Science Department
Allied Health Sciences
Anatomy & Physiology I & II

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Effective Date: September 2026

Scope and Sequence

Unit	Topic of Study	Duration (Weeks)
1	Foundations of Human Anatomy and Physiology: Chemistry, Cells, and Metabolism	4
2	Tissues and the Integumentary System	3
3	The Skeletal System and Joints	4
4	The Muscular System	3
5	The Nervous System and the Senses	5
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7	The Cardiovascular and Lymphatic Systems and Immunity	4
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Unit 1

Foundations of Human Anatomy and Physiology: Chemistry, Cells, and Metabolism

Summary and Rationale

A central aspect of anatomy and physiology is understanding the human body as a hierarchy of organization, from atoms to organ systems, held in balance by homeostasis. Students are introduced to the origins of medical science, levels of organization, core themes, anatomical terminology, and life-span changes. They then build the chemical foundation of physiology (the structure of matter and the chemical constituents of cells), examine cell structure, membrane transport, the cell cycle, and cell death, and study cellular metabolism, including cellular respiration, protein synthesis, and changes in genetic information. Overall, this unit equips students with the chemistry and cell biology that explain every body system studied later, and challenges them to connect structure to function and to explain how homeostasis is maintained.

Recommended Pacing

4 weeks (~13 class periods)
Exam weight: 24% of Exam 1 (24 of 100 questions; Chapters 1-4)

Standards

HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How is the human body organized, from atoms and cells to organ systems?

- How do anatomical terms and reference systems allow precise description of body structures?
- How does homeostasis maintain a stable internal environment?
- How do atoms, molecules, and chemical bonds form the basis of body chemistry?
- How do the structures of a cell relate to its functions, and how do substances move into and out of cells?
- How do cells grow, divide, and die, and how is cell division controlled?
- How do cells obtain and use energy, and how is genetic information used to build proteins?

Unit Enduring Understandings:

- The human body is organized in levels, and the structure of each level is related to its function.
- Homeostasis depends on feedback mechanisms that keep internal conditions within a narrow range.
- Chemistry explains physiological processes, including the roles of water, ions, and the four major classes of organic molecules.
- Cell structures carry out specialized functions, and membranes regulate what enters and leaves the cell.
- Cell division, differentiation, and cell death maintain tissues throughout life.
- Metabolic reactions, controlled by enzymes, transfer energy and build the molecules cells need.
- DNA is transcribed and translated into proteins, and changes in genetic information can alter cell function.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 1-4 (formative, aligned to the Rutgers exam blueprint).
2. Anatomical terminology and body-region lab: planes, directions, cavities, and regions.
3. Cell and membrane transport investigations: microscope observation, diffusion and osmosis lab.
4. Metabolism and protein synthesis modeling task: enzyme action, cellular respiration, transcription and translation.
5. Unit 1 Test (24 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1221 Credit-by-Examination (Exam 1), administered at the conclusion of Semester 1 (Unit 1 content represents 24 of the 100 blueprint questions).

Objectives (SLO)

Topic 1.1: Introduction to Human Anatomy and Physiology (Chapter 1)

- Origins of Medical Science
- Anatomy and Physiology overview
- Levels of Organization
- Core Themes in Anatomy and Physiology
- Life and the Maintenance of Life
- Organization of the Human Body
- Life-Span Changes
- Anatomical Terminology
- Medical and Applied Science Terminology

Topic 1.2: Chemical Basis of Life (Chapter 2)

- Importance of Chemistry in Anatomy and Physiology
- Structure of Matter
- Chemical Constituents of Cells

Topic 1.3: Cells (Chapter 3)

- Cells are the Basic Units of the Body
- A Composite Cell
- Movements into and out of the Cell
- The Cell Cycle
- Control of Cell Division
- Stem and Progenitor Cells
- Cell Death

Topic 1.4: Cellular Metabolism (Chapter 4)

- Metabolic Processes
- Control of Metabolic Processes
- Energy of Metabolic Reactions
- Cellular Respiration
- Nucleic Acids and Protein Synthesis
- Changes in Genetic Information

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 1-4); Hoehn, K. Marieb Human Anatomy and Physiology with Mastering A and P (12th ed.), Pearson (alternate text listed in the outline); Rutgers IDST 1221 Course and Exam Outline.

Modifications

Special Education-

Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.

● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .

ML-

● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading

Gifted and Talented-

● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills

504-

Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.

● Provide additional time for in-class assignments and assessments

● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.

At Risk-

● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☐ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☐ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☑ Use technology to enhance productivity.
- ☐ Work productively in teams while using cultural global competence.

