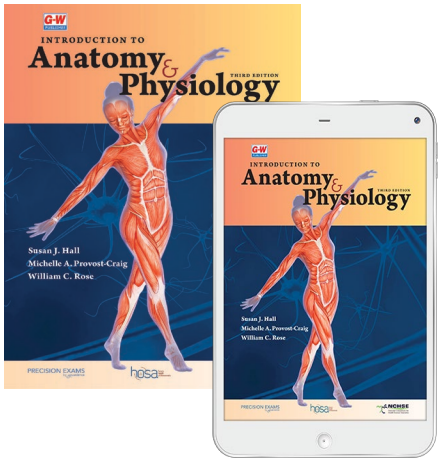
Introduction to Anatomy and Physiology, 3rd Edition



By: Susan J. Hall, Michelle A. Provost-Craig, and William C. Rose

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Subject: Anatomy and Physiology

Grade Level: 9-12

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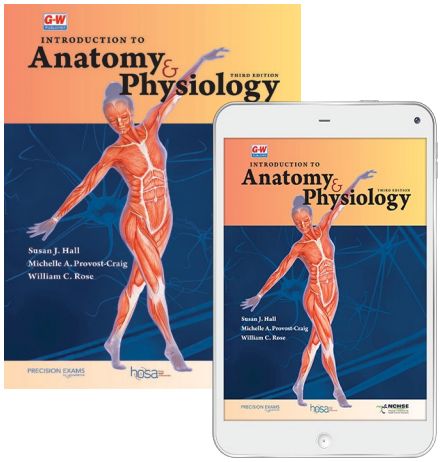
Introduction to Anatomy and Physiology



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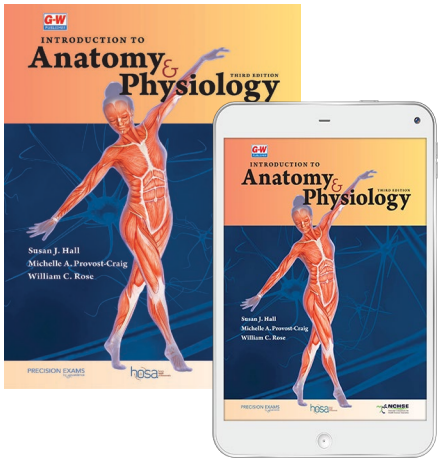
Introduction to Anatomy & Physiology covers all body systems using a student-friendly writing style that makes complex subjects easier to understand. Written specifically for the high school market, the chapters in this textbook are divided into lessons, providing content in a manageable format for the student. Each lesson is further divided into subtopics, with questions at the end of each subtopic to help students gauge their understanding of the material. Clinical case studies and real-world applications enhance student interest and involvement. An outstanding illustration program includes anatomically exact drawings with great use of color, simplified labeling, and teaching captions. Strong pedagogy includes study aids, such as learning objectives, lesson summaries, and extensive assessment opportunities increase students' ability to succeed in this challenging course. This edition has been updated to include content on the impact of COVID-19, artificial tissues, muscle disorders, the sense of touch, and Rh factor to the universal donor and universal recipient definitions.

- The text is written specifically for high school students, including the content needed for a science or health science program. Easy-to-read tables about diseases, disorders, and trauma provide important information in a short amount of time in a format that is easy to study.
- New HOSA–Future Health Professionals activities encourage student and instructor involvement in HOSA and help prepare students for competitive events.
- This title is correlated to the industry-recognized credentials offered by YouScience® Industry Certifications and NCHSE National Health Science Standards for Human Structure, Function and Disease A and B exams.

Introduction to Anatomy and Physiology



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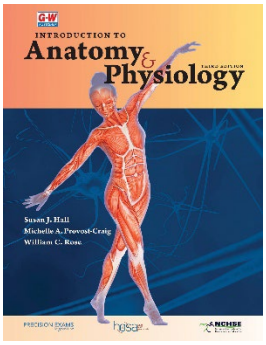

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Unit	*Title*	*MS State Standards*	*Correlation (Textbook References)*
1	Introduction, Safety, & Careers (6 hrs)	MS Standard: 1.1, 1.2, 1.3	Career exploration, safety procedures (pp. 5–22)
2	Body Organization & Terminology (10 hrs)	MS Standard: 2.1, 2.2	Anatomical terminology, planes, cavities (pp. 23–45)
3	Cells & Tissues (14 hrs)	MS Standard: 3.1, 3.2	Cell structures, tissues, mitosis (pp. 50–75)
4	Integumentary System (12 hrs)	MS Standard: 4.1, 4.2	Skin layers, functions, disorders (pp. 80–95)
5	Skeletal System (18 hrs)	MS Standard: 5.1, 5.2, 5.3	Bones, joints, skeletal diseases (pp. 100–130)
6	Muscular System (20 hrs)	MS Standard: 6.1, 6.2	Muscle anatomy, contraction, disorders (pp. 135–160)
7	Nervous System (18 hrs)	MS Standard: 7.1, 7.2, 7.3	Neurons, CNS, PNS, senses (pp. 165–200)
8	Endocrine System (14 hrs)	MS Standard: 8.1, 8.2	Hormones, glands, feedback loops (pp. 205–220)
9	Cardiovascular System (16 hrs)	MS Standard: 9.1, 9.2	Heart, blood vessels, circulation (pp. 225–250)
10	Lymphatic & Immune System (12 hrs)	MS Standard: 10.1, 10.2	Lymph nodes, immunity, defense (pp. 255–275)
11	Respiratory System (12 hrs)	MS Standard: 11.1, 11.2	Respiratory anatomy, breathing, disorders (pp. 280–300)
12	Digestive System (14 hrs)	MS Standard: 12.1, 12.2	Digestion, nutrition, absorption (pp. 305–330)
13	Urinary System (10 hrs)	MS Standard: 13.1, 13.2	Kidneys, nephron, urine formation (pp. 335–350)
14	Reproductive System (12 hrs)	MS Standard: 14.1, 14.2	Reproductive anatomy, reproduction (pp. 355–375)

TECHNOLOGY SUPPORT

THIN COMMON CARTRIDGE 1.3

G-W is a proud member of IMS Global and supports the use of open standards such as Common Cartridge, LTI, OneRoster, and others. We require compliance with IMS Global standards.

- We provide implementation and support for OneRoster version 1.0. We currently conform to OneRoster IMS Global standards. Versions Supported: 1.0
- We currently conform to LTI IMS Global standards. Versions Supported: 1.3
- Our Common Cartridges can be imported into any IMS Global and LTI-compliant LMS. Our Common Cartridges are known to work with Moodle, Blackboard, Brightspace by D2L, Schoology and Canvas. Versions Supported: 1.1.
- G-W only provides QTI files for customer use in their own QTI-compliant systems, such as Canvas or another Learning Management System..

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G-W Online	Learning Management System (LMS) Integration	Single Sign-On (SSO)
Students use a shared username and password, established for a specific number of concurrent users, to access G-W Online.	G-W provides the LMS administrator a cartridge, key, and shared secret to our content. Students gain access to G-W's content by clicking a link. The school's LMS platform handles rostering.	G-W provides a link to our content for the school's secure platform/portal (not public). The result is a single sign-on experience to G-W's content using LTI as a SSO mechanism. If rostering or provision is necessary, we support OneRoster uploads via SFTP.

Teachers receive an individual instructor login access to student materials and instructor resources including editable lesson plans, assessments with customizable test banks, and teaching strategies.

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All G-W online textbooks are designed with accessibility in mind. Navigation elements and menu items include keyboard shortcuts, and both text and non-text features (such as buttons and icons) can be resized as needed. Videos and animations include captioning, and the platform is fully compatible with screen readers, third-party plugins, and browser extensions.

G-W complies with ADA and NIMAC requirements for K–12 textbooks and partners with Bookshare to provide additional accessibility options. As a Benetech Global Certified Accessible publisher, G-W ensures its programs meet recognized standards and guidelines for accessibility.

In addition, every text emphasizes real-world applications and is supported by photos, diagrams, technical drawings, and other features that reinforce and expand upon the written content.

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- Maintain administrative, technical and physical safeguards to services
- Maintain data security and privacy policies internally, as well as with our Subcontractors, including appropriate training.
- Have processes to comply with data breach detection, investigation, and appropriate notification
- Have processes to comply with data destruction upon termination of services
- Encrypt data in transit and at rest
- We have drafted our own internal processes in alignment with the NIST cybersecurity framework, and we attest to best practices compliance for our cybersecurity insurance renewals.

BROWSER AND OS SUPPORT

- Access: An Internet connection is required.
- Supported Browsers: Current browsers work best (Google Chrome™ browser recommended; free download). Cookies and JavaScript must be enabled for full site functionality.
- Optimal Screen Width: 1024px
- Mobile:
    - Apple: iOS® 11 or later.
    - Android: 9 or later. Google Chrome™ browser recommended (free download via the Google Play store).
- Additional Requirements: Files are provided in various formats, including but not limited to PDF, DOCX, PPSX, and PPTX. These types of files will require compatible programs.

Introduction to Anatomy and Physiology

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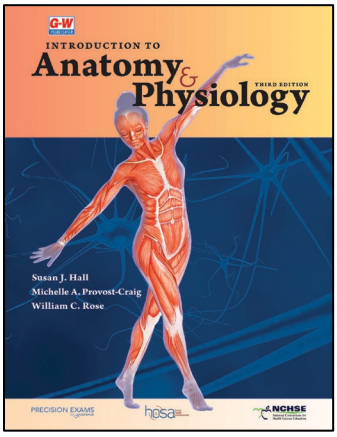	• Student Edition • Teacher Edition • Student Resources, including Reading Guides, Case Studies, Workbook, Vocabulary Activities, E-Flash Cards, and audio and video resources. • Instructor Resources, including Instructor Guides, Course Planning, Correlations, Skills Rubrics and Templates, Assessments, Alternative Activities, and Parent Resources.	ap2026ms	msreview2026

Minimum System Requirements	
Access:	An internet connection is required. Broadband cable, high-speed DSL, fiber optic, or other equivalent recommended.
Supported Browsers:	Safari®, Firefox®, Internet Explorer®, Chrome®, or Edge®. Please use the most up to date version available. Cookies, JavaScript, and popups must be enabled for full site functionality. Mobile browsers: Apple: iPad®, iOS® 4.3. Android: Desktop experience functions best in Firefox for Android
HTML5 Browser:	For activities, simulations, videos, and animations.
Screen Resolution:	Screen resolution of 1024 x 768 or higher is recommended for best experience.
Adobe Reader:	Adobe Reader® is needed to view PDF downloads
Technical support and system requirements are available at www.g-w.com/onlinetextbooks/faq	

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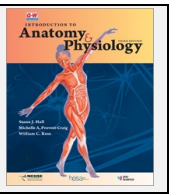
to Mississippi Department of Education
Course: HUMAN ANATOMY AND PHYSIOLOGY



Standards	Correlating Text Pages

HUMAN ANATOMY AND PHYSIOLOGY

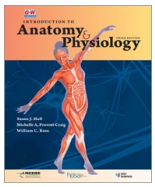
Human Anatomy and Physiology, a one-credit course, is a laboratory-based course that investigates the structures and functions of the human body. Core content emphasizes the structure and function of cells, tissues, and organs; organization of the human body and its biochemical composition; the skeletal, muscular, nervous, endocrine, digestive, respiratory, cardiovascular, integumentary, immune, urinary, and reproductive systems; and the impact of diseases on certain systems. Laboratory activities, research, the use of technology, and the effective communication of results through various methods are integral components of this course. It is recommended that Human Anatomy and Physiology be taken after successful completion of Biology.

The nature of science refers to the foundational concepts that govern the way scientists formulate explanations about the natural world to increase the depth of understanding based on evidence, logic, and innovation. These concepts are expected to appear throughout the course. As a laboratory-based course, students are expected to design and conduct investigations using appropriate equipment, measurement (SI units), and safety procedures. Students should also design data tables and draw conclusions using mathematical computations and/or graphical analysis. It is recommended that students should be actively engaged in inquiry activities, lab experiences, and scientific research (projects) for a minimum of 30% of the class time.

The standards and performance objectives do not have to be taught in the order presented in this document. The performance objectives are intentionally broad to allow school districts and teachers the flexibility to create a curriculum that meets the needs of their students.

