HUMAN ANATOMY

SECOND EDITION

JOHN W. HOLE, JR.

KAREN A. KOOS

HUMAN ANATOMY

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SECOND EDITION

JOHN W. HOLE, JR.

KAREN A. KOOS

Rio Hondo College

WCB Wm. C. Brown Publishers

Dubuque, Iowa • Melbourne, Australia • Oxford, England

To the memory of Ed Jaffe,
editor and friend, who provided
the inspiration for this book.

REFERENCE PLATES

The Human Organism

1 Human female torso with a view of the anterior surface on one side and the superficial muscles exposed on the other side 20
2 Human male torso with the deeper muscle layers exposed 21
3 Human male torso with the deep muscles removed and the abdominal viscera exposed 22
4 Human male torso with the thoracic and abdominal viscera exposed 23
5 Human female torso with the lungs, heart, and small intestine sectioned 24
6 Human female torso with the heart, stomach, and parts of the intestine and lungs removed 25
7 Human female torso with the thoracic, abdominal, and pelvic visceral organs removed 26

Human Skull

8 The skull, frontal view 180
9 The skull, left lateral view 181
10 The skull, left posterior view 181
11 The skull, inferior view 182
12 Base of the skull, sphenoidal region 183
13 Mandible, lateral view 183
14 Temporal bone, left lateral view 184
15 Ethmoid bone, right lateral view 184
16 Sphenoid bone, posterior view 184
17 The skull, median section 185
18 Sphenoidal region, median section 185
19 The skull, floor of the cranial cavity 186
20 Sphenoidal region, floor of the cranial cavity 187

Surface Anatomy

21 Surface anatomy of head and neck, lateral view 258
22 Surface anatomy of arm and thorax, lateral view 258
23 Surface anatomy of back and arms, posterior view 259
24 Surface anatomy of torso and arms, anterior view 259
25 Surface anatomy of torso and upper legs, posterior view 260
26 Surface anatomy of the arm, anterior view 260
27 Surface anatomy of the hand 260
28 Surface anatomy of knee and surrounding area, anterior view 261
29 Surface anatomy of knee and surrounding area, lateral view 261
30 Surface anatomy of ankle and lower leg, medial view 261
31 Surface anatomy of the ankle and foot 261

Human Brain

32 Median section of the brain 327
33 Sagittal section of the brain, 6 mm to the right of the midline 327
34 MRI scan of the brain (sagittal section) 328
35 Frontal section of the brain revealing the basal nuclei 328
36 Frontal section of the brain revealing the insula 329
37 Frontal section of the brain through the thalamus and hypothalamus 329
38 MRI scan of the brain (frontal section) 330

Human Development

39 Formation of the primary germ layers 599
40 Early stages of brain development 600
41 Later stages of human brain development 601
42 Stages of development of the human heart 602
43 Development of the human digestive system 603
44 Stages of development of the human reproductive organs 604
45 Lateral views of human embryos, fifth through seventh week 605, 606

Human Cadavers

46 Sagittal section of the head and trunk 608
47 Sagittal section of the head and neck 609
48 Viscera of the thoracic cavity, sagittal section 610
49 Viscera of the abdominal cavity, sagittal section 610
50 Viscera of the pelvic cavity, sagittal section 611
51 Transverse section of the head above the eyes, superior view 612
52 Transverse section of the head at the level of the eyes, superior view 612
53 Transverse section of the neck, inferior view 613
54 Transverse section of the thorax through the base of the heart, inferior view 613
55 Transverse section of the thorax through the heart, inferior view 614
56 Transverse section of the abdomen through the kidneys, inferior view 614
57 Transverse section of the abdomen through the pancreas, inferior view 615
58 Transverse section of the male pelvic cavity, superior view 615
59 Lateral view of the head 616
60 Anterior view of the trunk 617
61 Posterior view of the trunk, with deep thoracic muscles exposed on the left 618
62 Posterior view of the right thorax and upper arm 619
63 Posterior view of the right forearm and hand 620
64 Anterior view of the right thigh 621
65 Posterior view of the right thigh 622
66 Anterior view of the right leg 622
67 Lateral view of the right leg 623
68 Posterior view of the right leg 623
69 Thoracic viscera, anterior view 624
70 Thorax with the lungs removed, anterior view 625
71 Thorax with the heart and lungs removed, anterior view 626
72 Abdominal viscera, anterior view 627
73 Abdominal viscera with the greater omentum removed 628