Unit 2

Tissues and the Integumentary System

Summary and Rationale

Tissues are the bridge between cells and organs, and the skin is the body's largest organ and first line of defense. Students study how cells are organized into epithelial, connective, muscle, and nervous tissues, the types of membranes, and how tissue structure relates to function. They then apply tissue concepts to the integumentary system: the layers and tissues of the skin, accessory structures such as hair, nails, and glands, the functions of skin, the healing of wounds and burns, and life-span changes. Overall, this unit shows students how structure determines function at the tissue and organ level and prepares them to recognize tissues in every organ system they study later.

Recommended Pacing

3 weeks (~10 class periods)
Exam weight: 15% of Exam 1 (15 of 100 questions; Chapters 5-6)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How are cells organized into the four primary tissue types, and how does each tissue's structure relate to its function?
- What are the types of body membranes, and what do they do?
- What are the layers and tissues of the skin?
- What roles do hair, nails, and skin glands play in protection and homeostasis?
- How does the skin help regulate temperature, protect the body, and sense the environment?
- How do wounds and burns heal, and how does skin change across the life span?

Unit Enduring Understandings:

- Tissues are groups of similar cells that perform a common function, and tissue structure reflects that function.
- Epithelial, connective, muscle, and nervous tissues combine to form organs.
- Membranes line cavities and cover organs, providing protection and lubrication.
- The integumentary system protects, regulates temperature, and senses the environment.
- Skin repairs itself through predictable stages, and the severity of injury affects healing.
- Aging produces structural and functional changes in skin and other tissues.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 5-6 (formative, aligned to the Rutgers exam blueprint).
2. Histology lab: identification of epithelial, connective, muscle, and nervous tissues from slides or images.
3. Skin model and thermoregulation investigation (structure and function; feedback and homeostasis).
4. Case analysis: wound healing and burn classification.
5. Unit 2 Test (15 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1221 Credit-by-Examination (Exam 1), administered at the conclusion of Semester 1 (Unit 2 content represents 15 of the 100 blueprint questions).

Objectives (SLO)

Topic 2.1: Tissues (Chapter 5)

- Cells are Organized into Tissues
- Epithelial Tissues
- Connective Tissues
- Types of Membranes
- Muscle Tissues
- Nervous Tissues

Topic 2.2: Integumentary System (Chapter 6)

- Skin and its Tissues
- Accessory Structures of the Skin
- Skin Functions
- Healing of Wounds and Burns
- Life-Span Changes

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 5-6); Hoehn, K. Marieb Human Anatomy and Physiology with Mastering A and P (12th ed.), Pearson (alternate text listed in the outline); Rutgers IDST 1221 Course and Exam Outline.

Modifications

Special Education-

Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.

● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .

ML-

● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading

Gifted and Talented-

● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills

504-

Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.

● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker

● Offer individual help throughout the lesson
● Modify readings and primary source documents.

At Risk-

● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☑ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☐ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☑ Use technology to enhance productivity.
- ☐ Work productively in teams while using cultural global competence.

Unit 3

The Skeletal System and Joints

Summary and Rationale

The skeletal system supports and protects the body, stores minerals, produces blood cells, and, together with joints, makes movement possible. Students study bone shape and structure, bone development and growth, and bone function, then learn the organization of the skeleton region by region: skull, vertebral column, thoracic cage, pectoral girdle, upper limb, and lower limb. They then examine the types of joints, joint movements, and examples of synovial joints, along with life-span changes in bones and joints. Students identify and locate major bones and landmarks using models and images. Overall, this unit develops the anatomical vocabulary and spatial reasoning needed for the muscular system and for later clinical coursework, and challenges students to relate bone and joint structure to function.

Recommended Pacing

4 weeks (~13 class periods)
Exam weight: 20% of Exam 1 (20 of 100 questions; Chapters 7-8)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How do the shape and structure of bones relate to their functions?
- How do bones develop, grow, and remodel throughout life?
- What are the functions of the skeletal system, including its role in mineral homeostasis and blood cell formation?
- How is the skeleton organized, and what are the major bones and landmarks of each region?
- How are joints classified, and how do their structures allow different movements?
- What are examples of synovial joints, and how do they function?
- How do bones and joints change over the life span?

Unit Enduring Understandings:

- Bone is living tissue that grows, remodels, and repairs itself.
- Bones support, protect, store minerals, produce blood cells, and serve as levers for movement.
- The axial and appendicular divisions of the skeleton are organized into regions with distinctive structures.
- Joint structure determines the type and range of movement possible.
- Synovial joints are freely movable and vulnerable to injury and degeneration.
- Aging and hormonal changes affect bone density and joint function.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 7-8 (formative, aligned to the Rutgers exam blueprint).
2. Skeleton lab practical: identification and location of major bones and landmarks by region.
3. Joint classification and movement activity: demonstrating and naming joint movements.
4. Case analysis: bone fracture healing and common joint disorders.
5. Unit 3 Test (20 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1221 Credit-by-Examination (Exam 1), administered at the conclusion of Semester 1 (Unit 3 content represents 20 of the 100 blueprint questions).