Objectives identified by "Enrichment:" are considered enrichment material that may be expanded upon as time permits. Engineering standards are represented in some performance objectives with specific wording that will prompt students to approach learning and exploration using the engineering process. These performance objectives are marked with an * at the end of the statement

HAP.1 Physiological Functions/Anatomical Structure	
HAP.1 **Students will demonstrate an understanding of how anatomical structures and physiological functions are organized and described using anatomical position.**	
HAP.1.1 Apply appropriate anatomical terminology when explaining the orientation of regions, directions, and body planes or sections.	**Instruction:** 4 1.1 The Language of Anatomy and Physiology 4 1.1-1 Introducing Anatomy and Physiology 5 1.1-2 Describing the Human Body 5 Planes 7 Directions 7 Quadrants or Regions 7 Figure 1.3 Common Directional Terms for Anatomy 7 Figure 1.4 Regions of the Body 8 Cavities 8 Figure 1.5 Abdominal Quadrants and Regions 9 Figure 1.6 The Body Cavities 40-41 Chapter 1 Review **Application:** 9 Check Your Understanding 11 Lesson 1.1 Review and Assessment 41-45 Chapter 1 Assessment
HAP.1.2 Locate organs and their applicable body cavities and systems.	**Instruction:** 12 Lesson 1.2 Basic Physiological Processes 12 1.2-1 Structural and Functional Organization of the Body



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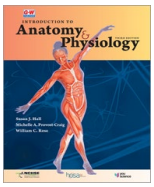
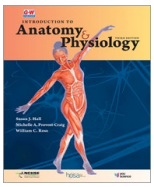


	547 Small Intestine 547 Figure 13.17 Small Intestine 548 Figure 13.18 Wall of the Small Intestine 549 Liver and Gallbladder 550 Figure 13.19 Liver, Gallbladder, Pancreas, Duodenum 551 Figure 13.20 Liver Lobule 552 Pancreas 553 Large Intestine 554 Figure 13.21 Large Intestine 554 Rectum, Anal Canal, and Anus 568 Chapter 13 Review 574 Lesson 14.1 The Kidney 574 14.1-1 Anatomy of the Kidney 575 Figure 14.1 Urinary System Anatomy 576 Figure 14.2 Fontal Section Through Kidney 577 Figure 14.3 Structure of a Nephron 606 Chapter 14 Review 618 15.2 Male Reproductive System 618 15.2-1 Male Reproductive Anatomy 618 Scrotum and Testes 618 Penis 619 Figure 15.4 Male Reproductive Organs 619 Ducts of the Male Reproductive System 620 Figure 15.5 Testis and Epididymis 620 Accessory Glands and Semen 623 Lesson 15.3 Female Reproductive System 623 15.3-1 Female Reproductive Anatomy 623 The Ovaries 623 Ducts of the Female Reproductive System 624 Figure 15.7 Female Reproductive Organs 625 Figure 15.9 Female Reproductive Organs, Midsagittal Section 626 The External Genitalia 626 Figure 15.9 Female External Genitalia 627 The Mammary Glands 627 Figure 15.10 Lactating Mammary Gland 654-655 Chapter 15 Review **Application:** 41-45 Chapter 1 Assessment 325 Check Your Understanding 329 Check Your Understanding 331 Check Your Understanding 333 Check Your Understanding 336 Check Your Understanding 336-337 Lesson 8.2 Review and Assessment 351-355 Chapter 8 Assessment 364 Check Your Understanding 365 Lesson 9.1 Review and Assessment 389-393 Chapter 9 Assessment 435 Check Your Understanding 439-440 Lesson 11.1 Review and Assessment 478-481 Chapter 11 Assessment 492 Check Your Understanding



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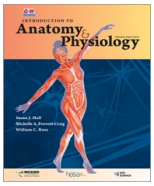
HAP.1.3 Investigate the interdependence of the various body systems to each other and to the body as a whole.	**Instruction:** 12 Lesson 1.2 Basic Physiological Processes 12 1.2-1 Structural and Functional Organization of the Body 13 Figure 1.8 Organ Systems 15 Figure 1.9 The Human Organ Systems 15 1.2-2 Homeostasis 16 Figure 1.10 Sweating 16 Figure 1.11 Shivering 18 Check Your Understanding 18 1.2-3 Metabolism 40-41 Chapter 1 Review **Application:** 15 Check Your Understanding 19 Lesson 1.2 Review and Assessment 41-45 Chapter 1 Assessment
HAP.2 Cells and Tissues	
HAP.2 **Students will demonstrate an understanding of the relationship of cells and tissues that form complex structures of the body.**	
HAP.2.1 Analyze the characteristics of the four main tissue types: epithelial, connective, muscle, and nervous. Examine tissues using microscopes and other various technologies.	**Instruction:** 46 Chapter 2 Cells and Tissues 48 Learning Outcomes and Key Terms 76 2.3-1 Epithelial Tissue 76 Epithelial: Inside and Outside 76 Lumen 77 Figure 2.22 Diagram Represents the Body's Relationship to the Outside World 77 Epithelia: Cell Layers and Shapes 77 Simple Epithelia & Stratified Epithelia 77 Figure 2.23 Types of Epithelia 77 Basement Membrane – Extracellular Matrix 77 Simple Epithelia 77 Simple Squamous Epithelia 78 Figure 2.24 Simple Columnar Epithelium 78 Stratified Epithelia 78 Stratified Squamous Epithelia 78 Figure 2.25 Light Micrograph of Stratified Squamous Epithelium 78 Other Epithelia 78 Transitional Epithelia



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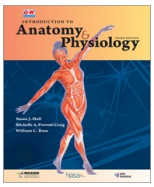
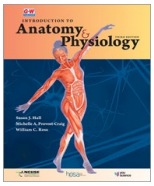


	89-95 Chapter 2 Assessment
HAP.2.1 Analyze the characteristics of the four main tissue types: epithelial, connective, muscle, and nervous. Examine tissues using microscopes and other various technologies.	**Instruction:** 46 Chapter 2 Cells and Tissues 48 Learning Outcomes and Key Terms 76 2.3-1 Epithelial Tissue 76 Epithelial: Inside and Outside 76 Lumen 77 Figure 2.22 Diagram Represents the Body's Relationship to the Outside World 77 Epithelia: Cell Layers and Shapes 77 Simple Epithelia & Stratified Epithelia 77 Figure 2.23 Types of Epithelia 77 Basement Membrane – Extracellular Matrix 77 Simple Epithelia 77 Simple Squamous Epithelia 78 Figure 2.24 Simple Columnar Epithelium 78 Stratified Epithelia 78 Stratified Squamous Epithelia 78 Figure 2.25 Light Micrograph of Stratified Squamous Epithelium 78 Other Epithelia 78 Transitional Epithelia 78 Glands 78 Exocrine Gland and Endocrine Gland 78 Simple and Compound 79 Figure 2.26 Different Structure of Multicellular Exocrine Glands 79 2.3-2 Connective Tissue 80 Figure 2.27 Major Classes of Connective Tissue 80 Collagen Fiber – Tensile Strength 80 Reticular Fibers 80 Elastic Fibers 80 What Research Tells Us…about Artificial Tissues, Organs, and Wearables 81 Tension, Compression and Elasticity 81 Compressive Strength 81 Connective Tissue Proper 81 Types of Loose Connective Tissue 81 Areolar Connective Tissue 82 Figure 2.28 Areolar Connective Tissue 82 Reticular Connective Tissue 82 Adipose Tissue 82 Figure 2.29 Light Micrograph of Adipose Connective Tissue 82 Types of Dense Connective Tissue 82 Figure 2.30 Regular Dense Connective Tissue 82 Cartilage 83 Chondroblasts 83 Figure 2.31 Irregular Dense Connective Tissue 83 Figure 2.32 Light Micrograph Dense Elastic Connective Tissue 83 Hyaline Cartilage 83 Figure 2.33 Light Micrograph Hyaline Cartilage



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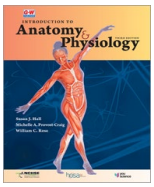
HAP.2.2 Construct a model to demonstrate how the structural organization of cells in a tissue relates to the specialized function of that tissue.	**Instruction:** 46 Chapter 2 Cells and Tissues 48 Learning Outcomes and Key Terms 76 2.3-1 Epithelial Tissue 76 Epithelial: Inside and Outside 76 Lumen 77 Figure 2.22 Diagram Represents the Body's Relationship to the Outside World 77 Epithelia: Cell Layers and Shapes 77 Simple Epithelia & Stratified Epithelia 77 Figure 2.23 Types of Epithelia 77 Basement Membrane – Extracellular Matrix 77 Simple Epithelia 77 Simple Squamous Epithelia 78 Figure 2.24 Simple Columnar Epithelium 78 Stratified Epithelia 78 Stratified Squamous Epithelia 78 Figure 2.25 Light Micrograph of Stratified Squamous Epithelium 78 Other Epithelia 78 Transitional Epithelia 78 Glands 78 Exocrine Gland and Endocrine Gland 78 Simple and Compound 79 Figure 2.26 Different Structure of Multicellular Exocrine Glands 79 2.3-2 Connective Tissue 80 Figure 2.27 Major Classes of Connective Tissue 80 Collagen Fiber – Tensile Strength 80 Reticular Fibers 80 Elastic Fibers 80 What Research Tells Us…about Artificial Tissues, Organs, and Wearables



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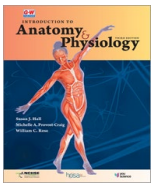

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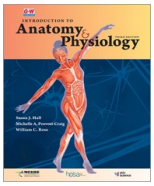

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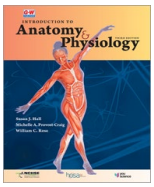

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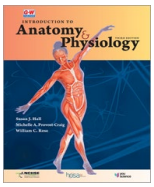

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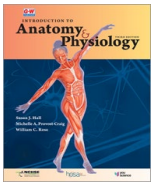

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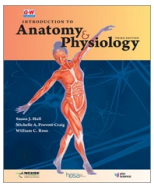

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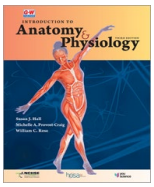

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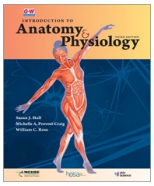

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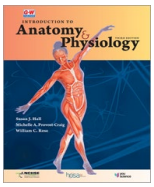

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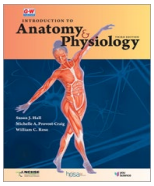

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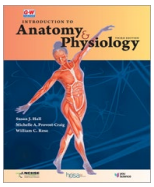

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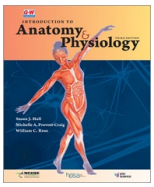

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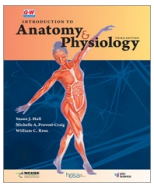
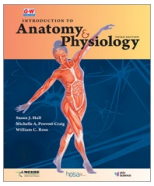
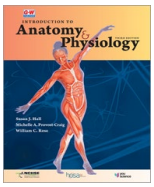
HAP.5.7 Research and analyze the causes and effects of various pathological conditions, (e.g., fibromyalgia, muscular dystrophy, cerebral palsy, muscle cramps/strains, and tendonitis).	**Instruction:** 212 Lesson 5.4 Common Muscle Injuries and Disorders 212 5.4-1 Common Muscle Injuries 212 Clinical Case Study 213 Figure 5.25 Common Muscle Injuries 214 Figure 5.27 Whiplash Injury 214 5.4-2 Overuse Injuries 215 Figure 5.28 Common Muscle Overuse Injuries 216 What Research Tells Us…about Low Back Pain (LBP) 217 5.4-3 Muscle Disorders 218 Figure 5.32 Common Muscle Disorders 224-225 Chapter 5 Review **Application:** 214 Check Your Understanding 217 Check Your Understanding 220 Check Your Understanding 220 Lesson 5.4 Review and Assessment 225-229 Chapter 5 Assessment
HAP.5.8 Enrichment: Use an engineering design process to develop effective ergonomic devices to prevent muscle fatigue and strain (e.g., carpal tunnel, exoskeletons for paralysis, or training plans to prevent strains/sprains/cramps).*	**Instruction:** 188 5.1-2 Muscle Functions 189 Figure 5.3 Muscle Categories 190 Figure 5.4 Three Types of Muscle Contractions 196 5.2-3 Muscle Strength, Power, and Endurance 212 Lesson 5.4 Common Muscle Injuries and Disorders 212 5.4-1 Common Muscle Injuries 212 Clinical Case Study 213 Figure 5.25 Common Muscle Injuries 214 Figure 5.27 Whiplash Injury 214 5.4-2 Overuse Injuries 215 Figure 5.28 Common Muscle Overuse Injuries 216 What Research Tells Us…about Low Back Pain (LBP) 217 5.4-3 Muscle Disorders 218 Figure 5.32 Common Muscle Disorders 224-225 Chapter 5 Review **Application:** 190 Check Your Understanding 191 Lesson 5.1 Review and Assessment 191 In the Lab 199 Check Your Understanding 200 Lesson 5.2 Review and Assessment 220 Lesson 5.4 Review and Assessment 225 Chapter 5 Assessment
HAP.6 Nervous System	
HAP. 6 Students will investigate the structures and functions of the nervous system, including the cause and effect of diseases and disorders.	
HAP.6.1 Describe and evaluate how the nervous system functions and interconnects with all other body systems.	**Instruction:** 230 Chapter 6 The Nervous System 232 Lesson 6.1 Overview of the Nervous System 232 6.1-1 Organization of the Nervous System



	233 Figure 6.1 Organization of the Nervous System 234 6.1-2 Nervous Tissues 234 Figure 6.2 A Typical Neuron 235 Figure 6.3 Neuron Structures 236 Figure 6.4 Glial Cells 238 Lesson 6.2 Transmission of Nerve Impulses 238 6.2-1 Action Potentials 239 Figure 6.5 Propagation of an Impulse 239 6.2-2 Impulse Transmission 240 Figure 6.7 Synapse 241 Figure 6.8 Neurotransmitter Mechanisms 242 What Research Tells Us…about Measuring Nerve Impulses 245 Lesson 6.3 Functional Anatomy of the Central Nervous System 245 6.3-1 The Brain 246 Figure 6.11 The Hemispheres and Lobes of the Cerebrum 247 Figure 6.12 Motor and Somatic Sensory Cortexes 248 Figure 6.13 Diencephalon 249 Figure 6.14 Functions of the Brain 249 Figure 6.15 Three Meninges 250 What Research Tells Us…about Studying the Brain 251 6.3-2 The Spinal Cord 251 Figure 6.17 Layers and Regions of the Spinal Cord 253 Lesson 6.4 Functional Anatomy of the Peripheral Nervous System 253 6.4-1 Nerve Structure 253 Figure 6.18 Structure of a Nerve 254 Figure 6.19 The Cranial Nerves 255 Figure 6.20 Functions of the Cranial Nerves 255 Figure 6.21 Spinal Nerves 256 Figure 6.22 Spinal Nerve Plexuses 257 Figure 6.23 Major Nerves Emanate from the Brachial, Lumbar, and Sacral Plexuses 258 Figure 6.24 Mechanoreceptors in the Skin 258 6.4-2 Autonomic Nervous System 259 Life Span Development: The Nervous System 274-275 Chapter 6 Review **Application:** 234 Check Your Understanding 236 Check Your Understanding 237 Lesson 6.1 Review and Assessment 239 Check Your Understanding 243 Check Your Understanding 244 Lesson 6.2 Review and Assessment 251 Check Your Understanding 252 Lesson 6.3 Review and Assessment 258 Check Your Understanding 260 Check Your Understanding 260 Lesson 6.4 Review and Assessment 275-279 Chapter 6 Assessment



