Escondido Union High School District

Human Anatomy and Physiology

EUHSD Board Approval Date: April 17, 2018
The EUHSD Human Anatomy and Physiology curriculum document is aligned to the new California Next Generation Science Standards. It identifies what students should be able to know and do by grade level in a comprehensive standards-based course of study. The curriculum document is updated annually based on student academic achievement data, research and best practices, and input from stakeholders. The EUHSD curriculum document contains the following documents and/or information:

A. Course Description
B. Course Guidelines/Requirements - graduation credit information, transcript information, adopted materials, adopted technology, assessment outline
C. Instructional Materials References
D. Scope and Sequence Map with Essential Standards outlined by Unit
E. References to key essential design and implementation documents

A comprehensive course of study and/or program is designed so that all students have access to the rigorous curriculum necessary to graduate high school demonstrating college and career readiness skills. Student-Centered learning provides opportunity for collaboration, communication, and a robust learning environment and provides opportunities for all students to meet the goals of the district’s Instructional Focus at the time of this writing: “All students communicate their thinking, ideas and understanding by effectively using oral, written and/or non-verbal expression.”

Key design considerations in the transition to the new California Next Generation Science Standards is a focus on changes in pedagogy. The NGSS instructional shifts guide classroom teaching and learning and form the foundation of curriculum and instructional design. Specific references to the key NGSS Instructional shifts are outlined within the 2015/2016 California Science framework document.

The curriculum document is aligned to the California Next Generation Science Standards: http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp
Human Anatomy and Physiology Course Description

The introductory course of Human Anatomy and Physiology is an NGSS aligned science course that focuses on a deeper understanding of the structure and function of the human body and mechanisms for maintaining homeostasis. It is an intense course for those who are planning on a career in medicine or veterinary medicine for biological research. Students will do readings and investigations that will prepare them to operate very effectively in freshman level college courses in this area.

(Honors) – The EUHSD Honors Human Anatomy & Physiology classes are designed to teach the core skills outlined with the Human Anatomy and Physiology curriculum document as well as provide extension-learning opportunities within unit. Honors teachers will incorporate required units as well as two additional units of study thus the honors course moves at a faster pace. Students in the honors program will be required to be well organized, attend to a variety of projects and/or writing tasks that seek to extend their learning. They may be asked to complete additional outside and/or in class tasks and will need a strong foundation in reading and writing. Consideration for honors placement includes a variety of data such as science teacher recommendation, class grades, test scores or other assessment data. The honors curriculum extensions are outlined within this document.

Course Requirements

<table>
<thead>
<tr>
<th>Course Length: Year Long</th>
<th>Grade Level: 11-12</th>
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<tbody>
<tr>
<td>UC/CSU Requirement:</td>
<td>Meets UC/CSU “d” requirements</td>
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<tr>
<td>Course Number (Semester A):</td>
<td>Transcript Abbreviation (Semester A):</td>
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<tr>
<td>(P) 4630</td>
<td>HUMN ANAT&amp;PHYS A P</td>
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<td>(H) 4616</td>
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<tr>
<td>Course Number (Semester B):</td>
<td>Transcript Abbreviation (Semester B):</td>
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<td>(P) 4631</td>
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<td>(H) 4617</td>
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<tr>
<td>Credits (Semester A):</td>
<td>5 Biological Science</td>
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<tr>
<td>Credits (Semester B):</td>
<td>5 Biological Science</td>
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<tr>
<td>Required Prerequisite/s:</td>
<td>Completion or Concurrent Enrollment in Algebra 1 or Math 1 (Integrated)</td>
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<tr>
<td>Recommended Prerequisite/s:</td>
<td>Biology &amp; Chemistry</td>
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<tr>
<td>Board Approval Date (Curriculum):</td>
<td>4/17/18</td>
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<tr>
<td>Board Approval Date (Materials):</td>
<td>4/17/18</td>
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<tr>
<td>Supplemental Instructional Material/s:</td>
<td>A variety of supplemental instructional materials have been written into the Scope and Sequence and will be updated in developing Unit Plans.</td>
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<tr>
<td>Technology and Resource/s:</td>
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<tr>
<td>• Individual student computer</td>
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<td>• Probeware</td>
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<tr>
<td>• Variety of classroom laboratory equipment</td>
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<tr>
<td>• Interactive Curriculum document with rubrics and detailed performance tasks plans</td>
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</tbody>
</table>
Assessment/s:
- Each unit of instruction outlines key performance based tasks required in order to address specific CA NGSS skills.
- Specific unit plans will be developed and will contain key unit formative and summative NGSS aligned assessments.
- Assessment is ‘science’ and three-dimensional learning must be assessed three dimensionally. To assess our students, we plan and conduct investigations about student learning and then analyze and interpret data to develop models of what students are thinking. These models allow us to predict the effect of additional teaching that addresses patterns we notice in student understanding and misunderstanding. Assessment allows us to progressively improve our teaching practice, spiraling upward.