Objectives (SLO)

Topic 3.1: Skeletal System (Chapter 7)

- Bone Shape and Structure
- Bone Development and Growth
- Bone Function
- Skeletal Organization
- Skull
- Vertebral Column
- Thoracic Cage
- Pectoral Girdle
- Upper Limb
- Lower Limb
- Life-Span Changes

Topic 3.2: Joints in the Skeletal System (Chapter 8)

- Types of Joints
- Types of Joint Movements
- Examples of Synovial Joints
- Life-Span Changes

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 7-8); Hoehn, K. Marieb Human Anatomy and Physiology with Mastering A and P (12th ed.), Pearson (alternate text listed in the outline); Rutgers IDST 1221 Course and Exam Outline; skeletal models and anatomical imaging resources.

Modifications

Special Education-

Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.

● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .

ML-

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● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading

Gifted and Talented-

● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests

● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills

504-

Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.

● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.

At Risk-

● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☑ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☐ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☑ Use technology to enhance productivity.
- ☐ Work productively in teams while using cultural global competence.

Unit 4

The Muscular System

Summary and Rationale

Muscle tissue converts chemical energy into movement, maintains posture, and generates heat. Students study the structure of a skeletal muscle, the mechanism of skeletal muscle contraction, and muscular responses such as twitch, summation, tetanus, and muscle fatigue. They compare skeletal, smooth, and cardiac muscle, learn how skeletal muscles act together to produce movement, and identify the major skeletal muscles by location, action, origin, and insertion. Life-span changes in muscle are also considered. Overall, this unit connects cellular energy metabolism from Unit 1 and bone and joint structure from Unit 3 to whole-body movement, and prepares students for nervous system control of muscle in Unit 5.

Recommended Pacing

3 weeks (~10 class periods)
Exam weight: 14% of Exam 1 (14 of 100 questions; Chapter 9)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How is a skeletal muscle organized from muscle fibers to the whole muscle?
- How do muscle fibers contract, and how is contraction powered?
- How do muscles respond to stimulation, and what factors affect muscle response and fatigue?
- How do skeletal, smooth, and cardiac muscle differ in structure, control, and function?
- How do muscles work together to produce movement?
- What are the locations and actions of the major skeletal muscles?
- How does muscle change with age?

Unit Enduring Understandings:

- Skeletal muscle structure, from fiber to fascicle to whole muscle, is related to its ability to produce force.
- Muscle contraction depends on nervous stimulation, calcium, and energy from ATP.
- Muscular responses vary with stimulus strength and frequency, and metabolism limits endurance.
- Skeletal, smooth, and cardiac muscle are specialized for different functions.
- Muscles produce movement by pulling on bones, and coordinated action involves prime movers, synergists, and antagonists.
- Muscle mass and strength change across the life span.

Evidence of Learning (Assessments)

1. Chapter 9 quiz (formative, aligned to the Rutgers exam blueprint).
2. Muscle structure and sliding-filament modeling task.
3. Muscle response and fatigue investigation (for example, grip strength and fatigue data collection and analysis).
4. Major muscles lab practical: identification, location, and action.
5. Unit 4 Test (14 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1221 Credit-by-Examination (Exam 1), administered at the conclusion of Semester 1 (Unit 4 content represents 14 of the 100 blueprint questions).

Objectives (SLO)

Topic 4.1: Muscular System (Chapter 9)

- Structure of a Skeletal Muscle
- Skeletal Muscle Contraction
- Muscular Responses
- Smooth Muscle
- Cardiac Muscle
- Skeletal Muscle Actions
- Major Skeletal Muscles
- Life-Span Changes

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapter 9); Hoehn, K. Marieb Human Anatomy and Physiology with Mastering A and P (12th ed.), Pearson (alternate text listed in the outline); Rutgers IDST 1221 Course and Exam Outline; muscle models and anatomical imaging resources.

Modifications

Special Education-

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● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
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● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .

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● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading

Gifted and Talented-

● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests

● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills

504-

Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.

● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.

At Risk-

● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

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- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☐ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☑ Use technology to enhance productivity.
- ☐ Work productively in teams while using cultural global competence.

