Hillside Township School District

Human Anatomy and Physiology

Grade 11-12

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Board of Education Approved:
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Hillside Township School District Human Anatomy and Physiology Curriculum

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Hillside Township School District Human Anatomy and Physiology Curriculum

District Mission Statement

The mission of the Hillside Public Schools is to ensure that all students at all grade levels achieve the Next Generation Science Standards and make connections to real-world success. We are committed to strong parent-community school partnerships, providing a safe, engaging, and effective learning environment, and supporting a comprehensive system of academic and developmental support that meets the unique needs of each individual.

Academic Area Overview

The Hillside Township School District is committed to excellence. We believe that all children are entitled to an education that will equip them to become productive citizens of the twenty-first century. We believe that an education grounded in the fundamental principles of science will provide students with the skills and content necessary to become our future leaders.

A sound science education is grounded in the principles of inquiry and rigor. Children are actively engaged in learning as they model real-world scientific behaviors to construct knowledge. They have ample opportunities to manipulate materials in ways that are developmentally appropriate to their age. They work in an environment that encourages them to take risks, think critically, and make models, note patterns and anomalies in those patterns. Children are encouraged to ask questions, not just the "how" and the "what" of observed phenomena, but also the "why".

Our program provides teachers with cost-effective science materials that are aligned to state and national standards, incorporate instructional strategies that are research-based, and provides teachers with a deep understanding of science and the pedagogical underpinnings of science. Our teachers receive quality professional development through a partnership with nearby districts. Our K-8 kit based program encourages "hands-on science" and is endorsed by the National Science Foundation.

Equality and Equity in Curriculum

The Hillside Township School District ensures that the district's curriculum and instruction are aligned to the Next Generation Science Standards and addresses the elimination of discrimination and the achievement gap, as identified by underperforming school-level AYP reports for State assessment, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

N.J.A.C. 6A:7-1.7(b): Section 504, Rehabilitation Act of 1973; N.J.S.A. 10:5; Title IX, Education Amendments of 1972

Hillside Township School District Human Anatomy and Physiology Curriculum

Next Generation Science Standards Overview

The New Jersey Student Learning Standards for Science (NJSLS-S) describe the expectations for what students should know and be able to do as well as promote three-dimensional science instruction across the three science domains (i.e., physical sciences, life science, Earth and space sciences). From the earliest grades, the expectation is that students will engage in learning experiences that enable them to investigate phenomena, design solutions to problems, make sense of evidence to construct arguments, and critique and discuss those arguments (in appropriate ways relative to their grade level). The foundation of the NJSLS-S reflects three dimensions — science and engineering practices, disciplinary core ideas, and crosscutting concepts. The performance expectations are derived from the interplay of these three dimensions. It is essential that these three components are integrated into all learning experiences. Within each standard document, the three dimensions are intentionally presented as integrated components to foster sensemaking and designing solutions to problems. Because the NJSLS-S is built on the notions of coherence and contextuality, each of the science and engineering practices and crosscutting concepts appear multiple times across New Jersey Department of Education January 2022 Page 1 of 200 topics and at every grade level. Additionally, the three dimensions should be an integral part of every curriculum unit and should not be taught in isolation.

Anatomy/Physiology Science Overview

Students in the Anatomy/ Physiology course continue to develop knowledge in the core disciplinary ideas described in the Next Generation Science Standards (NGSS) including science as inquiry. The course will introduce students to the scientific methodologies used in forensic investigations. The objectives of this course are to apply the Next Generation Science Standards (NGSS) Crosscutting Concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering.

Hillside Township School District Human Anatomy and Physiology Curriculum

New Jersey Studnet Learning Science Standards Performance Expectations for High School Biology

HS-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

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.]

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.]

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]

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. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

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. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- § Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)
- § Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

Planning and Carrying Out Investigations

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that

Disciplinary Core Ideas

LS1.A: Structure and Function

- § Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- § All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) *(Note: This Disciplinary Core Idea is also addressed by HS-LS3- 1.)*
- § Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a

Crosscutting Concepts

Systems and System Models

- § Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)

Energy and Matter

- § Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)
- § Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

Structure and Function

- § Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Stability and Change

- § Feedback (negative or positive) can stabilize or destabilize a system. (HS- LS1-3)

provide evidence for and test conceptual, mathematical, physical, and empirical models.

§ Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.

§ Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

§ Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

component of the next level. (HS-LS1-2)

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

LS1.B: Growth and Development of Organisms

§ 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)

LS1.C: Organization for Matter and Energy Flow in Organisms

§ The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)

§ The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)

§ As matter and energy flow through different

HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [*Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.*]

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using gr comparisons of multiple sets of data.] [*Assessment Boundary: Assessment is limited to provided data.*]

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [*Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.*]

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [*Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.*]

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [*Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.*]

HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show how relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
- Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2)
- Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)
- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)
- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8)

Scale, Proportion, and Quantity

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1)
- Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2)

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS2-5)

Energy and Matter

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS2-4)
- Energy drives the cycling of matter within and between systems. (HS-LS2-3)

Stability and Change

student-generated sources of evidence consistent with scientific ideas, principles, and theories. ● Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS2-3) ● Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7) **Engaging in Argument from Evidence** Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. ● Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6) ● Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. (HS-LS2-8) - ***Connections to Nature of Science*** **Scientific Knowledge is Open to Revision in Light of New Evidence**	**LS2.D: Social Interactions and Group Behavior** ● Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8) **LS4.D: Biodiversity and Humans** ● Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). *(secondary to HS-LS2-7)* ● Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.*(secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)* **PS3.D: Energy in Chemical Processes** ● The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. *(secondary to HS-LS2-5)* **ETS1.B: Developing Possible Solutions** ● When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts.*(secondary to HS-LS2-7)*	● Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

• Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-2),(HS-LS2-3) • Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (HS-LS2-6),(HS-LS2-8)		

Connections to other DCIs in this grade-band:

HS.PS1.B (HS-LS2-3),(HS-LS2-5); **HS.PS3.B** (HS-LS2-3),(HS-LS2-4); **HS.PS3.D** (HS-LS2-3),(HS-LS2-4); **HS.ESS2.A** (HS-LS2-3); **HS.ESS2.D** (HS-LS2-5),(HS-LS2-7);**HS.ESS2.E** (HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **HS.ESS3.A** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.C** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.D** (HS-LS2-2)

Articulation of DCIs across grade-bands:

MS.PS1.B (HS-LS2-3); **MS.PS3.D** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS1.B** (MS-LS2-8); **MS.LS1.C** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.A** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6); **MS.LS2.B** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.C**(HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS2.A** (HS-LS2-5); **MS.ESS3.A** (HS-LS2-1); **MS.ESS3.C** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS3.D** (HS-LS2-7)

Common Core State Standards Connections:

ELA/Literacy -

RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.(HS-LS2-6),*(HS-LS2-7),(HS-LS2-8)*

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies the account. *(HS-LS2-1),(HS-LS2-2),*(HS-LS2-3),(HS-LS2-6),(HS-LS2-8)

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. *(HS-LS2-6),(HS-LS2-7),(HS-LS2-8)*

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS2-1),(HS-LS2-2)*,(HS-LS2-3)

WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS2-3)

WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS2-7)

Mathematics -

MP.2 Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-6),*(HS-LS2-7)*

MP.4 Model with mathematics. *(HS-LS2-1),(HS-LS2-2),(HS-LS2-4)*

HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)*

HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. *(HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)*
HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)*
HSS-ID.A.1 Represent data with plots on the real number line. *(HS-LS2-6)*
HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. *(HS-LS2-6)*
HSS-IC.B.6 Evaluate reports based on data. (HS-LS2-6)

HS-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

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. [*Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.*]
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. [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.[Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [*Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.*]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)

Analyzing and Interpreting Data

Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for

Disciplinary Core Ideas

LS1.A: Structure and Function

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. *(secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)*

LS3.A: Inheritance of Traits

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)

LS3.B: Variation of Traits

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1),(HS-LS3-2)

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Connections to Nature of Science

Science is a Human Endeavor

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<tr>
<td>consistency, and the use of models to generate and analyze data.
● Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS3-3)
Engaging in Argument from Evidence
Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.
● Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)</td>
<td>occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)
● Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)</td>
<td>● Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
● Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)</td>
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<tr>
<td colspan="3">Connections to other DCIs in this grade-band:
HS.LS2.A (HS-LS3-3); HS.LS2.C (HS-LS3-3); HS.LS4.B (HS-LS3-3); HS.LS4.C (HS-LS3-3)</td>
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<tr>
<td colspan="3">Articulation of DCIs across grade-bands:
MS.LS2.A (HS-LS3-3); MS.LS3.A (HS-LS3-1),(HS-LS3-2); MS.LS3.B (HS-LS3-1),(HS-LS3-2),(HS-LS3-3); MS.LS4.C (HS-LS3-3)</td>
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<td colspan="3">Common Core State Standards Connections:
ELA/Literacy -
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS3-1),(HS-LS3-2)
RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-LS3-1)
WHST.9-12.1 Write arguments focused on discipline-specific content. (HS-LS3-2)</td>
</tr>
</table>