Meeting the Needs of ELs:
- Utilize the student information system to acquire the language levels of EUHSD English Learners.
- In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf
- In 2014, the CA Department of Education adopted new ELA-ELD Framework, with specific strategies designed to meet the needs of EL students. Visit the following URL to learn more about the new frameworks: http://www.cde.ca.gov/ci/rl/cf/documents/elaeldfwchapter11.pdf
The Scope and Sequence Guide is a California standards based document that delineates the standards based skills students are expected to know and do in order to meet College and Career Readiness expectations. Each unit of study in the Scope and Sequence document is designed to build upon the previous unit and/or prerequisite coursework in support of student mastery of specific standards based skills. The Scope and Sequence document provides the framework of understanding for key assignments, key assessments, and instructional resources and strategies that serve to assist students in meeting unit-learning objectives. The document will be updated annually with input from all stakeholders.

In coursework requiring reading and writing, the following standards are not specifically stated in any one unit of study, but are the result of implementation throughout the curriculum as students participate in reading, writing, and speaking/listening standards based activities.

- By the end of grade 11, students will read and comprehend literary nonfiction in the grades 11-CCR text completely and proficiently, with scaffolding as needed at the high range. (Reading Informational Text Standard 10)
- Students will write routinely over extending time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks and purposes. (Writing Standard 10)
- “To be college and career ready, students must have ample opportunities to take part in a variety of rich and structured conversations – as part of a whole class, in small groups, and with a partner – build around important content in various domains. They must be able to contribute appropriately to conversations, make comparisons and contrasts, and analyze and synthesize a multitude of ideas according to the standards of evidence appropriate to a particular discipline.” (Standards for ELA Anchor Standards for Speaking/Listening)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Regular and/or Honors*</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Introduction</td>
<td>Regular/Honors</td>
<td>1</td>
</tr>
<tr>
<td>2: Integumentary System</td>
<td>Regular/Honors</td>
<td>1</td>
</tr>
<tr>
<td>3: Muscoskeletal Systems</td>
<td>Regular/Honors</td>
<td>1</td>
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<tr>
<td>4: Nervous System</td>
<td>Regular/Honors</td>
<td>2</td>
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<tr>
<td>5: Respiratory and Circulatory Systems</td>
<td>Regular/Honors</td>
<td>2</td>
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<tr>
<td>6: Digestive System</td>
<td>Regular/Honors</td>
<td>2</td>
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<tr>
<td>7: Urinary System</td>
<td>Honors*</td>
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<tr>
<td>8: Lymphatic and Immune Systems</td>
<td>Honors*</td>
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<tr>
<td>9: Endocrine and Reproductive Systems</td>
<td>Honors*</td>
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*Honors teachers select two additional units of study
Human Anatomy and Physiology Scope and Sequence
Unit 1 – Introduction to the Human Body
Length: 3-4 Weeks

**Unit Description:** This unit introduces students to levels of cellular organization in the human body, the process and purpose of homeostasis, and terminology related to anatomy, direction, and position as used by medical professionals. Students generate models, perform experiments and take a lab safety quiz to show their understanding of the material.

**Focus Unit 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. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

**Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)**

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system. [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

**Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)**

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

**Key Learning Objectives:**

Students will be able to…

- Identify tissue types microscopically: epithelial, connective, muscle, nervous.
- Differentiate between the nuclei, cells, and tissue.
- Make a model and label major types epithelium and connective tissues.
- Use anatomical and directional vocabulary to describe the location of major parts of the body.
- Perform an experiment to explain with evidence why the body needs to maintain homeostasis.
- Make and use a model of positive and negative feedback loops to describe homeostatic mechanisms.
- Explain the role of lab safety in the classroom.