Unit 5

The Nervous System and the Senses

Summary and Rationale

The nervous system is the body's rapid communication and control network, detecting changes, integrating information, and coordinating responses. Students begin with the basic structure and function of the nervous system: neurons and neuroglia, the synapse, cell membrane potential, synaptic transmission, and impulse processing. They then study the divisions of the nervous system, including the meninges, ventricles and cerebrospinal fluid, brain, spinal cord, peripheral nervous system, and autonomic nervous system. Finally, they examine sensory function, from receptors, sensation, and perception to the general and special senses. Throughout, students connect membrane physiology from Unit 1 and muscle control from Unit 4 to neural function and consider life-span changes. Overall, this unit completes Semester 1 and challenges students to explain

how electrical and chemical signaling coordinates the body and maintains homeostasis.

Recommended Pacing

5 weeks (~17 class periods): 4 weeks of instruction and 1 week of cumulative review for Exam 1
Exam weight: 27% of Exam 1 (27 of 100 questions; Chapters 10-12)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- What are the general functions of the nervous system, and what cells make it up?
- How do neurons generate and conduct impulses, and how do they communicate at synapses?
- How is the nervous system divided, and how do the brain, spinal cord, and peripheral nerves work together?
- How do the meninges, ventricles, and cerebrospinal fluid protect and support the central nervous system?
- How does the autonomic nervous system regulate involuntary functions?
- How do receptors convert stimuli into sensation, and how does the brain produce perception?
- How do the general and special senses work, and how do they change with age?

Unit Enduring Understandings:

- The nervous system detects stimuli, integrates information, and produces responses.
- Neurons communicate through changes in membrane potential and chemical neurotransmission at synapses.
- The central and peripheral divisions of the nervous system have distinct structures and cooperate to control the body.
- The autonomic nervous system maintains homeostasis through its sympathetic and parasympathetic divisions.
- Sensory receptors convert stimuli into nerve impulses, and the brain interprets those impulses as sensation and perception.
- Nervous system and sensory function change across the life span.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 10-12 (formative, aligned to the Rutgers exam blueprint).
2. Neuron, synapse, and action potential modeling task.
3. Brain and spinal cord anatomy lab: structures, meninges, ventricles, and cerebrospinal fluid.
4. Reflex and sensory investigations (for example, reaction time, general sensation mapping, vision and hearing tests) with data analysis.
5. Unit 5 Test (27 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1221 Credit-by-Examination (Exam 1), administered at the conclusion of Semester 1 (Unit 5 content represents 27 of the 100 blueprint questions; the exam covers Units 1-5).

Objectives (SLO)

Topic 5.1: Nervous System I: Basic Structure and Function (Chapter 10)

- General Characteristics of the Nervous System
- General Functions of the Nervous System
- Description of Cells of the Nervous System
- Classification of Cells of the Nervous System
- The Synapse
- Cell Membrane Potential
- Synaptic Transmission
- Impulse Processing

Topic 5.2: Nervous System II: Divisions of the Nervous System (Chapter 11)

- General Characteristics of the Divisions of the Nervous System
- Meninges
- Ventricles and Cerebrospinal Fluid
- Brain
- Spinal Cord
- Peripheral Nervous System
- Autonomic Nervous System
- Life-Span Changes

Topic 5.3: Nervous System III: Senses (Chapter 12)

- General Characteristics of Sensory Function
- Receptors, Sensation and Perception
- General Senses
- Special Senses
- Life-Span Changes

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 10-12); Hoehn, K. Marieb Human Anatomy and Physiology with Mastering A and P (12th ed.), Pearson (alternate text listed in the outline); Rutgers IDST 1221 Course and Exam Outline; brain, eye, and ear models and anatomical imaging resources.

Modifications

Special Education-

Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.

● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .

ML-

● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading

Gifted and Talented-

● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills

504-

Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.

● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.

At Risk-

● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☑ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☐ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☑ Use technology to enhance productivity.

☐ Work productively in teams while using cultural global competence.

Unit 6

The Endocrine System and Blood

Summary and Rationale

The endocrine system and blood both act as long-distance communication and transport systems, carrying chemical messages and materials throughout the body. Students study the general characteristics of the endocrine system, hormone action, and the control of hormone secretion, then examine each major gland (pituitary, thyroid, parathyroid, adrenal, pancreas, and others), stress and its effects, and life-span changes. They then turn to blood: its characteristics, cells, plasma, hemostasis, and blood groups and transfusions. Students connect hormonal feedback to the homeostasis concepts of Semester 1 and see how blood carries hormones, nutrients, gases, and immune cells to every tissue. Overall, this unit opens Semester 2 by building the regulatory and transport foundation needed for the cardiovascular, lymphatic, and other systems that follow.

