoses 224 Interosseous Membranes 224
9.3 Cartilaginous Joints 224
Synchondroses 224 Symphyses 224
9.4 Synovial Joints 225
Structure of Synovial Joints 225 Bursae and Tendon Sheaths 227
Types of Synovial Joints 227
9.5 Types of Movements at Synovial Joints 230
Gliding 230 Angular Movements 230 Rotation 233 Special Movements 234
9.6 Selected Joints of the Body 236
Exhibit 9.1 Temporomandibular Joint 238
Exhibit 9.2 Shoulder Joint 240
Exhibit 9.3 Elbow Joint 243
Exhibit 9.4 Hip Joint 244
Exhibit 9.5 Knee Joint 246
Exhibit 9.6 Ankle Joint 249
9.7 Factors Affecting Contact and Range of Motion at Synovial Joints 251
9.8 Arthroplasty 252
9.9 Aging and Joints 253
Key Medical Terms Associated with Joints 253

MANUAL THERAPY APPLICATIONS
Muscular Atrophy and Hypertrophy 263 Lactic Acid Fuels Intensive Exercise 268 Treatment of Muscle Spasms 276
11 THE MUSCULAR SYSTEM: THE MUSCLES OF THE HEAD AND NECK 284

11.1 How Skeletal Muscles Produce Movement 285
Muscle Attachment Sites: Origin and Insertion 285
Lever Systems and Leverage 285 Effects of Fascicle
Arrangement 288 Coordination within Muscle Groups 288
11.2 How Skeletal Muscles Are Named 289
11.3 Principal Skeletal Muscles of the Head and Neck 289
Exhibit 11.1 Muscles of Facial Expression 294
Exhibit 11.2 Muscles that Move the Eyeballs and Upper Eyelids
(Extrinsic Eye Muscles) 300
Exhibit 11.3 Muscles that Move the Mandible and Assist in
Mastication (Chewing) and Speech 302
Exhibit 11.4 Muscles of the Anterior Neck that Assist in
Deglutition (Swallowing) and Speech 304
Exhibit 11.5 Muscles of the Anterior Neck that Assist in
Elevating the Ribs or Flexing the Neck and Head 307
Exhibit 11.6 Muscles of the Lateral Neck that Move the
Head 310

11.4 How Skeletal Muscles Are Named 289

11.5 Principal Skeletal Muscles of the Head and Neck 289
Exhibit 11.1 Muscles of Facial Expression 294
Exhibit 11.2 Muscles that Move the Eyeballs and Upper Eyelids
(Extrinsic Eye Muscles) 300
Exhibit 11.3 Muscles that Move the Mandible and Assist in
Mastication (Chewing) and Speech 302
Exhibit 11.4 Muscles of the Anterior Neck that Assist in
Deglutition (Swallowing) and Speech 304
Exhibit 11.5 Muscles of the Anterior Neck that Assist in
Elevating the Ribs or Flexing the Neck and Head 307
Exhibit 11.6 Muscles of the Lateral Neck that Move the
Head 310

MANUAL THERAPY APPLICATIONS
Sternocleidomastoid (SCM) as an Example of Referred
Trigger Points 310 Whiplash Injuries 312

12 THE MUSCULAR SYSTEM: THE MUSCLES OF THE TORSO 316

Exhibit 12.1 Muscles of the Abdomen that Act on the
Abdominal Wall 317
Surface Features of the Abdomen and Pelvis 320
Exhibit 12.2 Muscles of the Thorax Used in Breathing 324
Exhibit 12.3 Muscles of the Pelvic Diaphragm and
Perineum that Support the Pelvic Viscera 325
Exhibit 12.4 Muscles of the Neck and Back that Act on the
Posterior Head, Posterior Neck, Back, and Vertebral
Column 328
Suboccipital Muscles 332

MANUAL THERAPY APPLICATIONS
The Quadratus Lumborum and “Short Leg” Syndrome 319
Back Injuries and Heavy Lifting 332

13 THE MUSCULAR SYSTEM: THE MUSCLES OF THE LOWER LIMB 336

Exhibit 13.1 Muscles of the Thorax that
Move the Pectoral Girdle 337
Movements of the Scapula 340
Exhibit 13.2 Muscles of the Thorax and
Shoulder that Move the Humerus 341
Surface Features of the Shoulder 341
Surface Features of the Armpit 341
Surface Features of the Back 346
Exhibit 13.3 Muscles of the Arm that
Move the Radius and Ulna 347
Surface Features of the Arm and Elbow 352
Exhibit 13.4 Muscles of the Forearm that
Move the Wrist, Hand, and Digits 354
Exhibit 13.5 Muscles of the Palm that
Move the Digits–Intrinsic Muscles of the Hand 362
Surface Features of the Hand 366

MANUAL THERAPY APPLICATIONS
Structural and Functional Analysis 340 Tenosynovitis 352
Repetitive Strain Injuries 359