**Essential Questions:**

- How is the body organized?
- How would someone in medicine describe location/parts of human body?
- Why does the body need to maintain homeostasis?

**Unit Assignments & Assessments:**

- **1-1 Anatomical Position:** Using models, students will collaboratively work together in small groups to use anatomical and directional vocabulary to describe the location of major parts of the body. They will be able to take a novel scenario to communicate the location(s) that has been provided.

- **1-2 Homeostasis:** Students will perform an experiment to test feedback mechanisms associated with homeostasis (i.e. heart rate, temperature...). They will create a model of positive and negative feedback loops and will use their model to explain why the body needs to maintain homeostasis.

- **1-3 Tissues of the Body:** Students will participate in a histology lab identifying the various types of tissues of the body (connective, muscular, epithelial, and nervous). They will draw and label the tissue types. They will compare and contrast cells and tissues. They will then take a lab practical to assess their ability to visually identify the tissues.

- **1-4 Lab Safety:** Students will participate in lab safety training. Students will participate in a written lab safety test. Students must complete the test with at least 80% accuracy.

- **1-5 Portfolio/Interactive Notebook:** Students will create a portfolio that will serve as storage of their lab reports, research projects (short and long term), and other key documents and learning experiences. Teachers may choose to utilize a print or digital notebook.
Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**Crosscutting Concepts:**
- Systems and system models
- Cause and effect: mechanism and explanation
- Patterns
- Scale/Proportion and Quantity
- Structure and function

**Science and Engineering Practices**
- Engaging in argument from evidence
- Developing and using models
- Planning and carrying out investigations
- Asking questions and defining problems
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information

**Assessments:**
- 1-1: Model
- 1-2: Model, Lab Report
- 1-3: Lab Practical
- 1-4: Safety Quiz
- 1-5: Notebook Rubric
Human Anatomy and Physiology Scope and Sequence

Unit 2 – Integumentary System

Length: 2-3 Weeks

**Unit Description:** Students model and experimentally explore the structure/function of hair, skin, nails, and glands. They explain the effects of aging on the integumentary system and present their findings to their peers.

**Focus Unit 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. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

**Systems of specialized cells within organisms help them perform the essential functions of life.** (HS-LS1-1)

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

**Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.** (HS-LS1-2)

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

**Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through**

**Key Learning Objectives:**

Students will be able to…

- Use a microscope to analyze and identify various features related to the skin.
- Make a model that describes the layers and structures of the epidermis and dermis.
- Argue with evidence the role of skin on the body and its variation according to location.
- Describe the structure and function of hair, skin, and nails.
- Compare and contrast glands in the skin (apocrine vs eccrine).
- Describe how the skin relates to homeostasis within the human body.
- Describe the effects of aging on integumentary system (honors).
- Research and communicate information about skin and the integumentary system.
- Ask questions and define the problem that results in a specific skin disease.
- Conduct an experiment to test the effects of skin insulation and thermoregulation.

**Essential Questions:**

- What is the skin’s role in maintaining homeostasis?
- How does that endocrine and integumentary system work together?
- What are the effects of aging and the environment on the integumentary system?

**Unit Assignments & Assessments:**

- **2-1 Modeling Layers of Skin:** Students will draw and label a model of the layers of skin, identifying the major important features (e.g. hair, nails, epidermis, dermis, glands…). Students will then use a model to argue with evidence the type of skin they are looking at (thick vs thin) then identify where on the body it could be found and why it is there.
- **2-2 Homeostasis of the Skin:** Students will participate in an experiment to test the effects of various insulating properties of the skin and its effect on thermoregulation. Still will write a lab report to share their findings.
- **2-3 Diseases of the Skin:** Students will look at pictures of people with various skin diseases. They will generate a list of questions about the images. They will research a skin disease specifically finding the symptoms, causes, treatments, and prognosis as well as various other questions about their specific skin disease. They will present their findings to their peers.