HAP.6.2 Analyze the structure and function of neurons and their supporting neuroglia cells (e.g. astrocytes, oligodendrocytes, Schwann cells, microglial).	**Instruction:** 234 6.1-2 Nervous Tissues 234 Figure 6.2 A Typical Neuron 235 Figure 6.3 Neuron Structures 235 Astrocytes 235 Oligodendrocytes 235 Schwann cells 235 Microglia 236 Figure 6.4 Glial Cells 274-275 Chapter 6 Review **Application:** 236 Check Your Understanding 237 Lesson 6.1 Review and Assessment 275-279 Chapter 6 Assessment
HAP.6.3 Discuss the structure and function of the brain and spinal cord.	**Instruction:** 245 6.3-1 The Brain 246 Figure 6.11 The Hemispheres and Lobes of the Cerebrum 247 Figure 6.12 Motor and Somatic Sensory Cortexes 248 Figure 6.13 Diencephalon 249 Figure 6.14 Functions of the Brain 249 Figure 6.15 Three Meninges 250 What Research Tells Us…about Studying the Brain 251 6.3-2 The Spinal Cord 251 Figure 6.17 Layers and Regions of the Spinal Cord 274-275 Chapter 6 Review **Application:** 251 Check Your Understanding 252 Lesson 6.3 Review and Assessment 275-279 Chapter 6 Assessment
HAP.6.4 Compare and contrast the structures and functions of the central and peripheral nervous systems. Investigate how the systems interact to maintain homeostasis (e.g., reflex responses, sensory responses).	**Instruction:** 239 6.2-2 Impulse Transmission 240 Figure 6.7 Synapse 241 Figure 6.8 Neurotransmitter Mechanisms 242 What Research Tells Us…about Measuring Nerve Impulses 243 Figure 6.10 Sensory Receptor Example 253 Lesson 6.4 Functional Anatomy of the Peripheral Nervous System 253 6.4-1 Nerve Structure 253 Figure 6.18 Structure of a Nerve 254 Figure 6.19 The Cranial Nerves 255 Figure 6.20 Functions of the Cranial Nerves 255 Figure 6.21 Spinal Nerves 256 Figure 6.22 Spinal Nerve Plexuses 257 Figure 6.23 Major Nerves Emanate from the Brachial, Lumbar, and Sacral Plexuses 258 Figure 6.24 Mechanoreceptors in the Skin 258 6.4-2 Autonomic Nervous System 259 Life Span Development: The Nervous System 274-275 Chapter 6 Review



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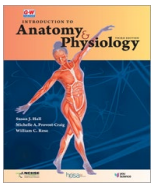
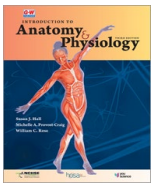
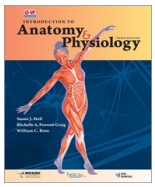
HAP.6.5 **Enrichment:** Plan and conduct an experiment to test reflex response rates under varying conditions. Using technology, construct graphs in order to analyze and interpret data to explain and communicate conclusions.	**Instruction:** 239 6.2-2 Impulse Transmission 240 Figure 6.7 Synapse 241 Figure 6.8 Neurotransmitter Mechanisms 242 What Research Tells Us…about Measuring Nerve Impulses 243 Figure 6.10 Sensory Receptor Example **Application:** 244 Lesson 6.2 Review and Assessment 244 In the Lab
HAP.6.6 Describe the major characteristics of the autonomic nervous system. Contrast the roles of the sympathetic and parasympathetic nervous systems in maintaining homeostasis.	**Instruction:** 258 6.4-2 Autonomic Nervous System 260 Sympathetic Nerves 260 Parasympathetic Nerves 259 Life Span Development: The Nervous System 274-275 Chapter 6 Review **Application:** 260 Check Your Understanding 260 Lesson 6.4 Review and Assessment 275-279 Chapter 6 Assessment
HAP.6.7 Describe the structure and function of the special senses (i.e., vision, hearing, taste, and olfaction).	**Instruction:** 281 Chapter 7 The Special Senses 282 Lesson 7.1 The Eye 283 Figure 7.1 Lubricating Structure of the Eye 283 Figure 7.2 Lateral View of Extrinsic Muscles of Eye 283 Figure 7.3 The Extrinsic Eye Muscles 284 Figure 7.4 Internal Structures of the Eye 285 Figure 7.5 Rods and Cones 285 7.1-2 Vision 286 Life Span Development: The Eyes and Vision 286 7.1-3 Injuries, Diseases, and Disorders of the Eye 287 Figure 7.6 Common Vision Disorders 287 Clinical Case Study 288 Figure 7.8 Common Vision Disorders Compared to Normal Vision 290 Figure 7.9 Common Eye Diseases and Disorders 293 Lesson 7.2 The Ear 293 7.2-1 Anatomy of the Ear 294 Figure 7.12 Anatomy of the Ear 295 Figure 7.13 Structures of the Inner Ear 295 7.2-2 Functions of the Ear 295 Life Span Development: The Ears and Hearing 296 Figure 7.14 Anatomy of the Cochlea



	297 7.2-3 Disorders and Functions of the Ear 297 Clinical Case Study 297 Figure 7.15 Disorders and Infections of the Ear 299 What Research Tells Us…about Tone-Deafness 302 Lesson 7.3 Smell and Taste 302 7.3-1 Olfaction 303 Figure 7.18 The Olfactory Region 303 Life Span Development: The Nose and Sense of Smell 304 Figure 7.19 Disorders and Infections of the Nose 305 What Research Tells Us…about Sense of Smell in Animals 306 7.3-2 Gustation 306 Figure 7.20 Anatomy of the Taste Bud 307 Life Span Development: The Tongue and Sense of Taste 307 Clinical Case Study 308 Figure 7.23 Disorders and Infections of the Tongue 312 Chapter 7 Review **Application:** 285 Check Your Understanding 286 Check Your Understanding 291 Check Your Understanding 291 Lesson 7.1 Review and Assessment 295 Check Your Understanding 297 Check Your Understanding 300 Check Your Understanding 300 Lesson 7.2 Review and Assessment 305 Check Your Understanding 309 Lesson 7.3 Review and Assessment 313-315 Chapter 7 Assessment
HAP.6.8 Research and analyze the causes and effects of various pathological conditions (e.g., addiction, depression, schizophrenia, Alzheimer's, sports-related chronic traumatic encephalopathy [CTE], dementia, chronic migraine, stroke, and epilepsy).	**Instruction:** 262 Lesson 6.5 Injuries and Disorders of the Nervous System 262 6.5-1 Injuries to the Brain and Spinal Cord 262 Clinical Case Study 263 Figure 6.27 Injuries to the Brain and Spinal Cord 263 Figure 6.28 Brain Scan of Traumatic Brain Injury 264 What Research Tells Us…about Concussions 266 6.5-2 Diseases and Disorders of the CNS 267 Figure 6.32 Diseases and Disorders of the CNS 268 Epilepsy 269 Dementia and Alsheimer's Disease 270 What Research Tells Us…about Peripheral Nerve Injury Repair 274 Chapter 6 Review 470 Figure 11.34 Other Cardiovascular Abnormalities 472 Cerebrovascular Accident (stroke) 472 Memory Tip **Application:** 266 Check Your Understanding 269 Check Your Understanding 270 Lesson 6.5 Review and Assessment



	275-279 Chapter 6 Assessment
HAP.6.9 **Enrichment:** Use an engineering design process to develop, model, and test preventative devices for neurological injuries and/or disorders (e.g., concussion-proof helmets or possible medications for addiction and depression).*	**Instruction:** 262 Lesson 6.5 Injuries and Disorders of the Nervous System 262 6.5-1 Injuries to the Brain and Spinal Cord 262 Clinical Case Study 264 What Research Tells Us…about Concussions 266 6.5-2 Diseases and Disorders of the CNS 267 Figure 6.32 Diseases and Disorders of the CNS 270 What Research Tells Us…about Peripheral Nerve Injury Repair **Application:** 270 Lesson 6.5 Review and Assessment 275-279 Chapter 6 Assessment 271 In the Lab
HAP.7 Endocrine System	
HAP.7 **Students will demonstrate an understanding of the major organs of the endocrine system and the associated hormonal production and regulation.**	
HAP.7.1 Obtain, evaluate, and communicate information to illustrate that the endocrine glands secrete hormones that help the body maintain homeostasis through feedback mechanisms.	**Instruction:** 316 Chapter 8 The Endocrine System 318 Lesson 8.1 Functions and Control of the Endocrine System 318 8.1-1 Anatomy of the Endocrine System 319 Figure 8.1 Glands and Organs of the Endocrine System 319 8.1-2 Hormones 320 8.1-3 Hormone Secretion Control 321 Figure 8.2 Hierarchy of the Endocrine System 322 Figure 8.3 Negative Feedback Loop 323 Figure 8.4 Hypothalamus 325 Lesson 8.2 Major Endocrine Organs 325 8.2-1 Hypothalamus 325 8.2-2 Pituitary Gland 326 Figure 8.5 Anterior Pituitary Hormones Act on Other Glands 327 Figure 8.6 Hormones Excreted by Anterior Pituitary Affect Many Parts of the Body 329 Figure 8.7 Posterior Pituitary Stores ADH and Oxytocin 329 8.2-3 Thyroid Gland 330 Figure 8.8 The Thyroid Gland 330 8.2-4 Parathyroid Glands 331 Figure 8.9 Thyroid and Parathyroid Glands Act Together 331 8.2-5 Adrenal Glands 332 Figure 8.10 Adrenal Glands Location 333 8.2-6 Pancreas 334 Figure 8.11 Insulin and Glucagon Maintain Blood Glucose Levels 334 8.2-7 Other Hormone-Producing Organs and Tissues 335 Life Span Development: The Endocrine System 350 Chapter 8 Review



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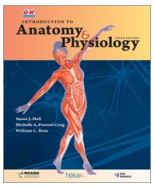
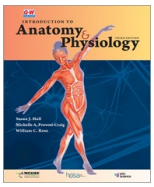
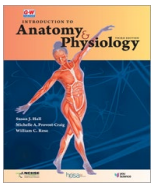
HAP.7.2 Discuss the function of each endocrine gland and the various hormones secreted**.**	**Instruction:** 318 Lesson 8.1 Functions and Control of the Endocrine System 318 8.1-1 Anatomy of the Endocrine System 318 Endocrine Glands 319 Figure 8.1 Glands and Organs of the Endocrine System 321 Figure 8.2 Hierarchy of the Endocrine System 322 Figure 8.3 Negative Feedback Loop 323 Figure 8.4 Hypothalamus 325 Lesson 8.2 Major Endocrine Organs 325 8.2-1 Hypothalamus 325 8.2-2 Pituitary Gland 326 Figure 8.5 Anterior Pituitary Hormones Act on Other Glands 326 Hormones of the Anterior Pituitary 327 Figure 8.6 Hormones Excreted by Anterior Pituitary Affect Many Parts of the Body 328 Hormones of the Posterior Pituitary 329 Figure 8.7 Posterior Pituitary Stores ADH and Oxytocin 329 8.2-3 Thyroid Gland 329 T_3 and T_4 330 Calcitonin 330 Figure 8.8 The Thyroid Gland 330 8.2-4 Parathyroid Glands 331 Figure 8.9 Thyroid and Parathyroid Glands Act Together 331 8.2-5 Adrenal Glands 331 Hormones of the Adrenal Medulla 332 Figure 8.10 Adrenal Glands Location 332 Hormones of the Adrenal Cortex 333 8.2-6 Pancreas 334 Figure 8.11 Insulin and Glucagon Maintain Blood Glucose Levels 334 8.2-7 Other Hormone-Producing Organs and Tissues 334 Thymus 334 Pineal Gland 335 Life Span Development: The Endocrine System 335 Gonads



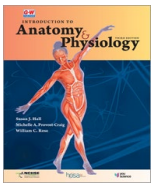
	335 Other Hormones 350 Chapter 8 Review **Application:** 319 Check Your Understanding 320 Check Your Understanding 324 Lesson 8.1 Review and Assessment 329 Check Your Understanding 330 Check Your Understanding 331 Check Your Understanding 333 Check Your Understanding 336 Check Your Understanding 336 Lesson 8.2 Review and Assessment 351-355 Chapter 8 Assessment
HAP.7.3 Model specific mechanisms through which the endocrine system maintains homeostasis (e.g., insulin/glucagon and glucose regulation; T3 / T4 and metabolic rates; calcitonin/parathyroid and calcium regulation; antidiuretic hormone and water balance; growth hormone; and cortisol and stress).	**Instruction:** 318 Lesson 8.1 Functions and Control of the Endocrine System 318 8.1-1 Anatomy of the Endocrine System 318 Endocrine Glands 319 Figure 8.1 Glands and Organs of the Endocrine System 320 8.1-3 Hormone Secretion Control 320 Neural Control 320 Hormonal Control 321 Figure 8.2 Hierarchy of the Endocrine System 321 Humoral Control 322 Figure 8.3 Negative Feedback Loop 322 Hormones and Homeostasis 322 Hypothalamic Control of Body Temperature 322 Example: The Endocrine System at Work 323 Figure 8.4 Hypothalamus 325 Lesson 8.2 Major Endocrine Organs 325 8.2-1 Hypothalamus 325 8.2-2 Pituitary Gland 326 Figure 8.5 Anterior Pituitary Hormones Act on Other Glands 326 Hormones of the Anterior Pituitary 327 Figure 8.6 Hormones Excreted by Anterior Pituitary Affect Many Parts of the Body 328 Hormones of the Posterior Pituitary 329 Figure 8.7 Posterior Pituitary Stores ADH and Oxytocin 329 8.2-3 Thyroid Gland 329 T_3 and T_4 330 Calcitonin 330 Figure 8.8 The Thyroid Gland 330 8.2-4 Parathyroid Glands 331 Figure 8.9 Thyroid and Parathyroid Glands Act Together 331 8.2-5 Adrenal Glands 331 Hormones of the Adrenal Medulla 332 Figure 8.10 Adrenal Glands Location 332 Hormones of the Adrenal Cortex