PREFACE

Human Anatomy, second edition, was prepared to provide a comprehensive introduction to the study of human body structure in an interesting and easily readable manner. It is especially designed for students pursuing careers in allied health fields, who have minimal backgrounds in the biological sciences and who need to understand the basic principles of human anatomy.

Human Anatomy takes a systematic approach to the study of the human body. Each chapter presents in detail the structure of certain body parts and describes more briefly the relationship between the structure and functions of these parts, clinical implications, and ways in which anatomic features vary normally from individual to individual.

Organization

The textbook is organized into units, each containing several chapters. These chapters are arranged traditionally, beginning with a discussion of basic terminology and proceeding through levels of increasing complexity.

Unit 1 introduces the human body and its major parts. It is also concerned with anatomic terminology and the structure of cells and tissues. It presents membranes as organs and the integumentary system as an organ system. Unit 2 concerns the parts of the skeletal and muscular systems; unit 3 deals with the organization of the nervous and endocrine systems; unit 4 discusses the structures of the digestive, respiratory, circulatory, lymphatic, and urinary systems; unit 5 describes the reproductive systems as well as growth and development of human offspring.

Terminology
The importance of anatomic terminology is emphasized throughout the book. Basic terms appear in boldface or italic type, and the phonetic pronunciation of many anatomic words has been included within the narratives of certain chapters as those terms are introduced.

Illustration Program
In recognition of the visual nature of human anatomy, the chapters are richly illustrated with line drawings, medical illustrations, photographs, X rays, and a variety of scanning and transmission electron micrographs. In addition, sets of reference plates are positioned between selected chapters. These include drawings of the human torso with various layers of organs exposed, photographs of the human skull with special features identified, photographs of human dissection, photographs of models with their surface features labeled, photographs of human brains sectioned in various planes, and drawings of the development of various organs. These illustrations will help the reader visualize anatomic structures macroscopically, as well as on the histological, cytological, and ultrastructural levels of organization.

Readability
Readability is an important asset of this text. The writing style is intentionally informal and easy to read. Technical vocabulary has been minimized, and summary paragraphs and review questions occur frequently within the narrative. Numerous illustrations and summary charts are carefully positioned near the discussions they complement.

Pedagogical Devices
The text includes an unusually large number of pedagogical devices intended to increase readability and to involve students in the learning process, to stimulate their interests in the subject matter, and to help them relate their classroom knowledge to their future clinical experiences. For an annotated listing of these devices, see To the Reader, which follows this preface.

Special Features of the Second Edition

Human Anatomy has been carefully reviewed for this second edition. The chapters have been revised and updated, the illustration program has been improved, and the clinical features have been expanded. The major improvements in this edition include:

1. Many figures have been improved or replaced. Examples of new artwork can be found in chapter 4 (tissues), chapter 6 (skeleton), chapter 8 (muscles), chapter 9 (nervous system), and the reference plates following chapter 18 (development).
2. Discussions of many topics have been revised or expanded. Among these topics are transport of intracellular membranes, neuromuscular junctions, muscles of the neck, back, legs, and hands, association tracts in the brain, pathways of cranial nerves, and valves of the heart.
3. All of the clinical boxed asides have been reviewed, and more than twenty new boxed asides have been added. The topics of these asides include endoscopy, skin cancer, wound healing, osteoporosis, knee ligament tears and repair, ALS (amyotrophic lateral sclerosis), pituitary gland development, and newborn lung function.
4. More than twenty-five new clinical application of knowledge questions have been added. The answers to all of the Clinical Application of Knowledge questions have been included in Appendix B. In addition, the Review Activities portion of certain chapters has been expanded to include a short answer section (Part B).