**Assessments:**

- **2-1 Modeling, CER**
- **2-2 Lab Report**
- **2-3 Questions, Presentation**
positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**Crosscutting Concepts**
- Systems and system models
- Cause and effect: mechanism and explanation
- Patterns
- Scale/Proportion and Quantity
- Structure and function
- Stability and Change

**Science and Engineering Practices**
- Engaging in argument from evidence
- Developing and using models
- Planning and carrying out investigations
- Analyzing and Interpreting Data
- Asking questions and defining problems
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information
# Human Anatomy and Physiology Scope and Sequence

## Unit 3 – Musculoskeletal

**Length:** 5-6 Weeks

**Unit Description:** In this unit, students experiment to identify and describe the function of major muscles, bones, and joints in the human body. Students explain the mechanism of muscle contraction and the effect of aging on the musculoskeletal systems.

<table>
<thead>
<tr>
<th>Focus Unit Standards</th>
<th>Key Learning Objectives</th>
<th>Unit Assignments &amp; Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HS-LS1-1</strong> 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. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]  Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)</td>
<td><strong>Students will be able to…</strong>  - Describe and explain bone structure and function.  - Compare and contrast joint types.  - Compare and contrast three types of lever system represented in the human body.  - Identify type, location and function of major muscles in human body.  - Describe when and why skeletal muscles do aerobic and anaerobic respiration (Lactic acid fermentation)* (honors).  - Describe and explain sliding filament mechanism* (honors).  - Use data to explain the effects of aging on the skeletal system* (honors).</td>
<td><strong>3-1 Bone, Joint, Muscle Lab:</strong> Students will identify the major structure and function of bones and muscles. They will evaluate the types of joints and lever systems within the human body. They will communicate their understanding through a lab practical.  <strong>3-2 EMG and Muscle Fatigue Lab:</strong> Students will conduct an experiment to correlate grip strength with electrical activity of a muscle. They will collect and analyze graphical data of muscle activity and will generate a lab report. (Honors Extension: Tie in the role of aerobic vs anaerobic respiration)</td>
</tr>
<tr>
<td><strong>HS-LS1-2</strong> Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]  Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)</td>
<td><strong>Essential Questions:</strong>  - How do the muscular and skeletal system work together to allow for bodily movement?  - How does the muscular and skeletal systems help the body maintain homeostasis?</td>
<td><strong>Assessments:</strong>  - 3-1: Lab Practical  - 3-2: Lab Report</td>
</tr>
<tr>
<td><strong>HS-LS1-3</strong> Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to...</td>
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</table>
Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

Crosscutting Concepts:
- Systems and system models
- Structure and function
- Energy and matter
- Stability and Change
- Cause and effect: mechanism and explanation
- Patterns
- Scale/Proportion and Quantity

Science and Engineering Practices
- Engaging in argument from evidence
- Developing and using models
- Planning and carrying out investigations
- Analyzing and Interpreting Data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information
# Human Anatomy and Physiology Scope and Sequence
## Unit 4 – Nervous System
### Length: 6 Weeks

**Unit Description:** Students describe the structure and function of the major parts of the nervous system and neuron. Students interpret graphs of action potentials; research diseases associated with the nervous system and present their findings.

**Focus Unit Standards:**

- **HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.] Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

- **HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomaire response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.] Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**Crosscutting Concepts:**
- Systems and system models
- Structure and function
- Stability and Change
- Cause and effect: mechanism and explanation

**Key Learning Objectives:**

- Students will be able to…
  - Describe the organization of the nervous system.
  - Describe the three basic functions of the nervous system.
  - Describe the series of events that results in an action potential.
  - Analyze a graph of an action potential.
  - Describe major sense organ structure and function.
  - Describe the functional components of a reflex arc and the ways reflexes maintain homeostasis.
  - Research and present on a disease of the nervous system.

**Essential Questions:**

- How does the nervous system help the body to maintain homeostasis?
- What is the relationship between the endocrine and nervous systems?
- How does the “message” to move travel from the brain to a particular muscle?
- How does the structure of the neuron relate to its function?