Recommended Pacing

3 weeks (~10 class periods)
Exam weight: 19% of Exam 2 (19 of 100 questions; Chapters 13-14)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How do hormones act on target cells, and how is hormone secretion controlled?
- What are the major endocrine glands, the hormones they secrete, and the functions of those hormones?
- How do the body's responses to stress involve the endocrine system?
- What are the characteristics and functions of blood, and what are its components?
- How do blood cells and plasma contribute to transport, defense, and homeostasis?

- How does hemostasis stop bleeding?
- How do blood groups affect transfusions?

Unit Enduring Understandings:

- Hormones are chemical messengers that regulate growth, metabolism, reproduction, and homeostasis.
- Negative feedback controls most hormone secretion.
- Each endocrine gland secretes specific hormones with characteristic target tissues and effects.
- The body's stress response involves coordinated nervous and endocrine activity.
- Blood transports gases, nutrients, wastes, and hormones and defends against infection.
- Hemostasis protects against blood loss, and blood group compatibility is essential to safe transfusion.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 13-14 (formative, aligned to the Rutgers exam blueprint).
2. Hormone feedback loop modeling task (for example, thyroid, calcium, and blood glucose regulation).
3. Blood cell identification and blood typing investigation.
4. Case analysis: endocrine disorders and clinical blood disorders.
5. Unit 6 Test (19 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1222 Credit-by-Examination (Exam 2), administered at the conclusion of Semester 2 (Unit 6 content represents 19 of the 100 blueprint questions).

Objectives (SLO)

Topic 6.1: Endocrine System (Chapter 13)

- General Characteristics of the Endocrine System
- Hormone Action
- Control of Hormone Secretions
- Pituitary Gland
- Thyroid Gland
- Parathyroid Gland
- Adrenal Glands
- Pancreas
- Other Endocrine Glands
- Stress and its Effects
- Life-Span Changes

Topic 6.2: Blood (Chapter 14)

- Characteristics of Blood
- Blood Cells
- Plasma
- Hemostasis
- Blood Groups and Transfusions

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 13-14); Rutgers IDST 1222 Course and Exam Outline.

Modifications

Special Education-
Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.
● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .
ML-
● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading
Gifted and Talented-
● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills
504-
Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.
● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.
At Risk-
● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☑ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☑ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.

- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☐ Use technology to enhance productivity.
- ☑ Work productively in teams while using cultural global competence.

Unit 7

The Cardiovascular and Lymphatic Systems and Immunity

Summary and Rationale

The cardiovascular system circulates blood to meet the needs of every cell, while the lymphatic system returns tissue fluid to the blood and, with the immune system, defends the body against infection. Students study the general characteristics of the cardiovascular system, the structure and function of the heart, blood vessels, blood pressure, the paths of circulation, and the major arteries and veins. They then examine lymphatic pathways, tissue fluid and lymph, lymphatic tissues and organs, and the body's defenses against infection, including innate and adaptive immunity. Life-span changes are considered for each system. Overall, this unit gives students an integrated view of transport and defense and challenges them to explain how heart function, vessel dynamics, and immune responses maintain homeostasis.

Recommended Pacing

4 weeks (~13 class periods)
Exam weight: 26% of Exam 2 (26 of 100 questions; Chapters 15-16)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How does the heart's structure allow it to pump blood through the pulmonary and systemic circuits?

- How do the cardiac cycle and the heart's conduction system produce a coordinated heartbeat?
- How do the structures of arteries, capillaries, and veins relate to their functions?
- What factors determine and regulate blood pressure?
- What are the major arteries and veins, and what are the major paths of circulation?
- How do lymphatic vessels, tissues, and organs return fluid to the blood and support immunity?
- How do innate and adaptive immune defenses protect against infection?
- How do the cardiovascular and lymphatic systems change with age?

Unit Enduring Understandings:

- The heart is a muscular pump whose chambers, valves, and conduction system produce a coordinated, one-way flow of blood.
- Blood vessel structure reflects function, and blood pressure is regulated by the heart, vessels, and kidneys.
- Circulation delivers oxygen and nutrients and removes wastes through defined pulmonary and systemic paths.
- The lymphatic system maintains fluid balance and is central to immune function.
- Immunity combines nonspecific defenses with specific responses by lymphocytes.
- Cardiovascular and immune function change across the life span.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 15-16 (formative, aligned to the Rutgers exam blueprint).
2. Heart anatomy lab and blood flow tracing task.
3. Blood pressure and heart rate investigation (resting vs. exercise; data analysis).
4. Immune response flowchart or modeling task: innate and adaptive defenses.
5. Case analysis: cardiovascular disease and immune disorders.
6. Unit 7 Test (26 items, modeled on the Rutgers exam format).
7. Cumulative Rutgers IDST 1222 Credit-by-Examination (Exam 2), administered at the conclusion of Semester 2 (Unit 7 content represents 26 of the 100 blueprint questions).