5. New summary charts dealing with neck, back, and laryngeal muscles have been added. Also, figure references have been added to appropriate charts.

Supplementary Materials

Supplementary materials designed to help the instructor plan class work and presentations and to aid students in their learning activities are also available. They include the following:

Instructor's Resource Manual and Test Item File by John W. Hole, Jr., and Karen A. Koos, which contains chapter overviews, instructional techniques, suggested schedules, discussions of chapter elements, lists of related films, and directories of suppliers of audiovisual and laboratory materials. It also contains test items for each chapter of the text.

WCB TestPak is a computerized testing service offered free upon request to adopters of this textbook. It provides a call-in/mail-in test preparation service. A complete test item file is also available on computer diskette for use with IBM compatible, Apple IIe or IIc, or Macintosh computers.

Transparencies include a set of 150 acetate transparencies designed to complement classroom lectures or to be used for short quizzes.

Color slides include a set of 72 micrographs of tissues, organs, and other body features described in the textbook to complement classroom instruction.

Laboratory Manual to Accompany Human Anatomy by John W. Hole, Jr., and Karen A. Koos is designed specifically to accompany *Human Anatomy.*

Dissection Video demonstrates for students the procurement, maintenance, and utilization of cadavers, as well as prosection of abdominal and thoracic cavities, and arm and leg extremities. The video was prepared by Terry Martin and Hassan Rastegar of Kishwaukee College.

Extended Lecture Outline Software consists of detailed outlines of each chapter on disk. Instructors can add their own lecture notes for convenience in lecture preparation. Available for use with IBM, Apple, or Macintosh.

Also available from WCB . . .

- Study Cards for Human Anatomy and Physiology by Van De Graaff/Rhees/Creek
- *The Coloring Review Guide to Human Anatomy* by McMurtrie/Rikel
- *Atlas of the Skeletal Muscles* by Robert and Judith Stone
- The WCB Anatomy and Physiology Video Series
- *Anatomy and Physiology of the Heart* videodisc
- *Computer Review of Human Anatomy and Physiology* software by Davis/Zimmerman/Van De Graaff
- *Knowledge Map of Human Anatomy Systems* software (Macintosh) by Craig Gundy of Weber State College
- *Slice of Life, Vol. V.* videodisc

TO THE READER

This textbook includes a variety of aids to the reader that should make your study of human anatomy more effective and enjoyable. These aids are included to help you master the basic concepts of human anatomy that are needed before progressing to more difficult material.

Unit Introductions

Each unit opens with a brief description of the general content of the unit and a list of chapters included within the unit (see page 1 for an example). This introduction provides an overview of the chapters that make up a unit and tells how the unit relates to the other aspects of human anatomy.

Chapter Introductions

Each chapter introduction previews the chapter's contents and relates that chapter to the others within the unit (see page 2).

After reading an introduction, browse through the chapter, paying particular attention to topic headings and illustrations so that you get a feeling for the kinds of ideas included within the chapter.

Chapter Outlines

The chapter outline includes all the major topic headings and subheadings within the body of the chapter (see page 3). It provides an overview of the chapter's contents and helps you locate sections dealing with particular topics.

Chapter Objectives

Before you begin to study a chapter, carefully read the chapter objectives (see page 3). These indicate what you should be able to do after mastering the information within the narrative. The review activities at the end of each chapter (see page 18) are phrased like detailed objectives, and it is helpful to read them before beginning your study. Both sets of objectives are guides that indicate important sections of the narrative.

Aids to Understanding Words

The aids to understanding words section at the beginning of each chapter also helps build your vocabulary. This section includes a list of word roots, stems, prefixes, and suffixes that help you discover word meanings. Each root and an example word using that root are defined (see page 3). Knowing the roots from these lists will help you discover and remember scientific word meanings. A complete list of word roots can be found inside the front and back covers of the book.