**Unit Assignments & Assessments:**

- **4-1 Nervous System Organization:** Students will do a series of hands-on activities and simulations to describe the structure and function of the nervous system. They will explore the role of the sense organs. Students will be able to use or generate a model to explain how the features of nervous system work together to send or receive a message.
- **4-2 Action Potential Activity:** Students will analyze and interpret graphs how an action potential is generated and propagated graphically and through models (online or physical simulation). They will communicate in writing the role that of sodium and potassium play in an action potential. Students will be able to describe either through a model, simulation or manipulative the process/steps of the action potential starting with the presynaptic neuron.
- **4-3 Reflex Lab:** Students will perform a variety of reflex activities (such as eye, patella reflex) and collect data (qualitative and/or quantitative) to be able to explain why the speed of a reflex (involuntary contractions) occurs faster than voluntary contractions. Students will generate a lab report of their findings. (Honors Extension: Students specifically analyze quantitative data.)
- **4-4 Nervous System Disease Research Project:** Students will choose a disease associated with the nervous system. They will generate a written summary and present their findings to the class.
- Patterns
- Scale/Proportion and Quantity

**Science and Engineering Practices**
- Engaging in argument from evidence
- Developing and using models
- Planning and carrying out investigations
- Analyzing and Interpreting Data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information
- Asking questions and defining problems

**Assessments:**
- 4-1: Model, Claim Evidence Reasoning
- 4-2: Model, Claim Evidence Reasoning
- 4-3: Lab Reports
- 4-4: Presentation, Essay
**Human Anatomy and Physiology Scope and Sequence**  
**Unit 5 – Respiratory & Circulatory Systems**  
**Length: 6 Weeks**

**Unit Description:** Students describe the general structure and function of the circulatory and respiratory systems. Students explain the functions of these systems in maintaining homeostasis. Students research diseases of these systems, plan, and carry out experiments to measure blood pressure, heart rate, and EKG.

**Focus Unit Standards:**

| HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.] | Key Learning Objectives: Students will be able to…  
• Describe the components and functions of the circulatory system.  
• Analyze and interpret an EKG wave tracing.  
• Describe the components and functions of the respiratory system.  
• Describe how the organs of the respiratory and circulatory system work together in order to maintain homeostasis.  
• Research and communicate information on diseases and disorders of the respiratory and circulatory system.  
• Plan and carry out investigations related to the respiratory and circulatory system maintaining homeostasis.  

| Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) |  

| HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.] | Essential Questions:  
• What roles do the respiratory and circulatory systems play in maintaining homeostasis?  
• How does structure of the respiratory system relate to its function?  
• How does the structure of the circulatory system relate to its function?  
• How does the endocrine system affect the respiratory and cardiovascular system?  

| Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3) |  

**Crosscutting Concepts:**  
• Systems and system models  
• Structure and function  
• Stability and Change  
• Cause and effect: mechanism and explanation

**Unit Assignments & Assessments:**

| 5-1 Structure and Function of Circulatory and Respiratory Systems: Students will identify the major structures and functions of the circulatory and respiratory systems. They use a graph of an EKG wave tracing to explain the structure and function of the heart. They will communicate their understanding through a lab practical. |  

| 5-2 Respiratory and Circulatory Homeostasis Lab: Students will plan and carry out an investigation to analyze how changes that occur in the respiratory and circulatory system help the body maintain homeostasis. Students will generate a lab report to share their findings. | Assessments:  
• 5-1: Lab Practical  
• 5-2: Lab Report  
• 5-3: presentation, Essay  

| 5-3 Respiratory/Circulatory Research Disease Project: Students will choose a disease associated with the circulatory or respiratory systems. They will generate a written summary and present their findings to the class. |  

**Assessments:**

| 5-1: Lab Practical  
| 5-2: Lab Report  
| 5-3: presentation, Essay |
- Patterns
- Scale/Proportion and Quantity

**Science and Engineering Practices**
- Engaging in argument from evidence
- Developing and using models
- Planning and carrying out investigations
- Analyzing and Interpreting Data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information
- Asking questions and defining problems
**Human Anatomy and Physiology Scope and Sequence**  
**Unit 6 – Digestive System**  
**Length: 2-3 Weeks**

**Unit Description:** Students describe the structure and function of the major parts of the digestive system. Students explore their experimentation and generate models to explain how the organs of the digestive system help maintain homeostasis. Students research and present on a disease of the digestive system.