Objectives (SLO)

Topic 7.1: Cardiovascular System (Chapter 15)

- General Characteristics of the Cardiovascular System
- The Heart
- Blood Vessels
- Blood Pressure
- Paths of Circulation
- Arterial System
- Venous System
- Life-Span Changes

Topic 7.2: Lymphatic System and Immunity (Chapter 16)

- Lymphatic Pathways
- Tissue Fluid and Lymph
- Lymphatic Tissues and Lymphatic Organs
- Body Defenses Against Infection (Immunity)

- Life-Span Changes

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 15-16); Rutgers IDST 1222 Course and Exam Outline; heart models and anatomical imaging resources.

Modifications

Special Education-
Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.
● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .
ML-
● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading
Gifted and Talented-
● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills
504-
Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.
● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.
At Risk-
● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☑ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.

- ☑ Communicate clearly and effectively and with reason.
- ☑ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☐ Use technology to enhance productivity.
- ☑ Work productively in teams while using cultural global competence.

Unit 8

Digestion, Nutrition, and Metabolism

Summary and Rationale

The digestive system converts food into the nutrients that cells use for energy, growth, and repair, and nutrition and metabolism determine how those nutrients are used. Students study the general characteristics of the digestive system and the structure and function of each organ: mouth, salivary glands, pharynx and esophagus, stomach, pancreas, liver and gallbladder, small intestine, and large intestine. They then examine carbohydrates, lipids, proteins, energy expenditure, appetite control, vitamins, minerals, healthy eating, and life-span changes. Students connect cellular respiration from Semester 1 to whole-body energy balance and to the endocrine control of metabolism studied in Unit 6. Overall, this unit helps students explain how the body obtains, processes, and uses nutrients and how nutrition affects health.

Recommended Pacing

3 weeks (~10 class periods)
Exam weight: 19% of Exam 2 (19 of 100 questions; Chapters 17-18)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How do the organs of the digestive tract and accessory organs work together to break down food and absorb nutrients?
- What roles do the pancreas, liver, and gallbladder play in digestion?
- How do the small and large intestines complete digestion, absorption, and waste formation?
- How are carbohydrates, lipids, and proteins digested, absorbed, and used by the body?
- How is energy expenditure measured, and how is appetite controlled?
- What are the functions of vitamins and minerals?
- What does healthy eating look like, and how do nutritional needs change across the life span?

Unit Enduring Understandings:

- Digestion is mechanical and chemical breakdown of food, and absorption moves nutrients into the blood and lymph.
- Accessory organs contribute enzymes, bile, and regulatory functions essential to digestion.
- Nutrients supply energy, building materials, and regulatory molecules for cells.
- Energy balance depends on intake, metabolic rate, and activity, and is regulated by hormones and the nervous system.
- Vitamins and minerals are required in small amounts for normal metabolism and health.
- Nutritional needs and digestive function change across the life span.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 17-18 (formative, aligned to the Rutgers exam blueprint).
2. Digestive tract anatomy lab and digestion pathway tracing task.
3. Enzyme and digestion investigation (for example, amylase or protease activity).
4. Nutrition analysis project: diet analysis, energy balance, and healthy-eating plan.
5. Unit 8 Test (19 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1222 Credit-by-Examination (Exam 2), administered at the conclusion of Semester 2 (Unit 8 content represents 19 of the 100 blueprint questions).

Objectives (SLO)

Topic 8.1: Digestive System (Chapter 17)

- General Characteristics of the Digestive System
- Mouth
- Salivary Glands
- Pharynx and Esophagus
- Stomach
- Pancreas
- Liver and Gallbladder

- Small Intestine
- Large Intestine
- Life-Span Changes

Topic 8.2: Nutrition and Metabolism (Chapter 18)

- Carbohydrates
- Lipids
- Proteins
- Energy Expenditures
- Appetite Control
- Vitamins
- Minerals
- Healthy Eating
- Life-Span Changes

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 17-18); Rutgers IDST 1222 Course and Exam Outline.

Modifications

Special Education-

Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.

● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .

ML-

● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading

Gifted and Talented-

● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills

504-

Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.

● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.

At Risk-

- Provide small group instruction for identified areas for growth
- Allow for alternate pathways for completion of assignments.
- Provide additional wait time for student responses to questions
- Pair oral instruction with visuals
- Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☑ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☑ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☐ Use technology to enhance productivity.
- ☑ Work productively in teams while using cultural global competence.