Review Questions within the Narrative

Review questions occur at the ends of major sections within each chapter (see page 5). When you reach such questions, try to answer them. If you succeed, then you probably understand the previous discussion and are ready to proceed. If you have difficulty answering the questions, reread that section before proceeding.

Illustrations and Charts

Numerous illustrations and charts occur in each chapter and are placed near their related textual discussion. They are designed to help you visualize structures and processes, clarify complex ideas, and summarize sections of the narrative.

As mentioned earlier, it is a good idea to skim through the chapter before beginning to read it, paying particular attention to these figures. Then, as you read for detail, carefully study each figure to gain a better understanding of the material presented.

Sometimes the figure legends contain questions that will help you apply your knowledge to the object or process the figure illustrates. The ability to apply information to new situations is of prime importance. These questions will provide practice in this skill.

There are also sets of special reference figures that you may want to refer to from time to time. The first set (see pages 19–26) is designed to illustrate the structure and location of the major internal organs of the body. Other sets (see pages 179–187) will help you locate major features of the skull, human muscles, the body surface, the brain, and stages in the development of certain organs.

Boxed Information

Shaded boxes occur throughout each chapter (see page 7). These boxed asides often contain information that will help you apply the ideas presented in the narrative to clinical situations. Some boxes contain information about changes that occur in the body's structure (and its function) as a person passes through the various phases of the human life cycle. These will help you understand how certain body conditions change as a person grows older.

Clinical Applications and Normal Variations

Other, longer asides are entitled "Clinical Applications" and "Normal Variations." These discuss pathological disorders and pertinent information of more general interest.

Clinical Terms

At the ends of certain chapters are lists of related terms and phonetic pronunciations sometimes used in clinical situations (see page 175). Although these lists and

the word definitions are often brief, they will be a useful addition to your understanding of medical terminology.

Chapter Summaries

A summary in outline form at the end of each chapter will help you review the major ideas presented in the narrative (see page 17). Scan this section a few days after you have read the chapter. If you find portions that seem unfamiliar, reread the related sections of the narrative.

Clinical Application of Knowledge

End-of-chapter questions dealing with clinical situations (see page 18) will help you gain experience in the critical thinking skills necessary to apply information presented in the text. You may find it useful to discuss your answers with other students or with an instructor. Answers to these questions are located in Appendix B.

Review Activities

The review activities at the end of each chapter (see page 18) will check your understanding of the major ideas presented in the narrative. After studying the chapter, read the review activities; if you can perform the tasks suggested, you have accomplished the goals of the chapter. If not, reread the sections of the narrative that need clarification.

Appendixes, Glossary, and Index

The Appendixes following chapter 18 contain: A, lists of various units of measurement and their equivalents, together with a description of how to convert one unit into another (see page 629); B, answers to Clinical Application of Knowledge questions (see page 630); C, suggestions for additional reading to help you locate library materials that can extend your understanding of topics discussed within the chapters (see page 634). If a particular idea interests you, check the list of readings for items related to it.

The Glossary defines the more important textual terms and provides their phonetic pronunciations. It also contains an explanation of phonetic pronunciation on page 636.

The Index is complete and comprehensive.

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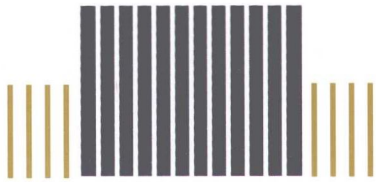


BRIEF CONTENTS

Expanded Contents vii
Reference Plates xiv
Preface xv
To the Reader xvii
Acknowledgments xix

UNIT 1

Levels of Organization 1

1 An Introduction to Human Anatomy 2
2 Body Organization and Terminology 27
3 The Cell 47
4 Tissues 73
5 Membranes and the Integumentary System 102