**Focus Unit Standards:**

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**Crosscutting Concepts**
- Structure and function
- Systems and system models
- Patterns
- Energy and matter: flows, cycles and conservation

**Key Learning Objectives:**

Students will be able to...
- Describe the components and functions of the digestive system.
- Plan and conduct an experiment to study how chemicals and/or physical components of the system aid in digestion.
- Develop a model of the digestive system.
- Explain how the organs of the digestive system help to maintain homeostasis.
- Research and communicate information on diseases and disorders of the digestive system.

**Essential Questions:**
- How does the digestive system help the body to maintain homeostasis?
- What is the relationship between the endocrine and digestive systems?
- How does the structure of the organs of the digestive system relate to their functions?

**Unit Assignments and Assessments:**

- **6-1 Structure and Function of Digestive System:** Students will develop and use a model of the digestive system to explain the structures and functions of the components within this system to maintain homeostasis. The model will include the histological identification of various tissue types as seen underneath the microscope.
- **6-2 Digestive System Lab:** Plan and conduct an experiment to study how chemicals (enzymes, acids, etc.) and/or physical components of the system aid in digestion. Students will generate a lab report to share their findings.
- **6-3 Digestive System Research Disease Project:** Students will choose a disease associated with the digestive systems. They will generate a written summary and present their findings to the class.

**Assessments:**
- **6-1: Model, Claim Evidence Reasoning**
- **6-2: Lab Report**
- **6-3: Essay, Presentation**
- Stability and change
- Cause and effect: mechanism and explanation

**Science and Engineering Practices**

- Engaging in argument from evidence
- Obtaining, evaluating and communicating information
- Developing and using models
- Asking and defining problems
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
# Human Anatomy and Physiology Scope and Sequence

## Unit 7 – Urinary System

**Length:** 2-3 Weeks

**Unit Description:** Students describe the structure and function of the major parts of the urinary system. Through experimentation, students analyze urinalysis results to identify metabolic disorders. Students research and present on a disease of the urinary system.

### Focus Unit Standards:

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.][Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.][Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

### Key Learning Objectives:

**Students will be able to…**

- Describe the components and functions of the urinary system.
- Develop a model of the urinary system and the nephron.
- Explain how the organs of the urinary system help to maintain homeostasis.
- Analyze and interpret data from a urinalysis.

### Essential Questions:

- How does the urinary system help the body to maintain homeostasis?
- What is the relationship between the endocrine and urinary systems?
- How does the structure of the nephron relate to its function?

### Unit Assignments and Assessments:

**7-1 Structure and Function of Urinary System:** Through a series of activities, students will develop and use a model of the urinary system to explain the structures and functions of the components within this system to maintain homeostasis. Students will participate in a lab practical.

**7-2 Urinalysis Lab:** Students will conduct an experiment to study the components within urine. Students will then be given a report and/or samples to determine the homeostatic imbalance within the patient. Students will write an argument evidence as to the conditions that caused the imbalance.

### Assessments:

- 7-1: Lab Practical
- 7-2: Lab Report, Claim Evidence Reasoning

<table>
<thead>
<tr>
<th>Crosscutting Concepts:</th>
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<tbody>
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<td>• Systems and system models</td>
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<td>• Stability and Change</td>
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</tbody>
</table>
- Cause and effect: mechanism and explanation
- Patterns
- Scale/Proportion and Quantity

**Science and Engineering Practices**
- Engaging in argument from evidence
- Developing and using models
- Planning and carrying out investigations
- Analyzing and Interpreting Data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information
- Asking questions and defining problems
## Focus Unit 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. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

**Systems of specialized cells within organisms help them perform the essential functions of life.** (HS-LS1-1)

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

**Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.** (HS-LS1-2)

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

**Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through**

## Key Learning Objectives:

Students will be able to…
- Describe the structures and functions of the lymphatic system.
- Describe the structures and functions of the immune system.
- Develop a model of the epidemics spread (ex: Hep A, Ebola, patient zero, cholera).
- Explain how the organs of the lymphatic and immune systems help to maintain homeostasis.
- Analyze and interpret data from blood work sample.
- Evaluate a solution to a real-world epidemic or public health crisis.

## Essential Questions:

- How do the lymphatic and immune systems help the body maintain homeostasis?
- What is the relationship between the lymphatic, immune, and endocrine systems?
- How do the structures of the lymphatic and immune systems relate to their functions?