Unit 9

Respiration, Urinary Function, and Fluid, Electrolyte, and Acid-Base Balance

Summary and Rationale

The respiratory and urinary systems exchange gases and eliminate wastes, and together they regulate the water, electrolyte, and acid-base balance of the internal environment. Students study the organs of the respiratory system, the breathing mechanism, the control of breathing, alveolar gas exchange, and gas transport. They then examine the kidneys, urine formation, and the storage and elimination of urine, and finally the balance of water, electrolytes, and acid-base status, including acid-base imbalances and compensation. Students integrate these systems to explain how the lungs and kidneys cooperate with blood and buffers to keep pH and fluid volume within narrow limits. Overall, this unit is among the most integrative of the course and challenges students to apply chemistry, cellular respiration, and cardiovascular concepts to whole-body homeostasis.

Recommended Pacing

4 weeks (~13 class periods)

Exam weight: 23% of Exam 2 (23 of 100 questions; Chapters 19-21)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- What are the organs of the respiratory system, and how do they conduct and condition air?
- How do pressure changes produce breathing, and how is breathing controlled?
- How do oxygen and carbon dioxide move across the respiratory membrane and through the blood?
- What are the structures and functions of the kidneys, and how is urine formed?
- How are urine stored and eliminated?
- How does the body regulate water and electrolyte balance?
- How do buffers, the lungs, and the kidneys regulate acid-base balance, and how do they compensate for imbalance?

Unit Enduring Understandings:

- Ventilation and gas exchange supply oxygen to cells and remove carbon dioxide.
- Breathing is controlled by neural centers responding to chemical and other stimuli.
- The kidneys filter blood, regulate its composition, and produce urine through filtration, reabsorption, and secretion.
- Water and electrolyte balance is essential for cell function and blood pressure.
- Acid-base balance depends on buffers, respiratory regulation, and renal regulation, and imbalances can be compensated.
- Respiratory and urinary function change across the life span.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 19-21 (formative, aligned to the Rutgers exam blueprint).
2. Respiratory anatomy lab and breathing mechanics investigation (for example, lung volume measurements and data analysis).
3. Kidney and nephron modeling task: filtration, reabsorption, and secretion.
4. Acid-base case analysis: identifying imbalance and compensation.
5. Unit 9 Test (23 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1222 Credit-by-Examination (Exam 2), administered at the conclusion of Semester 2 (Unit 9 content represents 23 of the 100 blueprint questions).

Objectives (SLO)

Topic 9.1: Respiratory System (Chapter 19)

- General Characteristics of the Respiratory System
- Organs of the Respiratory System
- Breathing Mechanism
- Control of Breathing
- Alveolar Gas Exchange
- Gas Transport
- Life-Span Changes

Topic 9.2: Urinary System (Chapter 20)

- General Characteristics of the Urinary System
- Kidneys
- Urine Formation
- Storage and Elimination of Urine
- Life-Span Changes

Topic 9.3: Water, Electrolytes, and Acid-Base Balance (Chapter 21)

- Water Balance
- Electrolyte Balance
- Acid-Base Balance
- Acid-Base Imbalance
- Compensation

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 19-21); Rutgers IDST 1222 Course and Exam Outline.

Modifications

Special Education-

Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.

● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .

ML-

● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading

Gifted and Talented-

● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills

504-

Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.

● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.

At Risk-

● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

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- ☑ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☑ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☑ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☐ Use technology to enhance productivity.
- ☑ Work productively in teams while using cultural global competence.

Unit 10

Reproduction, Development, and Genetics

Summary and Rationale

Reproduction, development, and genetics explain how life continues, how a single cell becomes a complex organism, and how traits are inherited. Students study meiosis and sex cell production, the organs and hormonal control of the male and female reproductive systems, mammary glands, birth control, and sexually transmitted infections. They then follow human development through fertilization, pregnancy and the prenatal period, the postnatal period, and aging. Finally, they explore genes and genomes, modes of inheritance, factors that affect the expression of single genes, multifactorial traits, matters of sex, chromosome disorders, and genomics in healthcare. Students draw on cell division, protein synthesis, and endocrine regulation from earlier units. Overall, this culminating unit connects molecular genetics to whole-organism development and prepares students for the Cumulative Rutgers Exam.

Recommended Pacing

4 weeks (~13 class periods): 3 weeks of instruction and 1 week of cumulative review for Exam 2
Exam weight: 13% of Exam 2 (13 of 100 questions; Chapters 22-24)

Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Interdisciplinary Connections

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

Instructional Focus

Unit Essential Questions:

- How does meiosis produce sex cells, and how does it differ from mitosis?
- What are the structures and hormonal controls of the male and female reproductive systems?
- How do birth control methods work, and how are sexually transmitted infections transmitted, prevented, and treated?
- How do fertilization, prenatal development, and the postnatal period produce a new individual?
- How do genes and genomes determine inherited traits, and what are the modes of inheritance?