	333 8.2-6 Pancreas 334 Figure 8.11 Insulin and Glucagon Maintain Blood Glucose Levels 334 8.2-7 Other Hormone-Producing Organs and Tissues 334 Thymus 334 Pineal Gland 335 Life Span Development: The Endocrine System 335 Gonads 335 Other Hormones 350 Chapter 8 Review **Application:** 319 Check Your Understanding 320 Check Your Understanding 324 Lesson 8.1 Review and Assessment 329 Check Your Understanding 330 Check Your Understanding 331 Check Your Understanding 333 Check Your Understanding 336 Check Your Understanding 336 Lesson 8.2 Review and Assessment 351-355 Chapter 8 Assessment
HAP.7.4 Research and analyze the effects of various pathological conditions (e.g., diabetes mellitus, pituitary dwarfism, Graves' disease, Cushing's syndrome, hypothyroidism, and obesity).	**Instruction:** 338 Lesson 8.3 Endocrine Disorders and Diseases 338 8.3-1 Pituitary Disorders 338 Clinical Case Study 339 Figure 8.12 Common Pituitary Disorders 340 8.3-2 Thyroid Disorders 340 Figure 8.14 Thyroid Disorders 341 8.3-3 Parathyroid Disorders 342 Figure 8.16 Parathyroid Disorders 342 8.3-4 Disorders of the Adrenal Glands 343 Figure 8.17 Adrenal Gland Disorders 344 8.3-5 The Pancreas and Diabetes Mellitus 344 Figure 8.19 Diabetes Mellitus 346 What Research Tells Us…about Managing Diabetes with Diet and Exercise 350 Chapter 8 Review **Application:** 340 Check Your Understanding 341 Check Your Understanding 342 Check Your Understanding 344 Check Your Understanding 346 Check Your Understanding 347 Lesson 8.3 Review and Assessment 351-355 Chapter 8 Assessment
HAP.7.5 Enrichment: Use an engineering design process to develop effective treatments for endocrine disorders (e.g., methods to regulate hormonal imbalance).*	**Instruction:** 338 Lesson 8.3 Endocrine Disorders and Diseases 338 8.3-1 Pituitary Disorders 338 Clinical Case Study 339 Figure 8.12 Common Pituitary Disorders 340 8.3-2 Thyroid Disorders



	340 Figure 8.14 Thyroid Disorders 341 8.3-3 Parathyroid Disorders 342 Figure 8.16 Parathyroid Disorders 342 8.3-4 Disorders of the Adrenal Glands 343 Figure 8.17 Adrenal Gland Disorders 344 8.3-5 The Pancreas and Diabetes Mellitus 344 Figure 8.19 Diabetes Mellitus 346 What Research Tells Us…about Managing Diabetes with Diet and Exercise 350 Chapter 8 Review **Application:** 340 Check Your Understanding 341 Check Your Understanding 342 Check Your Understanding 344 Check Your Understanding 346 Check Your Understanding 347 Lesson 8.3 Review and Assessment 351-355 Chapter 8 Assessment
HAP.8 Male and Female Reproductive Systems	
HAP. 8 Students will investigate the structures and functions of the male and female reproductive system, including the cause and effect of diseases and disorders.	
HAP.8.1 Compare and contrast the structure and function of the male and female reproductive systems.	**Instruction:** 610 Chapter 15 The Male and Female Reproductive Systems 612 Lesson 15.1 Reproduction and Development of the Human Reproductive Systems 612 15.1-1 Types of Reproduction 613 15.1-2 Mitosis versus Meiosis 613 Figure 15.1 Comparison Mitosis and Meiosis 615 15.1-3 Development and Puberty 618 Lesson 15.2 Male Reproductive System 618 15.2-1 Male Reproductive Anatomy 619 Figure 15.4 Sagittal View of the Male Reproductive Organs 620 Figure 15.5 Testes and Epididymis 620 Figure 15.6 Sperm Cell 621 15.2-2 Male Reproductive Physiology 621 Life Span Development: Adule Male Reproductive System 623 Lesson 15.3 Female Reproductive System 623 15.3-1 Female Reproductive Anatomy 624 Figure 15.7 Female Reproductive Organs, Posterior View 625 Figure 15.8 Female Reproductive Organs, Midsagittal Section 626 Figure 15.9 Female External Genitalia 627 Figure 15.10 Lactating Mammary Gland 627 15.3-2 Female Reproductive Physiology 629 Figure 15.11 Hormonal and Structural Changes During Female Sexual Cycle 630 Figure 15.12 Changes in the Ovary During Ovarian Cycle



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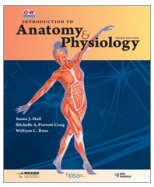
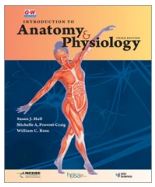
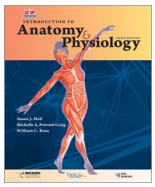
HAP.8.2 Describe the male reproductive anatomy and relate structure to sperm production and release.	**Instruction:** 618 Lesson 15.2 Male Reproductive System 618 15.2-1 Male Reproductive Anatomy 619 Figure 15.4 Sagittal View of the Male Reproductive Organs 620 Figure 15.5 Testes and Epididymis 620 Figure 15.6 Sperm Cell 621 15.2-2 Male Reproductive Physiology 621 Life Span Development: Adule Male Reproductive System 654 Chapter 15 Review **Application:** 621 Check Your Understanding 622 Lesson 15.2 Review and Assessment 655-658 Chapter 15 Assessment
HAP.8.3 Describe the female reproductive anatomy and relate structure to egg production and release.	**Instruction:** 623 Lesson 15.3 Female Reproductive System 623 15.3-1 Female Reproductive Anatomy 624 Figure 15.7 Female Reproductive Organs, Posterior View 625 Figure 15.8 Female Reproductive Organs, Midsagittal Section 626 Figure 15.9 Female External Genitalia 627 Figure 15.10 Lactating Mammary Gland 627 15.3-2 Female Reproductive Physiology 629 Figure 15.11 Hormonal and Structural Changes During Female Sexual Cycle 630 Figure 15.12 Changes in the Ovary During Ovarian Cycle 631 Life Span Development: Female Reproductive System 654 Chapter 15 Review **Application:** 627 Check Your Understanding 631 Check Your Understanding 632 Lesson 15.3 Review and Assessment 655-658 Chapter 15 Assessment



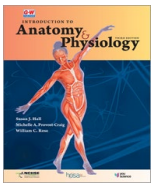
HAP.8.4 Construct explanations detailing the role of hormones in the regulation of sperm and egg development. Analyze the role of negative feedback in regulation of the female menstrual cycle and pregnancy.	**Instruction:** 618 15.2-1 Male Reproductive Anatomy 619 Figure 15.4 Sagittal View of the Male Reproductive Organs 619 Ducts of the Male Reproductive System 620 Accessory Glands and Semen 620 Figure 15.5 Testes and Epididymis 620 Figure 15.6 Sperm Cell 621 15.2-2 Male Reproductive Physiology 621 Sperm Formation 623 15.3-1 Female Reproductive Anatomy 624 Figure 15.7 Female Reproductive Organs, Posterior View 625 Figure 15.8 Female Reproductive Organs, Midsagittal Section 627 15.3-2 Female Reproductive Physiology 629 Figure 15.11 Hormonal and Structural Changes During Female Sexual Cycle 630 Figure 15.12 Changes in the Ovary During Ovarian Cycle 631 Life Span Development: Female Reproductive System 654 Chapter 15 Review **Application:** 621 Check your Understanding 622 Lesson 15.2 Review and Assessment 627 Check Your Understanding 631 Check Your Understanding 632 Lesson 15.3 Review and Assessment 655-658 Chapter 15 Assessment



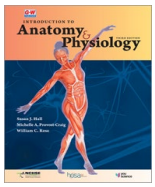
HAP.8.5 Evaluate and communicate information about various contraceptive methods to prevent fertilization and/or implantation.	**Instruction:** 621 15.2-2 Male Reproductive Physiology 627 15.3-2 Female Reproductive Physiology 629 Figure 15.11 Hormonal and Structural Changes During Female Sexual Cycle 630 Figure 15.12 Changes in the Ovary During Ovarian Cycle 633 Lesson 15.4 Fertilization, Pregnancy, and Brith 633 15.4-1 Fertilization of the Oocyte 634 Figure 15.13 Sperm Attempting to Penetrate an Oocyte 635 Figure 15.14 Ovulation to Fertilization to Implantation 634 15.4-2 Pregnancy 652 Career Corner: Obstetrician-Gynecologist 654 Chapter 15 Review **Application:** 621 Check Your Understanding 632 Lesson 15.3 Review and Assessment 634 Check Your Understanding 640 Lesson 15.4 Review and Assessment 655-658 Chapter 15 Assessment
HAP.8.6 Describe the changes that occur during embryonic/fetal development, birth, and the growth and development from infancy, childhood, and adolescence to adult.	**Instruction:** 85 Life Span Development: Cells and Tissues 105 Life Span Development: The Integumentary System 137 Life Span Development: Bones 208 Life Span Development: Muscle 259 Life Span Development: The Nervous System 286 Life Span Development: The Eyes and Vision 295 Life Span Development: The Ears and Hearing 303 Life Span Development: The Nose and Sense of Smell 307 Life Span Development: The Tongue and Sense of Taste 335 Life Span Development: The Endocrine System 372 Life Span Development: The Respiratory System 373 Figure 9.12 Lung Development in Utero 406 Life Span Development: The Blood 438 Life Span Development: The Cardiovascular System 491 Life Span Development: The Lymphatic and Immune Systems 555 Life Span Development: The Digestive System 591 Life Span Development: The Urinary System 621 Life Span Development: Adule Male Reproductive System 631 Life Span Development: Female Reproductive System 633 Lesson 15.4 Fertilization, Pregnancy, and Birth 633 15.4-1 Fertilization of the Oocyte 634 Pregnancy 635 Figure 15.14 Ovulation to Fertilization to Implantation 636 Figure 15.15 Hormone Levels During Pregnancy



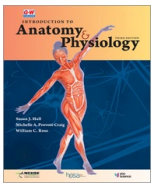
	637 Figure 15.16 13-Week-Old Fetus 638 15.4-3 Childbirth 639 Figure 15.17 Stages of Labor 639 15.4-4 Lactation 654 Chapter 15 Review **Application:** 634 Check Your Understanding 638 Check Your Understanding 639 Check Your Understanding 655-658 Chapter 15 Assessment
HAP.8.7 Research and analyze the causes and effects of various pathological conditions (e.g., infertility, ovarian cysts, endometriosis, sexually transmitted diseases, and ectopic pregnancy). Research current treatments for infertility.	**Instruction:** 642 Lesson 15.5 Disorders and Disease of the Reproductive Systems 642 15.5-1 Infertility 643 Figure 15.19 Diseases and Disorders of the Reproductive Systems 644 15.5-2 Sexually Transmitted Infections (STI) 645 What Research Tells Us…about Egg Freezing as a Solution for Infertility 647 15.5-3 Cancers of the Reproductive Systems 648 What Research Tells Us…about Stem Cells and Gene Therapy 649 What Research Tells Us…about Radioactivity in Healthcare 650 What Research Tells Us…about Genetic Research and Cancer Treatment Breakthroughs 654 Chapter 15 Review **Application:** 644 Check Your Understanding 647 Check Your Understanding 650 Check Your Understanding 651 Lesson 15.5 Review and Assessment 655-658 Chapter 15 Assessment
HAP.9 Blood	
HAP.9 Students will analyze the structure and functions of blood and its role in maintaining homeostasis.	
HAP.9.1 Describe the structure, function, and origin of the cellular components and plasma components of blood.	**Instruction:** 394 Chapter 10 The Blood 396 Lesson 10.1 The Functions and Composition of Blood 396 10.1-1 The Functions of Blood 396 10.1-2 Physical Properties of Blood 396 Figure 10.1 Functions of the Blood 397 10.1-3 Composition of Blood 397 Figure 10.2 Blood is Made Up of Liquid and Solid Components 398 Figure 10.3 Drawn Blood is Separated 399 Figure 10.4 Plasma Proteins 400 Figure 10.5 Oxygen Binds to Hemoglobin 401 Figure 10.6 Endocrine System Works with Blood to Release Erythropoietin 402 What Research Tells Us…about Bioengineering Red



	Blood Cells to Create an Unlimited Supply 403 Figure 10.8 White Blood Cells Engulf Antigens 404 Figure 10.9 Characteristics of White Blood Cells 405 Figure 10.10 Injured Vessel Walls Repaired During Hemostasis 406 Figure 10.11 Red and White Blood Cells 406 Life Span Development: The Blood 426 Chapter 10 Review **Application:** 396 Check Your Understanding 397 Check Your Understanding 406 Check Your Understanding 408 Lesson 10.1 Review and Assessment 427-429 Chapter 10 Assessment
HAP.9.2 Distinguish the cellular difference between the ABO blood groups and investigate blood type differences utilizing antibodies to determine compatible donors and recipients.	**Instruction:** 409 Lesson 10.2 Blood Types 409 10.2-1 ABO Blood Types 409 Figure 10.13 Inherited Blood Type 410 Figure 10.14 Blood Type Prevalence by Ethnicity 410 Figure 10.15 The ABO Blood Group System 411 10.2-2 The Rh Classification System 426 Chapter 10 Review **Application:** 411 Check Your Understanding 412 Lesson 10.2 Review and Assessment 427-429 Chapter 10 Assessment
HAP.9.3 Research and analyze the causes and effects of various pathological conditions (e.g., anemia, malaria, leukemia, hemophilia, and blood doping).	**Instruction:** 413 Lesson 10.3 Blood Disorders and Diseases 413 10.3-1 Complete Blood Count 413 Clinical Case Study 414 10.3-2 Anemia 414 Figure 10.17 Complete Blood Count Example Test Results 415 Figure 10.18 Acquired Anemias 417 Figure 10.20 Inherited Anemias 417 Figure 10.21 Sickle-Shaped Red Blood Cells 418 10.3-3 Other Diseases and Disorders of the Blood 418 Hemophilia 419 Figure 10.22 Other Blood Disorders 420 What Research Tells Us…about Extending the Life Expectancy of Patients with Sickle Cell Disease 421 Leukemia 421 Figure 10.24 Blood Sample from Person with Chronic Lymphocytic Leukemia 423 Lesson 10.3 Review and Assessment 426 Chapter 10 Review **Application:** 414 Check Your Understanding 418 Check Your Understanding 422 Check Your Understanding 427-429 Chapter 10 Assessment