## Unit Assignments and Assessments:

- **8-1 Structure and Function of Lymphatic and Immune System:** Through a series of activities, students will develop and use a model of the lymphatic and immune systems. They will explain how the components within this system work together to maintain homeostasis. Students will participate in a lab practical.
- **8-2 Patient Study:** Students will be given data of various blood work samples to analyze the white blood cell count. Students will argue from evidence the overall health of an individual based on this data.
- **8-3 Epidemics:** Students will model the spread of diseases through simulations and/or hands-on activities. They will then evaluate a real-world solution to an outbreak and identify what was prioritized and what were the trade-offs to fix the problem.

## Assessments:

- 8-1: Lab Practical
- 8-2: Claim Evidence Reasoning
- 8-3: Model, Essay
positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**Crosscutting Concepts:**
- Cause and effect: mechanism and explanation
- Stability and Change
- Systems and system models
- Energy and matter
- Structure and function
- Patterns
- Scale/Proportion and Quantity

**Science and Engineering Practices**
- Engaging in argument from evidence
- Developing and using models
- Planning and carrying out investigations
- Analyzing and Interpreting Data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information
- Asking questions and defining problems
Human Anatomy and Physiology Scope and Sequence
Unit 9 – Endocrine and Reproductive Systems
Length: 2-4 Weeks

Unit 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. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through

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**Unit Description:** Students describe the structure and function of the major parts of the endocrine and reproductive systems. Students model and explain how the organs of the endocrine and reproductive systems help maintain homeostasis. Students perform an ELISA to assess patient health. Students research and present on a disease of the endocrine and/or reproductive systems.

**Unit 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. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

**Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)**

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

**Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)**

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and function even as external conditions change within the range. Feedback mechanisms can encourage (through

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**Learning Objectives:**

Students will be able to…

- Ask questions to clarify the relationships about the role of DNA and chromosome in coding the instructions for characteristic traits passed from parents to offspring.
- Describe the production of sex cells.
- Describe the structures and functions of the reproductive system.
- Describe the role of the endocrine system in relationship to other body systems.
- Develop a model to represent the positive feedback loop of childbirth and the female monthly cycle.
- Explain how the organs of the reproductive and endocrine systems help to maintain homeostasis.
- Analyze and interpret data from urine or blood work samples.
- Research and communicate their findings on a genetic disease of the reproductive system.

**Essential Questions:**

- How does the endocrine system help the body maintain homeostasis?
- What is the relationship between the reproductive and endocrine systems?

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**Unit Assignments and Assessments:**

- **9-1 Female Hormones:** Students will analyze graphs of the hormone levels associated with the female monthly cycle. They will then use the graphs and various models to answer questions about the cycle.
- **9-2 Positive Feedback Loop:** Students will create a model of a positive feedback loop within the body (ex. childbirth as it relates to homeostasis). They will then use a feedback loop model to explain how the endocrine system works to maintain homeostasis within the body.
- **9-3 ELISA:** Students will perform an ELISA experiment to mimic a pregnancy test or other possible protein assay. They will report their findings in a lab report.
- **9-4 Endocrine Gland Analysis:** Students will work collaboratively to learn about the various functions and locations of endocrine glands within the human body. They will share out their findings to their peers then be able to use the information acquired to make a claim with evidence as to the role of various glands and their jobs within the human body (e.g. What would happen is the gland did not exist?).
- **9-5 Endocrine/Reproductive System Research Disease Project:** Students will choose a disease associated with the endocrine and/or reproductive systems. They will generate a written summary about the disease: statistics, causes, symptoms and treatments. They will present their findings to the class.
positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.** [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

In multicellular organisms, individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

**Crosscutting Concepts:**

- Cause and effect: mechanism and explanation
- Stability and change
- Systems and system models
- Structure and function
- Patterns

**Science and Engineering Practices**

- Engaging in argument from evidence
- Obtaining, evaluating and communicating information
- Developing and using models
- Asking and defining problems
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and communicating information

| • How do the structures of the reproductive and endocrine systems relate to their functions? |
| Assessments: |
| • 9-1: Claim Evidence Reasoning |
| • 9-2: Model, Claim Evidence Reasoning |
| • 9-3: Lab Report |
| • 9-3: Claim Evidence Reasoning, Presentation |
| • 9-4: Essay, Presentation |