- What factors affect gene expression, and how do multifactorial traits, sex-linked traits, and chromosome disorders arise?
- How is genomic knowledge changing healthcare?

Unit Enduring Understandings:

- Meiosis produces genetically varied sex cells with half the chromosome number.
- Hormones from the hypothalamus, pituitary, and gonads regulate reproductive function.
- Reproductive health includes understanding contraception and the prevention and treatment of sexually transmitted infections.
- Human development proceeds through predictable prenatal and postnatal stages and continues into aging.
- Inheritance follows patterns that can be predicted, and gene expression is influenced by genes, environment, and other factors.
- Chromosome disorders arise from changes in chromosome number or structure.
- Genomics is transforming diagnosis, treatment, and prevention in healthcare.

Evidence of Learning (Assessments)

1. Chapter quizzes for Chapters 22-24 (formative, aligned to the Rutgers exam blueprint).
2. Reproductive anatomy and hormone-cycle modeling task.
3. Prenatal development timeline project.
4. Genetics problem set and case analysis: Punnett squares, pedigrees, inheritance patterns, and chromosome disorders; genomics in healthcare discussion.
5. Unit 10 Test (13 items, modeled on the Rutgers exam format).
6. Cumulative Rutgers IDST 1222 Credit-by-Examination (Exam 2), administered at the conclusion of Semester 2 (Unit 10 content represents 13 of the 100 blueprint questions; the exam covers Units 6-10).

Objectives (SLO)

Topic 10.1: Reproductive Systems (Chapter 22)

- Meiosis and Sex Cell Production
- Organs of the Male Reproductive System
- Hormonal Control of Male Reproductive Functions
- Organs of the Female Reproductive System
- Hormonal Control of Female Reproductive Functions
- Mammary Glands
- Birth Control
- Sexually Transmitted Infections

Topic 10.2: Pregnancy, Growth and Development (Chapter 23)

- Fertilization
- Pregnancy and the Prenatal Period
- Postnatal Period
- Aging

Topic 10.3: Genetics and Genomics (Chapter 24)

- Genes and Genomes
- Modes of Inheritance

- Factors That Affect Expression of Single Genes
- Multifactorial Traits
- Matters of Sex
- Chromosome Disorders
- Genomics and Healthcare

Suggested Resources/Technology Tools

Shier, D., Butler, J., & Lewis, R. (2018). Hole's Human Anatomy and Physiology. McGraw Hill (Chapters 22-24); Rutgers IDST 1222 Course and Exam Outline.

Modifications

Special Education-
Modifications and accommodations must be aligned to students' IEPs and uphold expectations of the plan lawfully.
● Allow additional time for skill mastery.
● Provide small group/ individualized instruction.
● Allow use of assistive technology.
● Anticipate needs; pre-teach if needed.
● Have student repeat directions to check for understanding.
● Highlight text/ visual presentation.
● Modify assessment/assignment content, format, length (benchmarks, tests and quizzes) .
ML-
● Provide additional wait time for student responses to questions
● Provide simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase.
● Speak clearly, using a normal tone and rate of speed, or slightly slower.
● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading
Gifted and Talented-
● Advance, accelerate, or compact content
● Support abstract and advanced higher-level thinking through differentiated questioning
● Allowance for adapting of content for individual student interests
● Provide assignments geared to development in areas of affect, creativity, cognition, and research skills
504-
Modifications and accommodations must be aligned to the 504 plan and uphold expectations of the plan lawfully.
● Provide additional time for in-class assignments and assessments
● Allow for computer with voice output, spelling and grammar checker
● Offer individual help throughout the lesson
● Modify readings and primary source documents.
At Risk-
● Provide small group instruction for identified areas for growth
● Allow for alternate pathways for completion of assignments.
● Provide additional wait time for student responses to questions
● Pair oral instruction with visuals
● Utilize manipulatives

For a full list of Accommodations and Modifications, please click here.

Career Readiness, Life Literacies, and Key Skills Practices (June 2020)

Please select all standards that apply to this unit of study:

- ☐ Act as a responsible and contributing citizen and employee.
- ☑ Apply appropriate academic and technical skills.
- ☑ Attend to personal health and financial well being.
- ☑ Communicate clearly and effectively and with reason.
- ☑ Consider the environmental, social and economics impacts of decisions.
- ☑ Demonstrate creativity and innovation.
- ☑ Employ valid and reliable research strategies.
- ☑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ☐ Model integrity, ethical leadership, and effective management.
- ☑ Plan education and career paths aligned to personal goals.
- ☐ Use technology to enhance productivity.
- ☐ Work productively in teams while using cultural global competence.