14 THE MUSCULAR SYSTEM: THE MUSCLES OF THE LOWER LIMB 369

14.1 Introduction to the Muscles of the Lower Limb
(Extremity) 370
Exhibit 14.1 Muscles of the Gluteal Region that Move the
Femur 371
Surface Features of the Buttock 378
Exhibit 14.2 Muscles of the Thigh that Move on the Femur, Tibia,
and Fibula 380
Surface Features of the Thigh and Knee 383
Exhibit 14.3 Muscles of the Leg that Move the Foot and Toes 386
Surface Features of the Leg, Ankle, and Foot 391
Exhibit 14.4 Muscles of the Foot that Move the Toes 393
14.2 Muscle Interactions 398
The Interconnectedness of the Whole Body 398
Posture and Interactions between Muscles 398
Exhibit 14.5 Contributions of the Muscular
System to Homeostasis 400

• CLINICAL CONNECTIONS
Fibromyalgia 261 Muscular Dystrophy 261 Myasthenia Gravis 264
Abnormal Contractions of Skeletal Muscle 274

Study Outline 280 Self-Quiz Questions 282
Critical Thinking Questions 283 Answers to Figure Questions 283

• CLINICAL CONNECTIONS
McBurney’s Point 320 The Six-Pack 320 Injury
of Levator Ani and Urinary Stress Incontinence 325

Study Outline 334 Self-Quiz Questions 334
Critical Thinking Questions 335 Answers to Figure Questions 335

• CLINICAL CONNECTIONS
Bell’s Palsy 298 Gravity and the Mandible 302

Study Outline 314 Self-Quiz Questions 314
Critical Thinking Questions 315 Answers to Figure Questions 315

• CLINICAL CONNECTIONS
Rotator Cuff Injuries and Impingement Syndrome 345

Study Outline 367 Self-Quiz Questions 367
Critical Thinking Questions 368 Answers to Figure Questions 368

• CLINICAL CONNECTIONS
Gravity and the Mandible 302

Study Outline 314 Self-Quiz Questions 314
Critical Thinking Questions 315 Answers to Figure Questions 315
15  NERVOUS TISSUE 403

15.1 Overview of the Nervous System 404
   Structures of the Nervous System 404
   Functions of the Nervous System 404
   Organization of the Nervous System 405

15.2 Histology of Nervous Tissue 407
   Neurons 407
   Myelination 409
   Gray and White Matter 411
   Neuroglia 411

15.3 Electrical Signals in Neurons 413
   Action Potentials 413
   Conduction of Nerve Impulses 417
   Effect of Axon Diameter 418

15.4 Synaptic Transmission 418
   Events at a Synapse 418
   Neurotransmitters 420

15.5 Regeneration and Repair of Nervous Tissue 421
   Neurogenesis in the CNS 421
   Damage and Repair in the PNS 421

Key Medical Terms Associated with Nervous Tissue 422

16  THE SPINAL CORD AND SPINAL NERVES 426

16.1 Spinal Cord Anatomy 427
   Protective Structures 427
   External Anatomy of the Spinal Cord 427
   Internal Anatomy of the Spinal Cord 429

16.2 Spinal Nerves 430
   Connective Tissue Coverings of Spinal Nerves 432
   Distribution of Spinal Nerves 433
   Exhibit 16.1 Cervical Plexus 434
   Exhibit 16.2 Brachial Plexus 436
   Exhibit 16.3 Lumbar Plexus 440

16.3 Spinal Cord Physiology 444
   Sensory and Motor Tracts 445
   Reflexes and Reflex Arcs 449
   Reflexes and Diagnosis 457

16.4 Traumatic Injuries of the Spinal Cord 458
   Key Medical Terms Associated with the Spinal Cord and Spinal Nerves 458

17  THE BRAIN AND CRANIAL NERVES 463

17.1 The Brain 464
   Major Parts and Protective Coverings 464
   Brain Blood Supply and the Blood-Brain Barrier 464
   Cerebrospinal Fluid 464
   Brain Stem 468
   Diencephalon 469
   Cerebellum 471
   Cerebrum 471
   Hemispheric Lateralization 476
   Memory 476
   Electroencephalogram (EEG) 476

17.2 Cranial Nerves 477

17.3 Aging and the Nervous System 479

Key Medical Terms Associated with the Brain 479

18  THE AUTONOMIC NERVOUS SYSTEM 483

18.1 Introduction to the Autonomic Nervous System 484
18.2 Comparison of Somatic and Autonomic Nervous Systems 484
22 THE CARDIOVASCULAR SYSTEM: THE HEART 571

22.1 Structure and Organization of the Heart 572
- Location and Coverings of the Heart 572
- Heart Wall 575
- Chambers of the Heart 575
- Great Vessels of the Heart 577
- Valves of the Heart 577

22.2 Blood Flow and Blood Supply of the Heart 579
- Blood Flow through the Heart 579
- Blood Supply of the Heart 579
- Myocardial Ischemia and Infarction 580