UNIT 2

Support and Movement 119

6 The Skeletal System 120
7 Joints of the Skeletal System 188
8 The Muscular System 213

UNIT 3

Integration and Coordination 263

9 The Nervous System 264
10 Somatic and Special Senses 331
11 The Endocrine System 367

UNIT 4

Processing and Transporting 383

12 The Digestive System 384
13 The Respiratory System 419
14 The Cardiovascular System 447
15 The Lymphatic System 498
16 The Urinary System 518

UNIT 5

The Human Life Cycle 539

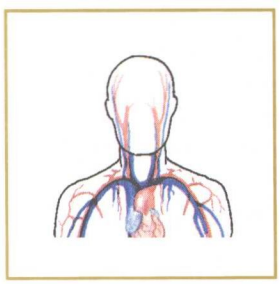
17 The Reproductive Systems 540
18 Human Growth and Development 570

Appendix A 629
Appendix B 630
Appendix C 634
Glossary 636
Credits 647
Index 651

CONTENTS

Reference Plates xiv
Preface xv
To the Reader xvii
Acknowledgments xix

UNIT 1



Levels of Organization 1

1
An Introduction to Human Anatomy 2

Chapter Outline 3
Chapter Objectives 3
Aids to Understanding Words 3
Introduction 4
Anatomy and Physiology 4
Types of Anatomy 7
- Gross Anatomy 7
- Microscopic Anatomy 8
- Developmental Anatomy 8

Methods of Anatomy 8
- Microscopy 8
- Radiography 11
- Tomography 11
- Ultrasonography 12
- Scintigraphy 12
- Magnetic Resonance Imaging 14

Normal Variation: Anatomical Characteristics 15
Language of Anatomy 15
- Origin of Terms 15
- Problems of Nomenclature 16

Chapter Summary 17
Clinical Application of Knowledge 18
Review Activities 18

REFERENCE PLATES 1–7: *The Human Organism* 19

2
Body Organization and Terminology 27

Chapter Outline 28
Chapter Objectives 28
Aids to Understanding Words 28
Introduction 29
Levels of Organization 29
Organization of the Human Body 30
- Body Cavities 30
- Thoracic and Abdominopelvic Membranes 32
- Organ Systems 35

Anatomical Terminology 38
- Relative Position 38
- Body Sections 39

Body Regions 40
Some Medical and Applied Sciences 44
Chapter Summary 45
Clinical Application of Knowledge 45
Review Activities 46

3
The Cell 47

Chapter Outline 48
Chapter Objectives 48
Aids to Understanding Words 48
Introduction 49
A Composite Cell 50
Cell Membrane 50
Cytoplasm 54
Cell Nucleus 60
Life Cycle of a Cell 62
Mitosis 62
Cytoplasmic Division 67
Interphase 67
Cell Differentiation 68
A Clinical Application: Cancer 70
Chapter Summary 71
Clinical Application of Knowledge 71
Review Activities 72

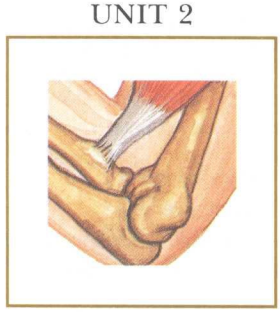
4
Tissues 73

Chapter Outline 74
Chapter Objectives 74
Aids to Understanding Words 74
Introduction 75
Epithelial Tissues 75
General Characteristics 75
Simple Squamous Epithelium 75
Simple Cuboidal Epithelium 75
Simple Columnar Epithelium 75
Pseudostratified Columnar Epithelium 76
Stratified Squamous Epithelium 77
Transitional Epithelium 78
Glandular Epithelium 79
Connective Tissues 81
General Characteristics 81
Major Cell Types 81
Connective Tissue Fibers 82
Loose Connective Tissue 83
Adipose Tissue 83
Fibrous Connective Tissue 84
Elastic Connective Tissue 84
Reticular Connective Tissue 85
Cartilage 85
Bone 86
Blood 87
A Clinical Application: Leukemia 92
Reticuloendothelial Tissue 93
Muscle Tissues 93
General Characteristics 93
Skeletal Muscle Tissue 93
Smooth Muscle Tissue 96
Cardiac Muscle Tissue 96
Nerve Tissue 97
Chapter Summary 99
Clinical Application of Knowledge 101
Review Activities 101