HAP.9.4 Enrichment: Use an engineering design process to develop effective treatments for blood disorders (e.g., methods to regulate blood cell counts or blood doping tests).*	**Instruction:** 413 Lesson 10.3 Blood Disorders and Diseases 413 10.3-1 Complete Blood Count 413 Clinical Case Study 414 10.3-2 Anemia 414 Figure 10.17 Complete Blood Count Example Test Results 415 Figure 10.18 Acquired Anemias 417 Figure 10.20 Inherited Anemias 417 Figure 10.21 Sickle-Shaped Red Blood Cells 418 10.3-3 Other Diseases and Disorders of the Blood 418 Hemophilia 419 Figure 10.22 Other Blood Disorders 420 What Research Tells Us…about Extending the Life Expectancy of Patients with Sickle Cell Disease 421 Leukemia 421 Figure 10.24 Blood Sample from Person with Chronic Lymphocytic Leukemia 423 Lesson 10.3 Review and Assessment 426 Chapter 10 Review **Application:** 423 In the Lab 427-429 Chapter 10 Assessment
HAP.10 Cardiovascular System	
HAP.10 Students will investigate the structures and functions of the cardiovascular system, including the cause and effect of diseases and disorders.	
HAP.10.1 Design and use models to investigate the functions of the organs of the cardiovascular system.	**Instruction:** 430 Chapter 11 The Cardiovascular System 432 Lesson 11.1 Heart Anatomy and Physiology 432 11.1-1 Anatomy of the Heart 433 Figure 11.1 Position of the Heart 433 Figure 11.2 Anterior Superior View of the Heart Valves 434 Figure 11.3 Layers of the Walls of the Heart 435 11.1-2 Physiology of the Heart 435 Figure 11.4 Heart Chambers, Great Vessels, and Blood Flow Through the Heart 437 What Research Tells Us…about How the Hearts of Athletes Adapt to Exercise 438 Life Span Development: The Cardiovascular System 441 Lesson 11.2 Regulation of the Heart 441 11.2-1 Internal and External Control of the Heart 442 Figure 11.6 Location of the Cardiac Center in the Medulla of the Brain 442 Figure 11.7 Conduction System of the Heart 443 11.2-2 The Conduction System 444 11.8 Example of an ECG 444 Figure 11.9 Electrical and Mechanical Events on an ECG Tracing 444 What Research Tells Us…about Beta Receptors



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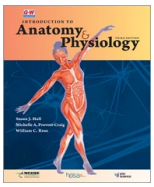
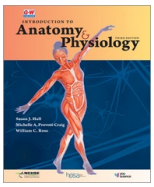
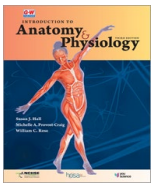
HAP.10.2 Describe the flow of blood through the pulmonary system and systemic circulation.	**Instruction:** 446 Lesson 11.3 Blood Vessels and Circulation 446 11.3-1 Blood Vessels: The Transport Network 447 Figure 11.10 Structure and Function of the Vessels 447 11.11 Sizes and Layers of Different Types of Blood Vessels 448 Figure 11.12 Differences Between Arteries and Veins 448 Figure 11. 13 Network of Blood Vessels in the Cardiovascular System 448 Figure 11. 14 Muscle Milking Action 449 11.3-2 Circulation: Moving Blood Around the Body 450 Figure 11.15 The Heart Pumps Blood Through Two



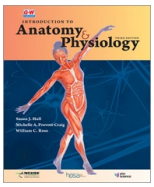
	Major Circuits 450 Figure 11. 16 Arteries Arising from the Aorta 451 What Research Tells Us…about Why Records Are Not Broken on Hot, Humid Days 452 Figure 11.17 Major Arteries of the Body 453 Figure 11.18 Major Veins of the Body 454 Figure 11. 19 Anterior View of the Coronary Arteries 454 Figure 11.20 Hepatic Portal Circulation 455 Figure 11.21 Fetal Circulation in Full-Term Fetus 476 Chapter 11 Review **Application:** 449 Check Your Understanding 456 Check Your Understanding 460 Lesson 11.3 Review and Assessment 478-481 Chapter 11 Assessment
HAP.10.3 Investigate the structure and function of different types of blood vessels (e.g., arteries, capillaries, veins). Identify the role each plays in the transport and exchange of materials.	**Instruction:** 446 Lesson 11.3 Blood Vessels and Circulation 446 11.3-1 Blood Vessels: The Transport Network 447 Figure 11.10 Structure and Function of the Vessels 447 11.11 Sizes and Layers of Different Types of Blood Vessels 448 Figure 11.12 Differences Between Arteries and Veins 448 Figure 11. 13 Network of Blood Vessels in the Cardiovascular System 448 Figure 11. 14 Muscle Milking Action 449 11.3-2 Circulation: Moving Blood Around the Body 450 Figure 11.15 The Heart Pumps Blood Through Two Major Circuits 450 Figure 11. 16 Arteries Arising from the Aorta 451 What Research Tells Us…about Why Records Are Not Broken on Hot, Humid Days 452 Figure 11.17 Major Arteries of the Body 453 Figure 11.18 Major Veins of the Body 454 Figure 11. 19 Anterior View of the Coronary Arteries 454 Figure 11.20 Hepatic Portal Circulation 455 Figure 11.21 Fetal Circulation in Full-Term Fetus 476 Chapter 11 Review **Application:** 449 Check Your Understanding 456 Check Your Understanding 460 Lesson 11.3 Review and Assessment 478-481 Chapter 11 Assessment
HAP.10.4 Demonstrate the role of valves in regulating blood flow.	**Instruction:** 430 Chapter 11 The Cardiovascular System 432 Lesson 11.1 Heart Anatomy and Physiology 432 11.1-1 Anatomy of the Heart 433 Figure 11.1 Position of the Heart 433 Figure 11.2 Anterior Superior View of the Heart Valves 433 The Heart Valves 435 Figure 11.4 Heart Chambers, Great Vessels, and



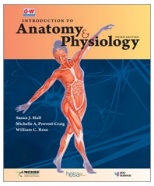
	Blood Flow Through the Heart 476 Chapter 11 Review **Application:** 435 Check Your Understanding 439 Lesson 11.1 Review and Assessment 478-481 Chapter 11 Assessment
HAP.10.5 Plan and conduct an investigation to test the effects of various stimuli on heart rate and/or blood pressure. Construct graphs to analyze data and communicate conclusions.	**Instruction:** 437 What Research Tells Us…about How the Hearts of Athletes Adapt to Exercise 456 11.3-3 Measuring Vital Signs 456 Figure 11.22 Measuring Pulse 458 Figure 11. 24 Blood Pressure Measurement 459 Figure 11. 25 Blood Pressure Classification 459 What Research Tells Us…about Hypertension 459 11.3-4 Know Your Numbers 476 Chapter 11 Review **Application:** 456 Check Your Understanding 459 Check Your Understanding 460 Check Your Understanding 460 Lesson 11.3 Review and Assessment 478-481 Chapter 11 Assessment
HAP.10.6 Research and analyze the effects of various pathological conditions (e.g., hypertension, myocardial infarction, mitral valve prolapse, varicose veins, and arrhythmia).	**Instruction:** 462 Lesson 11.4 Cardiovascular Disease 462 Clinical Case Study 463 11.4-1 Cardiac Dysrhythmias 464 Figure 11.26 ECG Examples 465 What Research Tells Us…about How Transplanted Hearts Function 465 11.4-2 Valve Abnormalities 465 Figure 11.28 Valve Abnormalities 466 Figure 11.29 Aortic Valve Stenosis 466 11.4-3 Inflammatory Conditions 467 Figure 11.30 Inflammation/Infection of the Heart Walls and Heart Failure 468 Figure 11.31 Diseases of the Arteries 468 Figure 11.32 Aneurysm 469 Figure 11.33 Progression of Atherosclerosis and Development of Myocardial Infarction 469 11.4-5 Other Cardiovascular Diseases and Disorders 470 Figure 11.34 Other Cardiovascular Abnormalities 471 Figure 11.35 Ballon Angioplasty and Stent Placement 476 Chapter 11 Review **Application:** 465 Check Your Understanding 466 Check Your Understanding 469 Check Your Understanding 472 Check Your Understanding 472 Lesson 11.4 Review and Assessment 478-481 Chapter 11 Assessment



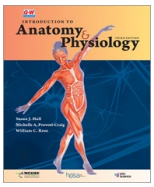
HAP.10.7 Enrichment: Use an engineering design process to develop, model, and test effective treatments for cardiovascular diseases (e.g., methods to regulate heart rate, artificial replacement valves, open blood vessels, or strengthening leaky valves).*	**Instruction:** 462 Lesson 11.4 Cardiovascular Disease 462 Clinical Case Study 463 11.4-1 Cardiac Dysrhythmias 464 Figure 11.26 ECG Examples 465 What Research Tells Us…about How Transplanted Hearts Function 465 11.4-2 Valve Abnormalities 465 Figure 11.28 Valve Abnormalities 466 Figure 11.29 Aortic Valve Stenosis 466 11.4-3 Inflammatory Conditions 467 Figure 11.30 Inflammation/Infection of the Heart Walls and Heart Failure 468 Figure 11.31 Diseases of the Arteries 468 Figure 11.32 Aneurysm 469 Figure 11.33 Progression of Atherosclerosis and Development of Myocardial Infarction 469 11.4-5 Other Cardiovascular Diseases and Disorders 470 Figure 11.34 Other Cardiovascular Abnormalities 471 Figure 11.35 Ballon Angioplasty and Stent Placement 476 Chapter 11 Review **Application:** 461 In the Lab 465 Check Your Understanding 466 Check Your Understanding 469 Check Your Understanding 472 Check Your Understanding 472 Lesson 11.4 Review and Assessment 473 In the Lab 478-481 Chapter 11 Assessment
HAP.11 Lymphatic System	
HAP. 11 Students will investigate the structures and functions of the lymphatic system, including the cause and effect of diseases and disorders.	
HAP.11.1 Analyze the functions of leukocytes, lymph, and lymphatic organs in the immune system.	**Instruction:** 482 Chapter 12 The Lymphatic and Immune Systems 484 12.1 The Lymphatic System 484 12.1-1 Organization of the Lymphatic System 485 Figure 12.1 The Lymphatic System 486 Figure 12.2 Lymph Formation and Flow 487 Figure 12.3 Locations of the Lymphatic Ducts and Vessels 488 12.1-2 Lymphatic Cells, Tissues, and Organs 489 Figure 12.4 Lymph Nodes 490 Figure 12.5 Diagram of the Spleen 491 Life Span Development: The Lymphatic and Immune Systems 494 Lesson 12.2 Nonspecific Defenses 494 12.2-1 Microbial and Other Disease-Causing Challenges 494 Figure 12.6 Gram-Negative and Positive Bacteria 496 12.2-2 Physical Barriers 496 Figure 12.7 The Skin and Its Structures



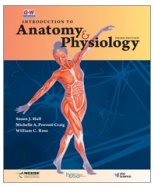
	497 12.2-3 Cellular and Chemical Defenses 497 Figure 12.8 Illustration of a Phagocyte 499 Figure 12.9 Classical and Alternative Pathways Converge at the Complement Protein C3 500 12.2-4 Inflammatory Response 500 12.2-5 Fever 501 Figure 12.10 Development of Inflammation 503 Lesson 12.3 Specific Defenses 504 12.3-1 Antigens 504 12.3-2 Immune System Cells 504 Figure 12.12 Diagram of the Immune System 506 Figure 12.13 Diagram of Antigen Presentation by an Antigen-Presenting Cell 506 12.3-3 Humoral Immunity 507 Figure 12.14 Antibody Diagram 507 Figure 12.15 Different Classes of Antibodies 508 12.3-4 Primary and Secondary Immune Responses 508 Figure 12.16 Primary and Secondary Immune Responses 509 12.3-5 Cellular Immunity 510 Figure 12.17 Activation and Clonal Selection of T-Cells 522 Chapter 12 Review **Application:** 488 Check Your Understanding 492 Check Your Understanding 492 Lesson 12.1 Review and Assessment 496 Check Your Understanding 497 Check Your Understanding 500 Check Your Understanding 502 Lesson 12.2 Review and Assessment 504 Check Your Understanding 505 Check Your Understanding 508 Check Your Understanding 509 Check Your Understanding 510 Lesson 12.3 Review and Assessment 524-527 Chapter 12 Assessment
HAP.11.2 Compare the primary functions of the lymphatic system and its relationship to the cardiovascular system.	**Instruction:** 482 Chapter 12 The Lymphatic and Immune Systems 484 12.1 The Lymphatic System 484 12.1-1 Organization of the Lymphatic System 485 Figure 12.1 The Lymphatic System 486 Figure 12.2 Lymph Formation and Flow 487 Figure 12.3 Locations of the Lymphatic Ducts and Vessels 488 12.1-2 Lymphatic Cells, Tissues, and Organs 489 Figure 12.4 Lymph Nodes 490 Figure 12.5 Diagram of the Spleen 491 Life Span Development: The Lymphatic and Immune Systems 522 Chapter 12 Review **Application:**