22.3 Conduction System of the Heart 581

22.4 Electrocardiogram 583
- Arrhythmias 583

22.5 The Cardiac Cycle 584
- Pressure and Volume Changes during the Cardiac Cycle 584
- Heart Sounds 586

22.6 Cardiac Output 586
- Regulation of Stroke Volume 586
- Regulation of Heart Rate 589

22.7 Exercise and the Heart 590
- Key Medical Terms Associated with the Heart 590

23 THE CARDIOVASCULAR SYSTEM: BLOOD VESSELS AND CIRCULATION 594

23.1 Blood Vessel Structure and Function 595
- Arteries and Arterioles 595
- Capillaries 595
- Veins and Veins 597

23.2 Blood Flow Through Blood Vessels 599
- Blood Pressure 599
- Resistance 600
- Regulation of Blood Pressure and Blood Flow 600

23.3 Checking Circulation 603
- Pulse 603
- Measurement of Blood Pressure 603

23.4 Circulatory Routes 603
- Systemic Circulation 603
- Pulmonary Circulation 605

23.5 Aging and the Cardiovascular System 620
- Exhibit 23.8 Contributions of the Cardiovascular System to Homeostasis 622
- Key Medical Terms Associated with Blood Vessels 623

24 THE LYMPHATIC SYSTEM AND IMMUNITY 627

24.1 Overview of Immunity 628

24.2 Lymphatic System Structure and Function 628
- Lymphatic Vessels and Lymph Circulation 628
- Lymphatic Organs and Tissues 631

24.3 Innate Immunity 634
- First Line of Defense: Skin and Mucous Membranes 634
- Second Line of Defense: Internal Defenses 634

24.4 Adaptive Immunity 636
- Maturation of T cells and B cells 637
- Types of Adaptive Immune Responses 637
- Antigens and Antibodies 637
- Processing and Presenting Antigens 638
- T Cells and Cell-Mediated Immunity 639
- B Cells and Antibody-Mediated Immunity 642
- Immunological Memory 643

24.5 Aging and the Immune System 645
- Exhibit 24.5 Contributions of the Lymphatic System and Immunity to Homeostasis 646
- Key Medical Terms Associated with the Lymphatic System 647

25 MANUAL THERAPY APPLICATIONS

- Arising Slowly from a Massage Therapy Session 601

- Reversing Arterial Plaque Buildup 605

- Edema and Lymphedema 630
- Metastasis 632

- Lymphomas 632
- Ulcer 636
- Infectious Mononucleosis 639
- AIDS: Acquired Immunodeficiency Syndrome 642
- Allergic Reactions 645
28.4 Transportation, Storage, and Elimination of Urine 737
Ureters 737 Urinary Bladder 737 Urethra 737 Micturition 738
28.5 Aging and the Urinary System 739
Key Medical Terms Associated with the Urinary System 739
Exhibit 28.1 The Urinary System and Homeostasis 740

MANUAL THERAPY APPLICATION
Massage and the Kidney 728

• CLINICAL CONNECTIONS
Kidney Transplant 729 Number of Nephrons 730
Oliguria and Anuria 733 Glucosuria and Polyuria 734
Urinalysis 734 Diuretics 736

Study Outline 741 Self-Quiz Questions 741
Critical Thinking Questions 743 Answers to Figure Questions 743

29 | THE REPRODUCTIVE SYSTEMS 744

29.1 Introduction to the Reproductive Systems 745
29.2 Male Reproductive System 745
Scrotum 745 Testes 745 Ducts 749 Accessory Sex Glands 750 Penis 752
29.3 Female Reproductive System 752
Ovaries 752 Uterine Tubes 755 Uterus 755 Vagina 756

Perineum and Vulva 756 Mammary Glands 758
29.4 Female Reproductive Cycle 759
Hormonal Regulation of the Female Reproductive Cycle 759
Phases of the Female Reproductive Cycle 759
29.5 Aging and the Reproductive Systems 763
Exhibit 29.1 The Reproductive Systems and Homeostasis 765
Key Medical Terms Associated with the Reproductive Systems 766

MANUAL THERAPY APPLICATION
Benefits of Massage During Pregnancy 764

• CLINICAL CONNECTIONS
Cryptorchidism 745 Vasectomy 750 Prostate Disorders 750
Circumcision 752 Ovarian Cancer 754 Hysterectomy 755
Episiotomy 757 Breast Cancer 758 Premenstrual Syndrome 761
The Female Athlete Triad—Disordered Eating, Amenorrhea, and Premature Osteoporosis 763

Study Outline 766 Self-Quiz Questions 767
Critical Thinking Questions 769 Answers to Figure Questions 769

APPENDIX A: MEASUREMENTS A1
B: PERIODIC TABLE B3
C: ANSWERS C4

GLOSSARY G1
CREDITS CR1
INDEX I1