5
Membranes and the Integumentary System 102

Chapter Outline 103
Chapter Objectives 103
Aids to Understanding Words 103
Introduction 104
Types of Membranes 104
Skin and Its Tissues 104
Epidermis 104
Dermis 108
A Clinical Application: Skin Cancer 108
Subcutaneous Layer 109
Accessory Organs of the Skin 109
Hair Follicles 109
Sebaceous Glands 111
Nails 111
Sweat Glands 112
Normal Variation: Skin Color 113
A Clinical Application: Burns and Wound Healing 114
Common Skin Disorders 116
Chapter Summary 116
Clinical Application of Knowledge 117
Review Activities 117

UNIT 2



Support and Movement 119

6
The Skeletal System 120

Chapter Outline 121
Chapter Objectives 121
Aids to Understanding Words 121
Introduction 122
Bone Structure 122
Classification of Bones 122
Parts of a Long Bone 122
Microscopic Structure 123
Bone Development and Growth 124
Intramembranous Bones 125
Endochondral Bones 125
Growth of an Endochondral Bone 125
Bone Reorganization 127
A Clinical Application: Fractures 129
Functions of Bones 131
Support and Protection 131
Body Movements 131
Blood Cell Formation 132
A Clinical Application: Osteoporosis 133

Storage of Minerals 134
Organization of the Skeleton 134
Number of Bones 134
Divisions of the Skeleton 135
The Skull 139
Cranium 139
Facial Skeleton 144
Infantile Skull 149
Vertebral Column 150
A Typical Vertebra 152
Cervical Vertebrae 152
Thoracic Vertebrae 154
Lumbar Vertebrae 154
Sacrum 154
Coccyx 154
A Clinical Application: Some Disorders of the Vertebral Column 156
Thoracic Cage 157
Ribs 157
Sternum 158
Pectoral Girdle 159
Clavicles 160
Scapulae 160
Upper Limb 160
Humerus 160
Radius 163
Ulna 164
Hand 165
Pelvic Girdle 166
Coxal Bones 166
Greater and Lesser Pelves 168
Sexual Differences in Pelves 168
Lower Limb 170
Femur 170
Tibia 171
Fibula 172
Foot 172
Normal Variation: Appendicular Skeleton 175
Clinical Terms Related to the Skeletal System 175
Chapter Summary 175
Clinical Application of Knowledge 178
Review Activities 178

REFERENCE PLATES 8–20: *Human Skull* 179

7
Joints of the Skeletal System 188

Chapter Outline 189
Chapter Objectives 189
Aids to Understanding Words 189
Introduction 190
Classification of Joints 190
Fibrous Joints 190
Cartilaginous Joints 190
Synovial Joints 192
General Structure of a Synovial Joint 192
Types of Synovial Joints 194
Types of Joint Movements 196
Examples of Synovial Joints 200
Intervertebral Joints 200
The Shoulder Joint 200
The Elbow Joint 202
The Hip Joint 204
The Knee Joint 206
A Clinical Application: Disorders of Joints 209
Clinical Terms Related to Joints 210
Chapter Summary 210
Clinical Application of Knowledge 212
Review Activities 212