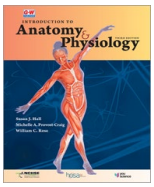
	488 Check Your Understanding 492 Check Your Understanding 492 Lesson 12.1 Review and Assessment 524-527 Chapter 12 Assessment
HAP.11.3 Compare and contrast the body's non-specific and specific lines of defense, including an analysis of the roles of various leukocytes: basophils, eosinophils, neutrophils, monocytes, and lymphocytes.	**Instruction:** 494 Lesson 12.2 Nonspecific Defenses 494 12.2-1 Microbial and Other Disease-Causing Challenges 494 Figure 12.6 Gram-Negative and Positive Bacteria 496 12.2-2 Physical Barriers 496 Figure 12.7 The Skin and Its Structures 497 12.2-3 Cellular and Chemical Defenses 497 Figure 12.8 Illustration of a Phagocyte 499 Figure 12.9 Classical and Alternative Pathways Converge at the Complement Protein C3 500 12.2-4 Inflammatory Response 500 12.2-5 Fever 501 Figure 12.10 Development of Inflammation 503 Lesson 12.3 Specific Defenses 504 12.3-1 Antigens 504 12.3-2 Immune System Cells 504 Figure 12.12 Diagram of the Immune System 506 Figure 12.13 Diagram of Antigen Presentation by an Antigen-Presenting Cell 506 12.3-3 Humoral Immunity 507 Figure 12.14 Antibody Diagram 507 Figure 12.15 Different Classes of Antibodies 508 12.3-4 Primary and Secondary Immune Responses 508 Figure 12.16 Primary and Secondary Immune Responses 509 12.3-5 Cellular Immunity 510 Figure 12.17 Activation and Clonal Selection of T-Cells 522 Chapter 12 Review **Application:** 496 Check Your Understanding 497 Check Your Understanding 500 Check Your Understanding 502 Lesson 12.2 Review and Assessment 504 Check Your Understanding 505 Check Your Understanding 508 Check Your Understanding 509 Check Your Understanding 510 Lesson 12.3 Review and Assessment 524-527 Chapter 12 Assessment
HAP.11.4 Correlate the functions of the spleen, thymus, lymph nodes, and lymphocytes to the development of immunity.	**Instruction:** 488 12.1-2 Lymphatic Cells, Tissues, and Organs 488 Lymphatic Cells 488 Lymphocytes 489 Figure 12.4 Lymph Nodes 490 Lymphatic Organs 490 Lymph Nodes



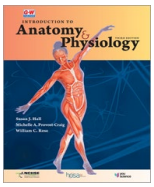
	490 Figure 12.5 Diagram of the Spleen 491 Spleen 492 Thymus 505 Lymphocytes 522 Chapter 12 Review **Application:** 492 Check Your Understanding 492 Lesson 12.1 Review and Assessment 524-527 Chapter 12 Assessment
HAP.11.5 Differentiate the role of B-lymphocytes and T-lymphocytes in the development of humoral and cell-mediated immunity and primary and secondary immune responses.	**Instruction:** 488 12.1-2 Lymphatic Cells, Tissues, and Organs 488 Lymphatic Cells 488 Lymphocytes 488 T lymphocytes 488 B lymphocytes 488 Memory Tip 489 Figure 12.4 Lymph Nodes 505 Lymphocytes 522 Chapter 12 Review **Application:** 488 Check Your Understanding 492 Lesson 12.1 Review and Assessment 524-527 Chapter 12 Assessment
HAP.11.6 Investigate various forms of acquired and passive immunity (e.g., fetal immunity, breastfed babies, vaccinations, and plasma donations).	**Instruction:** 508 12.3-4 Primary and Secondary Immune Responses 508 Figure 12.16 Primary and Secondary Immune Responses 509 active immunity 509 passive immunity 522 Chapter 12 Review **Application:** 509 Check Your Understanding 510 Lesson 12.3 Review and Assessment 524-527 Chapter 12 Assessment
HAP.11.7 Research and analyze the causes and effects of various pathological conditions (e.g., viral infections, auto-immune disorders, immunodeficiency disorders, and lymphomas).	**Instruction:** 512 Lesson 12.4 Disorders and Diseases of the Immune System 512 12.4-1 Cancer and Lymph Nodes 512 Clinical Case Study 513 Figure 12.18 Diseases and Disorders of the Lymphatic and Immune Systems 514 12.4-2 Allergies 514 Figure 12.19 Diagram of an Allergic Reaction 515 What Research Tells Us…about Antibody-Based Drugs 516 12.4-3 Autoimmune Disorders 517 12.4-4 HIV and AIDS 522 Chapter 12 Review **Application:** 514 Check Your Understanding 516 Check Your Understanding



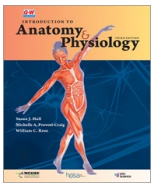
	517 Check Your Understanding 517-519 Lesson 12.4 Review and Assessment 524-527 Chapter 12 Assessment
HAP.12 Respiratory System	
HAP. 12 Students will investigate the structures and functions of the respiratory system, including the cause and effect of diseases and disorders.	
HAP.12.1 Design and use models to illustrate the functions of the organs of the respiratory system.	**Instruction:** 356 Chapter 9 The Respiratory System 358 Lesson 9.1 Anatomy of the Respiratory System 358 9.1-1 The Upper Respiratory Tract 359 Figure 9.1 Simplified Overview of the Major Respiratory Structures 360 Figure 9.2 Detailed Overview of the Major Structures of the Upper Respiratory Tract 361 Figure 9.3 Front and Side Views of the Sinuses 362 9.1-2 The Lower Respiratory Tract 362 Figure 9.4 The Larynx, Trachea, and Bronchial Tree 363 Figure 9.5 Lung Tissue Diagram 364 Figure 9.6 The Lungs 366 Lesson 9.2 Respiration: Mechanics and Control 366 9.2-1 Respiration 367 Figure 9.7 Changes in Intrapulmonary and Atmospheric Pressure Allow Air Flow Through Lungs 368 9.2-2 Control of Breathing 368 Figure 9.8 Nonrespiratory Air Maneuvers 369 Figure 9.9 Regulation of Breathing 370 9.2-3 Lung Volume 371 Figure 9.10 Lung Volume Chart 372 Life Span Development: The Respiratory System 373 Figure 9.12 Lung Development In Utero 388 Chapter 9 Review **Application:** 362 Check Your Understanding 364 Check Your Understanding 365 Lesson 9.1 Review and Assessment 368 Check Your Understanding 370 Check Your Understanding 373 Check Your Understanding 373-374 Lesson 9.2 Review and Assessment 389-393 Chapter 9 Assessment
HAP.12.2 Describe structural adaptations of the respiratory tract and relate these structural features to the function of preparing incoming air for gas exchange at the alveolus.	**Instruction:** 358 Lesson 9.1 Anatomy of the Respiratory System 358 9.1-1 The Upper Respiratory Tract 359 Figure 9.1 Simplified Overview of the Major Respiratory Structures 360 Figure 9.2 Detailed Overview of the Major Structures of the Upper Respiratory Tract 362 9.1-2 The Lower Respiratory Tract 362 Figure 9.4 The Larynx, Trachea, and Bronchial Tree 362 The Alveoli 363 The Alveolar Capillary Membrane



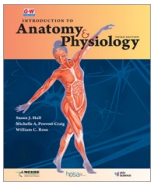
	363 Figure 9.5 Lung Tissue is Made Up of Alveoli Clusters 388 Chapter 9 Review **Application:** 362 Check Your Understanding 364 Check Your Understanding 389-393 Chapter 9 Assessment
HAP.12.3 Identify the five mechanics of gas exchange: pulmonary ventilation, external respiration, transport gases, internal respiration, and cellular respiration.	**Instruction:** 366 Lesson 9.2 Respiration: Mechanics and Control 366 9.2-1 Respiration 366 pulmonary ventilation 366 external respiration 366 respiratory gas transport 366 internal respiration 367 Figure 9.7 Changes in Intrapulmonary and Atmospheric Pressure Allow Air Flow Through Lungs 388 Chapter 9 Review **Application:** 368 Check Your Understanding 389-393 Chapter 9 Assessment
HAP.12.4 Enrichment: Use an engineering design process to develop a model of the mechanisms that support breathing and illustrate the inverse relationship between volume and pressure in the thoracic cavity.*	**Instruction:** 358 Lesson 9.1 Anatomy of the Respiratory System 358 9.1-1 The Upper Respiratory Tract 359 Figure 9.1 Simplified Overview of the Major Respiratory Structures 360 Figure 9.2 Detailed Overview of the Major Structures of the Upper Respiratory Tract 361 Figure 9.3 Front and Side Views of the Sinuses 362 9.1-2 The Lower Respiratory Tract 362 Figure 9.4 The Larynx, Trachea, and Bronchial Tree 363 Figure 9.5 Lung Tissue Diagram 364 Figure 9.6 The Lungs 364 Figure 9.6 The Lungs 366 Lesson 9.2 Respiration: Mechanics and Control 366 9.2-1 Respiration 367 Figure 9.7 Changes in Intrapulmonary and Atmospheric Pressure Allow Air Flow Through Lungs 368 9.2-2 Control of Breathing 368 Figure 9.8 Nonrespiratory Air Maneuvers 369 Figure 9.9 Regulation of Breathing 370 9.2-3 Lung Volume 371 Figure 9.10 Lung Volume Chart 388 Chapter 9 Review **Application:** 373-374 Lesson 9.2 Review and Assessment 389-393 Chapter 9 Assessment
HAP.12.5 Research and analyze the causes and effects of various pathological conditions (e.g., asthma, bronchitis, pneumonia, and COPD).	**Instruction:** 375 Lesson 9.3 Respiratory Disorders and Diseases 375 Clinical Case Study 375 9.3-1 Upper Respiratory Tract Illnesses 376 Figure 9.13 Upper Respiratory Tract Illnesses



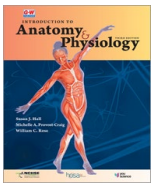
	377 9.3-2 Lower Respiratory Tract Illnesses 378 Figure 9.16 Lower Respiratory Tract Illnesses 379 9.3-3 Chronic Obstructive Pulmonary Diseases 379 Figure 9.17 Chronic Obstructive Pulmonary Diseases and Other Lung Disorders 380 Figure 9.18 Results of a Pulmonary Function Test 381 Lung of a Smoker with Emphysema 381 9.3-4 Asthma 382 What Research Tells Us…about Exercise-Induced Asthma 382 9.3-5 Obstructive Sleep Apnea 383 9.3-6 Other Respiratory System Diseases 384 Figure 9.23 Other Respiratory System Diseases 388 Chapter 9 Review **Application:** 377 Check Your Understanding 378 Check Your Understanding 381 Check Your Understanding 382 Check Your Understanding 383 Check Your Understanding 384 Check Your Understanding 385 Lesson 9.3 Review and Assessment 389-393 Chapter 9 Assessment
HAP.12.6 Research and discuss new environmental causes of respiratory distress (e.g., e-cigarettes, environmental pollutants, and changes in inhaled gas composition).	**Instruction:** 379 9.3-3 Chronic Obstructive Pulmonary Diseases 379 Figure 9.17 Chronic Obstructive Pulmonary Diseases and Other Lung Disorders 380 Figure 9.18 Results of a Pulmonary Function Test 381 Lung of a Smoker with Emphysema 383 9.3-6 Other Respiratory System Diseases 384 Figure 9.23 Other Respiratory System Diseases 388 Chapter 9 Review **Application:** 384 Check Your Understanding 385 Lesson 9.3 Review and Assessment 389-393 Chapter 9 Assessment
HAP.13 Digestive System	
HAP.13 Students will investigate the structures and functions of the digestive system, including the cause and effect of diseases and disorders.	
HAP.13.1 Analyze the structure-function relationship in organs of the digestive system.	**Instruction:** 536 Lesson 13.2 Anatomy and Physiology of the Digestive System 537 13.2-1 Activities of Digestion 537 Ingestion 537 Propulsion 537 Peristalsis 537 Memory Tip 538 Figure 13.7 Organs of the Digestive System 538 Mechanical Breakdown 538 Chemical Breakdown 538 Absorption



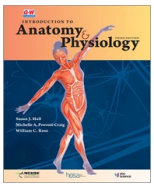
	538 Defecation 539 Figure 13.8 From Ingestion to Defecation 539 13.2-2 Layers of the GI Tract 540 Figure 13.9 Layers of the Walls of the GI Tract 540 Mucosa 540 Submucosa 540 Memory Tip 540 Muscularis Externa 540 Serosa, Peritoneum 541 Figure 13.10 Transverse View of the Abdominopelvic Cavity 541 Parietal and Visceral 541 Mesentery, Peritoneal Cavity 541 13.2-3 Digestive Organs and Their Functions 541 The Oral Cavity 542 Figure 13.11 Oral Cavity Houses Many Digestive Tools 542 Orbicularis Oris Muscle 542 Deglutition 542 Hard Palate, Soft Palate 542 The Nasal Cavity 542 Teeth and Gums 542 Mastication, Gingiva 542 Types of Teeth -Incisors, Dentition, Bicuspids, Wisdom Tooth 542 Anatomy of the Tooth – Root, Crown, Neck 543 Figure 13.12 Deciduous Teeth / Permanent Teeth 543 Dentin, Pulp Cavity, Root Canal, Periodontal Ligament 543 Salivary Glands- Parotid, Submandibular, Saliva 543 Memory Tip 543 Pharynx – Nasopharynx, Oropharynx, Laryngopharynx 544 Figure 13.13 Structure of a Tooth 544 Figure 13.14 Pharynx - Nasopharynx, Oropharynx, Laryngopharynx 545 Esophagus – Cardiac Sphincter 545 Stomach 545 Figure 13.15 The Stomach Contains Three Layers of Muscle 545 Rugae, Oblique, Pylorus 546 Lining of the Stomach – Goblet Cells, Gastric Pits, Intrinsic Factor 546 Figure 13.16 Lining of Stomach 547 Chemical Reactions in the GI Tract and Stomach 547 Maceration, Chyme 547 Small Intestine – Long Intestine 547 Segmentation 547 Segments of the Small Intestine Duodenum, Jejunum, Ileum 547 Figure 13.17 Small Intestine Divided into Three Segments 547 The Lining of the Small Intestine



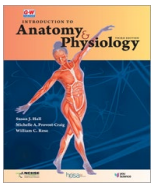
	547 Villi, Intestinal Crypts 548 Figure 13.18 Wall of the Small Intestine 548 Lacteal, Microvilli, Brush Border 548 Memory Tip 549 Chemical Breakdown in the Small Intestine 549 Emulsification 549 Memory Tip 549 Absorption from the Small Intestine into the Blood 549 Liver and Gallbladder 550 Figure 13.19 Anterior View of Liver, Gallbladder, Pancreas and Duodenum 550 Functions of the Liver 550 The Liver's Blood Supply 550 Sinusoids 551 Figure 13.20 Detailed Anatomy of Liver Lobue 551 Memory Tip 552 Liver Lobules – Hepatocytes, Bile Canaliculi 552 Bile – Bile Salts 552 Bile Storage – Steatorrhea 552 Pancreas 553 Pancreatic Juices 553 Glucose Regulation 553 Memory Tip 553 Large Intestine 553 The Cecum 553 The Colon 554 Memory Tip 554 Figure 13.21 Anterior View of Large Intestine 554 Haustral Churning 554 Rectum, anal Canal, and Anus 554 Life Span Development: The Digestive System 566 Career Corner: Nutritionist or Dietitian, Dental Hygienist **Application:** 539 Check Your Understanding 541 Check Your Understanding 555 Check Your Understanding 556 Lesson 13.2 Review and Assessment 569-571 Chapter 13 Assessment
HAP.13.2 Use models to describe structural adaptations present in each organ of the tract and correlate the structures to specific processing of food at each stage (e.g., types of teeth; muscular, elastic wall and mucous lining of the stomach; villi and microvilli of the small intestine; and sphincters along the digestive tract).	**Instruction:** 539 13.2-2 Layers of the GI Tract 540 Figure 13.9 Layers of the Walls of the GI Tract 540 Mucosa 540 Submucosa 540 Memory Tip 540 Muscularis Externa 40 Serosa, Peritoneum 541 Figure 13.10 Transverse View of the Abdominopelvic Cavity 541 Parietal and Visceral 541 Mesentery, Peritoneal Cavity 541 13.2-3 Digestive Organs and Their Functions



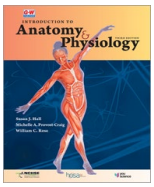
	541 The Oral Cavity 542 Figure 13.11 Oral Cavity Houses Many Digestive Tools 542 Orbicularis Oris Muscle 542 Deglutition 542 Hard Palate, Soft Palate 542 The Nasal Cavity 542 Teeth and Gums 542 Mastication , Gingiva 542 Types of Teeth -Incisors, Dentition, Bicuspids, Wisdom Tooth 542 Anatomy of the Tooth – Root, Crown, Neck 543 Figure 13.12 Deciduous Teeth / Permanent Teeth 543 Dentin, Pulp Cavity, Root Canal, Periodontal Ligament 543 Salivary Glands- Parotid, Submandibular, Saliva 543 Memory Tip 543 Pharynx – Nasopharynx, Oropharynx, Laryngopharynx 544 Figure 13.13 Structure of a Tooth 544 Figure 13.14 Pharynx - Nasopharynx, Oropharynx, Laryngopharynx 545 Esophagus – Cardiac Sphincter 545 Stomach 545 Figure 13.15 The Stomach Contains Three Layers of Muscle 545 Rugae, Oblique, Pylorus 546 Lining of the Stomach – Goblet Cells, Gastric Pits, Intrinsic Factor 546 Figure 13.16 Lining of Stomach 547 Chemical Reactions in the GI Tract and Stomach 547 Maceration, Chyme 547 Small Intestine – Long Intestine 547 Segmentation 547 Segments of the Small Intestine Duodenum, Jejunum, Ileum 547 Figure 13.17 Small Intestine Divided into Three Segments 547 The Lining of the Small Intestine 547 Villi, Intestinal Crypts 548 Figure 13.18 Wall of the Small Intestine 548 Lacteal, Microvilli, Brush Border 548 Memory Tip 549 Chemical Breakdown in the Small Intestine 549 Emulsification 549 Memory Tip 549 Absorption from the Small Intestine into the Blood 549 Liver and Gallbladder 550 Figure 13.19 Anterior View of Liver, Gallbladder, Pancreas and Duodenum 550 Functions of the Liver 550 The Liver's Blood Supply 550 Sinusoids



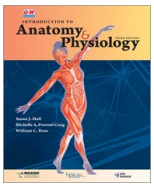
	551 Figure 13.20 Detailed Anatomy of Liver Lobue 551 Memory Tip 552 Liver Lobules – Hepatocytes, Bile Canaliculi 552 Bile – Bile Salts 552 Bile Storage – Steatorrhea 552 Pancreas 553 Pancreatic Juices 553 Glucose Regulation 553 Memory Tip 553 Large Intestine 553 The Cecum 553 The Colon 554 Memory Tip 554 Figure 13.21 Anterior View of Large Intestine 554 Haustral Churning 554 Rectum, anal Canal, and Anus 554 Life Span Development: The Digestive System 566 Career Corner: Nutritionist or Dietitian, Dental Hygienist **Application:** 541 Check Your Understanding 555 Check Your Understanding 556 Lesson 13.2 Review and Assessment 569-571 Chapter 13 Assessment
HAP.13.3 Identify the accessory organs (i.e., salivary glands, liver, gallbladder, and pancreas) for digestion and describe their function.	**Instruction:** 541 13.2-3 Digestive Organs and Their Functions 541 The Oral Cavity 542 Figure 13.11 Oral Cavity Houses Many Digestive Tools 542 Orbicularis Oris muscle 542 Deglutition 542 Hard Palate, Soft Palate 542 The Nasal Cavity 542 Teeth and Gums 542 Mastication, Gingiva 542 Types of Teeth -Incisors, Dentition, Bicuspids, Wisdom Tooth 542 Anatomy of the Tooth – Root, Crown, Neck 543 Figure 13.12 Deciduous Teeth / Permanent Teeth 543 Dentin, Pulp Cavity, Root Canal, Periodontal Ligament 543 Salivary Glands- Parotid, Submandibular, Saliva 543 Memory Tip 543 Pharynx – Nasopharynx, Oropharynx, Laryngopharynx 544 Figure 13.13 Structure of a Tooth 544 Figure 13.14 Pharynx - Nasopharynx, Oropharynx, Laryngopharynx 545 Esophagus – Cardiac Sphincter 545 Stomach 545 Figure 13.15 Stomach Contains Three Layers of Muscle



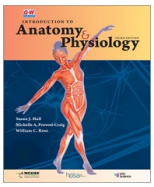
	545 Rugae, Oblique, Pylorus 546 Lining of the Stomach – Goblet Cells, Gastric Pits, Intrinsic Factor 546 Figure 13.16 Lining of Stomach 547 Chemical Reactions in the GI Tract and Stomach 549 Liver and Gallbladder 550 Figure 13.19 Anterior View of Liver, Gallbladder, Pancreas and Duodenum 550 Functions of the Liver 550 The Liver's Blood supply 550 Sinusoids 551 Figure 13.20 Detailed Anatomy of Liver Lobue 551 Memory Tip 552 Liver Lobules – Hepatocytes, Bile Canaliculi 552 Bile – Bile Salts 552 Bile Storage – Steatorrhea 552 Pancreas 553 Pancreatic Juices 553 Glucose Regulation 553 Memory Tip 553 Large Intestine 553 The Cecum 553 The Colon 554 Memory Tip 554 Figure 13.21 Anterior View of Large Intestine 554 Haustral Churning 554 Rectum, anal Canal, and Anus 554 Life Span Development: The Digestive System 566 Career corner: Nutritionist or Dietitian, Dental Hygienist 568 Chapter 13 Review **Application:** 555 Check Your Understanding 556 Lesson 13.2 Review and Assessment 569-571 Chapter 13 Assessment
HAP.13.4 Plan and conduct an experiment to illustrate the necessity of mechanical digestion for efficient chemical digestion.	**Instruction:** 541 13.2-3 Digestive Organs and Their Functions 541 The Oral Cavity 542 Figure 13.11 Oral Cavity Houses Many Digestive Tools 542 Orbicularis Oris muscle 542 Deglutition 542 Hard Palate, Soft Palate 542 The Nasal Cavity 542 Teeth and Gums 542 Mastication, Gingiva 542 Types of Teeth -Incisors, Dentition, Bicuspids, Wisdom Tooth 542 Anatomy of the Tooth – Root, Crown, Neck 543 Figure 13.12 Deciduous Teeth / Permanent Teeth 543 Dentin, Pulp Cavity, Root Canal, Periodontal Ligament



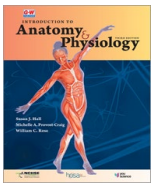
	543 Salivary Glands- Parotid, Submandibular, Saliva 543 Memory Tip 543 Pharynx – Nasopharynx, Oropharynx, Laryngopharynx 544 Figure 13.13 Structure of a Tooth 544 Figure 13.14 Pharynx - Nasopharynx, Oropharynx, Laryngopharynx 545 Esophagus – Cardiac Sphincter 545 Stomach 545 Figure 13.15 Stomach Contains Three Layers of Muscle 545 Rugae, Oblique, Pylorus 546 Lining of the Stomach – Goblet Cells, Gastric Pits, Intrinsic Factor 546 Figure 13.16 Lining of Stomach 547 Chemical Reactions in the GI Tract and Stomach 566 Career Corner: Nutritionist or Dietitian, Dental Hygienist 568 Chapter 13 Review **Application:** 556 Lesson 13.2 Review and Assessment 569-571 Chapter 13 Assessment
HAP.13.5 Research and analyze the activity of digestive enzymes within different organs of the digestive tract, connecting enzyme function to environmental factors such as pH.	**Instruction:** 547 Chemical Reactions in the GI Tract and Stomach 549 Liver and Gallbladder 550 Figure 13.19 Anterior View of Liver, Gallbladder, Pancreas and Duodenum 550 Functions of the Liver 550 The Liver's Blood Supply 550 Sinusoids 551 Figure 13.20 Detailed Anatomy of Liver Lobue 551 Memory Tip 552 Liver Lobules – Hepatocytes, Bile Canaliculi 552 Bile – Bile Salts 552 Bile Storage – Steatorrhea 552 Pancreas 553 Pancreatic Juices 553 Glucose Regulation 553 Memory Tip 553 Large Intestine 553 The Cecum 553 The Colon 554 Memory Tip 554 Figure 13.21 Anterior View of Large Intestine 554 Haustral Churning 554 Rectum, Anal Canal, and Anus 554 Life Span Development: The Digestive System 566 Career corner: Nutritionist or Dietitian, Dental Hygienist 561 13.3-2 Diseases and Disorders of the Accessory Organs 561 Hepatitis



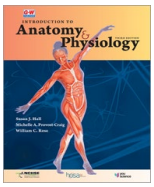
	562 Figure 13.24 Diseases and Disorders of the GI Accessory Organs 562 Pancreatitis 562 Gallstones 563 Figure 13.25 Gallstones 563 13.3-3 Cancer 563 Colonoscopy – Lower Endoscopy 563 Virtual Colonoscopy 563 Upper Endoscopy 564 Figure 13.26 Barium Enema, Radioactive Barium 564 Figure 13.27 Endoscopy 564 Liver Cancer 566 Career Corner: Nutritionist or Dietitian, Dental Hygienist 568 Chapter 13 Review **Application:** 555 Check Your Understanding 563 Check Your Understanding 564 Check Your Understanding 565 Lesson 13.3 Review and Assessment 569-571 Chapter 13 Assessment
HAP.13.6 Evaluate the role of hormones (i.e., gastrin, leptin, and insulin) in the regulation of hunger and satiety/fullness.	**Instruction:** 541 13.2-3 Digestive Organs and Their Functions 541 The Oral Cavity 542 Figure 13.11 Oral Cavity Houses Many Digestive Tools That Begin the Chemical and Mechanical Breakdown 542 Orbicularis Oris muscle 542 Deglutition 542 Hard Palate, Soft Palate 542 The Nasal Cavity 542 Teeth and Gums 542 Mastication, Gingiva 542 Types of Teeth-Incisors, Dentition, Bicuspids, Wisdom Tooth 542 Anatomy of the Tooth – Root, Crown, Neck 543 Figure 13.12 Deciduous Teeth / Permanent Teeth 543 Dentin, Pulp Cavity, Root Canal, Periodontal Ligament 543 Salivary Glands- Parotid, Submandibular, Saliva 543 Memory Tip 543 Pharynx – Nasopharynx, Oropharynx, Laryngopharynx 544 Figure 13.13 Structure of a tooth 544 Figure 13.14 Pharynx - Nasopharynx, Oropharynx, Laryngopharynx 545 Esophagus – Cardiac sphincter 545 Stomach 545 Figure 13.15 Stomach Contains Three Layers of Muscle 545 Rugae, Oblique, Pylorus 546 Lining of the Stomach – Goblet Cells, Gastric Pits,



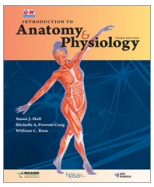
	Intrinsic Factor 546 Figure 13.16 Lining of Stomach 547 Chemical Reactions in the GI Tract and Stomach **Application:** 565 Lesson 13.3 Review and Assessment 569-571 Chapter 13 Assessment
HAP.13.7 Research and analyze the causes and effects of various pathological conditions (e.g., GERD/acid reflux, stomach ulcers, lactose intolerance, irritable bowel syndrome, gallstones, appendicitis, and hormonal imbalances and obesity).	**Instruction:** 552 Pancreas 553 Pancreatic Juices 553 Glucose Regulation 553 Memory Tip 553 Large Intestine 553 The Cecum - Appendicitis 553 The Colon 554 Memory Tip 554 Figure 13.21 Anterior View of Large Intestine 554 Haustral Churning 554 Rectum, Anal Canal, and Anus 554 Life Span Development: The Digestive System 556 Lesson 13.3 Disorders and Diseases of the Digestive system 557 Clinical Case Study 557 13.3-1 Diseases of the GI Tract 558 Figure 13.22 Diseases and Disorders of the GI Tract Chart 559 Gingivitis and Periodontal disease 559 Figure 13.23 Gingivitis 559 Plaque, Tartar 559 Gastroesophageal Reflux 559 Gastroesophageal Reflux Disease (GERD) 559 Peptic Ulcers – Helicobacter Pylori or H.Pylori 559 Gastroenteritis – Stomach Flu 560 Inflammatory Bowel Disease 560 Ulcerative Colitis 560 Crohn's Disease 560 Diverticulosis, Diverticulitis (Diverticular Disease) 560 Constipation and Diarrhea 560 Healthcare-Associated Infections – (HAIs) 560 Staphylococcus Aureus (MRSA- "mersah") 560 Clostridium Difficile (C. Difficile or "see diff") 561 Hepatitis 562 Figure 13.24 Diseases and Disorders of the GI Accessory Organs 562 Pancreatitis 562 Gallstones 563 Figure 13.25 Gallstones 563 13.3-3 Cancer 563 Colonoscopy – Lower Endoscopy 563 Virtual Colonoscopy 563 Upper Endoscopy 564 Figure 13.26 Barium Enema, Radioactive Barium 564 Figure 13.27 Endoscopy