8
The Muscular System 213

Chapter Outline 214
Chapter Objectives 214
Aids to Understanding Words 214
Introduction 215
Structure of a Skeletal Muscle 215
Connective Tissue Coverings 215
The Neuromuscular Junction 217
Motor Units 218
Skeletal Muscle Actions 218
Origin and Insertion 218
A Clinical Application: Use and Disuse of Skeletal Muscles 219
Interaction of Skeletal Muscles 219
Major Skeletal Muscles 221
Muscles of Facial Expression 222
Muscles of Mastication and Swallowing 223
Muscles That Move the Head 225
Muscles That Move the Vertebral Column 227
Muscles That Move the Pectoral Girdle 228
Muscles That Move the Upper Arm 231
Muscles That Move the Forearm 233
Muscles That Move the Wrist, Hand, and Fingers 236
Muscles of the Abdominal Wall 239
Muscles of the Pelvic Outlet 241
Muscles That Move the Thigh 242
Muscles That Move the Lower Leg 246
Muscles That Move the Ankle, Foot, and Toes 249
Normal Variation: Muscles 253
Clinical Terms Related to the Muscular System 253
Chapter Summary 254
Clinical Application of Knowledge 254
Review Activities 255

REFERENCE PLATES 21–31: *Surface Anatomy* 257

UNIT 3

Integration and Coordination 263

9
The Nervous System 264

Chapter Outline 265
Chapter Objectives 265
Aids to Understanding Words 265
Introduction 266
General Functions of the Nervous System 266
Nerve Tissue 266
- Neuron Structure 266
- Neuroglial Cells 269

A Clinical Application: Regeneration of a Nerve Fiber 271
The Synapse 272
Organization of Neurons 272
- Neuronal Pools 272
- Convergence 273
- Divergence 273

Classification of Neurons and Nerves 275
- Classification of Neurons 275
- Types of Nerves 276

Nerve Pathways 276
- Reflex Arcs 276
- Reflex Behavior 277

The Meninges 278
The Spinal Cord 281
- Structure of the Spinal Cord 281
- Functions of the Spinal Cord 282

A Clinical Application: Spinal Cord Injuries 286
The Brain 286
- Structure of the Cerebrum 287
- Functions of the Cerebrum 288
- Basal Nuclei 291
- The Ventricles and Cerebrospinal Fluid 292

A Clinical Application: Cerebral Injuries 294
- The Brain Stem 294
- The Cerebellum 298

The Peripheral Nervous System 299
- Structure of Peripheral Nerves 299
- The Cranial Nerves 300
- The Spinal Nerves 307

A Clinical Application: Spinal Nerve Injuries 310
The Autonomic Nervous System 316
- General Characteristics 316
- Autonomic Nerve Pathways 316

Clinical Terms Related to the Nervous System 321
Chapter Summary 322
Clinical Application of Knowledge 324
Review Activities 324

REFERENCE PLATES 32–38: *Human Brain* 326

10
Somatic and Special Senses 331

Chapter Outline 332
Chapter Objectives 332
Aids to Understanding Words 332
Introduction 333
Types of Receptors 333
Somatic Sense Receptors 333
- Touch and Pressure Receptors 333
- Temperature Receptors 335
- Pain Receptors 335
- Pain Nerve Pathways 335
- Stretch Receptors 336

A Clinical Application: Visceral Pain 336
Special Sense Receptors 338
Olfactory Organs 338
- Olfactory Organs and Receptors 338
- Olfactory Nerve Pathways 340

Gustatory Organs 340
- Taste Receptors 341
- Taste Nerve Pathways 342

Auditory Organs 342
- External Ear 342
- Middle Ear 343
- Auditory Tube 344
- Inner Ear 345
- Auditory Nerve Pathways 347

A Clinical Application: Deafness 349
Organs of Equilibrium 349
- Vestibule 349
- Semicircular Canals 350

Visual Organs 352
- Visual Accessory Organs 352
- Structure of the Eye 355
- Visual Receptors 361
- Visual Nerve Pathways 363

A Clinical Application: Disorders of the Eyes 363
Clinical Terms Related to the Senses 364
Chapter Summary 365
Clinical Application of Knowledge 366
Review Activities 366

11
The Endocrine System 367

Chapter Outline 368
Chapter Objectives 368
Aids to Understanding Words 368
Introduction 369
General Characteristics of the Endocrine System 369
The Pituitary Gland 369
- Anterior Lobe 371