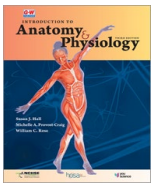
	566 Career corner: Nutritionist or Dietitian, Dental Hygienist 568 Chapter 13 Review **Application:** 555 Check Your Understanding 561 Check Your Understanding 563 Check Your Understanding 564 Check Your Understanding 565 Lesson 13.3 Review and Assessment 569-571 Chapter 13 Assessment
HAP.13.8 Enrichment: Use an engineering design process to develop effective treatments for gastrointestinal diseases (e.g., methods to regulate stomach acids or soothe ulcers, treat food intolerance, and dietary requirements/modifications).*	**Instruction:** 556 Lesson 13.3 Disorders and Diseases of the Digestive system 557 Clinical Case Study 557 13.3-1 Diseases of the GI Tract 558 Figure 13.22 Diseases and Disorders of the GI Tract Chart 559 Gingivitis and Periodontal disease 559 Figure 13.23 Gingivitis 559 Plaque, Tartar 559 Gastroesophageal Reflux 559 Gastroesophageal Reflux Disease (GERD) 559 Peptic Ulcers – Helicobacter Pylori or H.Pylori 559 Gastroenteritis – Stomach Flu 560 Inflammatory Bowel Disease 560 Ulcerative Colitis 560 Crohn's Disease 560 Diverticulosis, Diverticulitis (Diverticular Disease) 560 Constipation and Diarrhea 560 Healthcare-Associated Infections – (HAIs) 560 Staphylococcus Aureus (MRSA- "mersah") 560 Clostridium Difficile (C. Difficile or "see diff") 561 Hepatitis 562 Figure 13.24 Diseases and Disorders of the GI Accessory Organs 562 Pancreatitis 562 Gallstones 563 Figure 13.25 Gallstones 563 13.3-3 Cancer 563 Colonoscopy – Lower Endoscopy 563 Virtual Colonoscopy 563 Upper Endoscopy 564 Figure 13.26 Barium Enema, Radioactive Barium 564 Figure 13.27 Endoscopy 566 Career Corner: Nutritionist or Dietitian, Dental Hygienist 568 Chapter 13 Review **Application:** 561 Check Your Understanding 563 Check Your Understanding 564 Check Your Understanding 565 Lesson 13.3 Review and Assessment



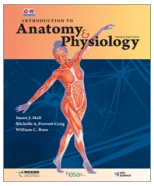
	569-571 Chapter 13 Assessment
HAP.14 Urinary System	
HAP.14 Students will investigate the structures and functions of the urinary system, including the cause and effect of diseases and disorders.	
HAP.14.1 Understand the structure and function of the urinary system in relation to maintenance of homeostasis.	**Instruction:** 572 Chapter 14 Urinary System 572 14.1 The Kidney 574 14.1-1 Anatomy of the Kidney 574 Retroperitoneal 574 Renal Hilum 574 Renal Cortex – Renal Capsule 574 Renal Medulla – Renal Pyramids 574 Renal Pelvis 574 Figure 14.1 Urinary System Anatomy 575 Nerve and Blood Supply 575 The Nephron 575 Renal Corpuscle and Renal Tubule 575 Cortical Nephrons, Juxtamedullary Nephrons 575 Glomerulus – Glomerular Capsule 575 Memory Tip 575 Afferent Arteriole 575 Efferent Arteriole 576 Figure 14.2 Frontal Section through the Kidney 576 Glomerular Capsule Space 576 Proximal Convoluted Tubule (PCT) 576 Nephron Loop 576 Distal Convoluted Tubule (DCT) 576 Collecting Duct 577 Figure 14.3 Structure of a Nephron 577 Memory Tip 578 Peritubular Capillaries 578 Vasa Recta 578 14.1-2 Blood Flow through the Kidney 606 Chapter 14 Review **Application:** 578 Check Your Understanding 578-579 Lesson 14.1 Review and Assessment 607-609 Chapter 14 Assessment
HAP.14.2 Describe the processes of filtration and selective reabsorption within the nephrons as it relates to the formation of urine and excretion of excess materials in the blood.	**Instruction:** 575 Nerve and Blood Supply 575 The Nephron 575 Renal Corpuscle and Renal Tubule 575 Cortical Nephrons, Juxtamedullary Nephrons 575 Glomerulus – Glomerular Capsule 575 Memory Tip 576 Figure 14.2 Frontal Section Through the Kidney 576 Glomerular Capsule Space 576 Proximal Convoluted Tubule (PCT) 576 Nephron Loop 576 Distal Convoluted Tubule (DCT) 576 Collecting Duct 577 Figure 14.3 Structure of a Nephron



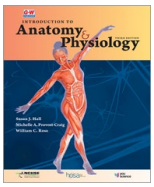
	577 Memory Tip 578 Peritubular Capillaries 578 Vasa Recta 578 14.1-2 Blood Flow through the Kidney 579 14.2 Urine Formation, Storage, and Excretion 580 14.2-1 Urine Formation 580 Filtration 580 Glomerular Filtration 580 Filtration Membrane 580 Figure 14.4 Formation of Urine in the Nephron 581 Glomerular Filtration Rate (GFR) 581 Hydrostatic Pressure 581 Osmotic Pressure 581 Osmosis 582 Memory Tip 582 Figure 14.5 Pressures driving filtration 582 Pressure Control 582 Reabsorption 583 Figure 14.6 Reabsorption in the Proximal Convoluted Tubule 583 Sodium 583 Secondary Active Transport 583 What Research Tell Us…About Body Fluids 584 Osmotic Pressure 584 Endocytosis – Receptor-Mediated Endocytosis 584 Secretion 584 Tubular Secretion 585 The Renal medulla 585 Figure 14.7 The Renal medulla 585 The Countercurrent Mechanism 586 Figure 14.8 Water Permeability of Descending Limb of Nephron Loop 586 Hormonal Regulation of Urine Volume and Composition 586 Intracellular Fluid 587 Aldosterone 587 Renin, Angiotensin 587 Atrial Natriuretic Peptide 587 Antidiuretic Hormone – Vasopressin 606 Chapter 14 Review **Application:** 578 Check Your Understanding 587 Check Your Understanding 578-579 Lesson 14.1 Review and Assessment 591-592 Lesson 14.2 Review and Assessment 607-609 Chapter 14 Assessment
HAP.14.3 Investigate relationship between urine composition and the maintenance of blood sugar, blood pressure, and blood volume.	**Instruction:** 580 14.2-1 Urine Formation 580 Filtration 580 Glomerular Filtration 580 Filtration Membrane 580 Figure 14.4 Formation of Urine in the Nephron 581 Glomerular Filtration Rate (GFR)



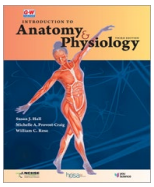
	581 Hydrostatic Pressure 581 Osmotic Pressure 581 Osmosis 582 Memory Tip 582 Figure 14.5 Pressures Driving Filtration 582 Pressure Control 582 Reabsorption 583 Figure 14.6 Reabsorption in the Proximal Convoluted Tubule 583 Sodium 583 Secondary Active Transport 583 What Research Tell Us…About Body Fluids 584 Osmotic Pressure 584 Endocytosis – Receptor-Mediated Endocytosis 584 Secretion 584 Tubular Secretion 585 The Renal Medulla 585 Figure 14.7 The Renal Medulla 585 The Countercurrent Mechanism 586 Figure 14.8 Water Permeability of Descending Limb of Nephron Loop 586 Hormonal Regulation of Urine Volume and Composition 586 Intracellular Fluid 587 Aldosterone 587 Renin, Angiotensin 587 Atrial Natriuretic Peptide 587 Antidiuretic Hormone – vasopressin 606 Chapter 14 Review **Application:** 587 Check Your Understanding 591-592 Lesson 14.2 Review and Assessment 607-609 Chapter 14 Assessment
HAP.14.4 Enrichment: Conduct a urinalysis to compare the composition of urine from various “patients.”	**Instruction:** 593 14.3-1 Assessing Renal Function 593 Clinical Case Study 593 Physical Characteristics of Urine 593 Urine Specific Gravity 594 Figure 14.11 Sample of Urine 594 Chemical composition of urine 594 Glomerular filtration rate 594 Inulin 594 Creatinine 594 14.3-2 Urinary Diseases and Disorders 594 Figure 14-12 Diseases and Disorder of Urinary System Chart 595 Diabetes 595 Diabetes Mellitus 595 Memory Tip 596 Osmotic Diuresis 596 Diabetic Nephropathy 596 Proteinuria 597 Figure 14.13 Normal Carbohydrate Digestion on



	Blood Glucose 597 Memory Tip 597 Diabetes Insipidus 597 Central Diabetes Insipidus 597 Nephrogenic Diabetes Insipidus 598 Memory Tip 598 Figure 14.14 Regulation of Blood Osmolality 598 What Research Tell Us…About Paired Kidney Transplants 600 Chronic Kidney Disease 600 Renal Failure 600 Renal Dialysis 600 Hemodialysis, Peritoneal Dialysis 600 Kidney Stones – Renal Calculus 600 Lithotripsy 601 Figure 14.16 Hemodialysis 601 Figure 14.17 Kidney Stones 601 Urinary Tract Infections (UTI) 601 Cystitis 602 Pyelonephritis 603 Career Corner: Nephrologist or Renal Physician 606 Chapter 14 Review **Application:** 594 Check Your Understanding 602 Check Your Understanding 602 Lesson 14.3 Review and Assessment 607-609 Chapter 14 Assessment
HAP.14.5 Develop and use models to illustrate the path of urine through the urinary tract.	**Instruction:** 580 14.2-1 Urine Formation 580 Filtration 580 Glomerular Filtration 580 Filtration Membrane 580 Figure 14.4 Formation of urine in the nephron 581 Glomerular Filtration rate (GFR) 581 Hydrostatic Pressure 581 Osmotic Pressure 581 Osmosis 582 Memory Tip 582 Figure 14.5 Pressures Driving Filtration 582 Pressure Control 582 Reabsorption 583 Figure 14.6 Reabsorption in the Proximal Convoluted Tubule 583 Sodium 583 Secondary Active Transport 583 What Research Tell Us…About Body Fluids 584 Osmotic Pressure 584 Endocytosis – Receptor-Mediated Endocytosis 584 Secretion 584 Tubular Secretion 585 The Renal medulla 585 Figure 14.7 The Renal medulla 585 The Countercurrent Mechanism



	586 Figure 14.8 Water Permeability of Descending Limb of Nephron Loop 586 Hormonal Regulation of Urine Volume and Composition 586 Intracellular Fluid 587 Aldosterone 587 Renin, Angiotensin 587 Atrial Natriuretic Peptide 587 Antidiuretic Hormone – Vasopressin 588 14.2-2 Urine Storage 588 Ureters 588 Urinary Bladder 588 Detrusor, Trigone 588 Urethra, Internal Urethral Sphincter, External Urethral Sphincter 588 14.2-3 Urine Excretion 589 Figure Male and Female Bladder and Urethra 589 Urination, Voiding, Micturition 590 Figure 14.10 Pathways and Action Involved in Micturition 590 Valsalva Maneuver 590 Life Span Development – The Urinary System 606 Chapter 14 Review **Application:** 587 Check Your Understanding 588 Check Your Understanding 591 Check Your Understanding 591-592 Lesson 14.2 Review and Assessment 607-609 Chapter 14 Assessment
HAP.14.6 Research and analyze the causes and effects of various pathological conditions and other kidney abnormalities (e.g., kidney stones, urinary tract infections, gout, dialysis, and incontinence).	**Instruction:** 593 14.3-1 Assessing Renal Function 593 Clinical Case Study 593 Physical Characteristics of Urine 593 Urine Specific Gravity 594 Figure 14.11 Sample of Urine 594 Chemical composition of urine 594 Glomerular filtration rate 594 Inulin 594 Creatinine 594 14.3-2 Urinary Diseases and Disorders 594 Figure 14-12 Diseases and Disorder of Urinary System Chart 595 Diabetes 595 Diabetes Mellitus 595 Memory Tip 596 Osmotic Diuresis 596 Diabetic Nephropathy 596 Proteinuria 597 Figure 14.13 Normal Carbohydrate Digestion on Blood Glucose 597 Memory Tip 597 Diabetes Insipidus 597 Central Diabetes Insipidus



	597 Nephrogenic diabetes insipidus 598 Memory Tip 598 Figure 14.14 Regulation of blood osmolality 598 What Research Tell Us…about paired Kidney Transplants 600 Chronic Kidney Disease 600 Renal Failure 600 Renal Dialysis 600 Hemodialysis, Peritoneal Dialysis 600 Kidney Stones – Renal Calculus 600 Lithotripsy 601 Figure 14.16 Hemodialysis 601 Figure 14.17 Kidney Stones 601 Urinary Tract Infections (UTI) 601 Cystitis 602 Pyelonephritis 603 Career corner: Nephrologist or Renal Physician 606 Chapter 14 Review **Application:** 594 Check Your Understanding 602 Check Your Understanding 602-603 Lesson 14.3 Review and Assessment 607-609 Chapter 14 Assessment