Mathematics -
MP.2 Reason abstractly and quantitatively. (HS-LS3-2),(HS-LS3-3)

HS-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [*Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.*]

HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [*Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.*]

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS4-3)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create or revise a simulation of a phenomenon, designed device, process, or system. (HS-LS4-6)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations,

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity

- Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)

LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)

LS4.C: Adaptation

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)

Crosscutting Concepts

Patterns

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1),(HS-LS4-3)

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2),(HS-LS4-4),(HS-LS4-5),(HS-LS4-6)

- -

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1),(HS-LS4-4)

models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4)

Engaging in Argument from Evidence

Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science.

- Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1)

- -

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- A scientific theory is a substantiated explanation of some aspect of the

- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)
- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5),(HS-LS4-6)
- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)

LS4.D: Biodiversity and Humans

- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (HS-LS4-6) *(Note: This Disciplinary Core Idea is also addressed by HS-LS2-7.)*

ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary to HS-LS4-6)*
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. *(secondary to HS-LS4-6)*

natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-LS4-1)		

Connections to other DCIs in this grade-band:

HS.LS2.A (HS-LS4-2),(HS-LS3-4),(HS-LS4-4),(HS-LS4-5); **HS.LS2.D** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **HS.LS3.A** (HS-LS4-1); **HS.LS3.B** (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-5); **HS.ESS1.C** (HS-LS4-1); **HS.ESS2.D** (HS-LS4-6); **HS.ESS2.E** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.A** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.C** (HS-LS4-6); **HS.ESS3.D** (HS-LS4-6)

Articulation of DCIs across grade-bands:

MS.LS2.A (HS-LS4-2),(HS-LS4-3),(HS-LS4-5); **MS.LS2.C** (HS-LS4-5),(HS-LS4-6); **LS3.A** (HS-LS4-1); **LS3.B** (HS-LS4-1),(HS-LS4-2),(HS-LS4-3); **MS.LS4.A** (HS-LS4-1);**MS.LS4.B** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4); **MS.LS4.C** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **MS.ESS1.C** (HS-LS4-1); **HS.ESS3.C** (HS-LS4-5),(HS-LS4-6)

Common Core State Standards Connections:

ELA/Literacy -

RST-11.12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4)
RST-11.12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS4-5)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4)
WHST.9-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. *(HS-LS4-6)*
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. *(HS-LS4-6)*
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4),(HS-LS4-5)
SL.11-12.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(HS-LS4-1),(HS-LS4-2)*

Mathematics -

MP.2	Reason abstractly and quantitatively. *(HS-LS4-1)*,(HS-LS4-2),(HS-LS4-3),*(HS-LS4-4),(HS-LS4-5)*
MP.4	Model with mathematics. *(HS-LS4-2)*

Science Department Lesson Plan Template

Lesson Information

Lesson Name: _____
Unit: _____
Date: _____

Lesson Data

1. Essential Question:

2. NGSS:

3. DCI :

Students will know……

4. Practices:

Students will be able to…..

5. Crosscutting Concepts:

Students will apply…

6. Assessment:

Evidence of student learning:

7. Lesson Agenda:

Include in Lesson Outline:

- *Anticipated timing*
- *DO NOW*
- *Activities and Investigations*
- *Discussion prompts*
- *Journal writing prompts*
- *Student uses of technology*
- *Safety precautions*
- *Materials*

8. Homework:

Science Practice Unit (ONGOING)

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
✓ Science is the study and discovery of the world around us. ✓ Science requires the collection and use of evidence. ✓ Scientific knowledge varies in its level of certainty. ✓ Scientists work together in a community to share and critique ideas.	✓ What does it mean? ✓ How do you know? ✓ Why do you believe? ✓ Why should you care?

Student Learning Objective	Disciplinary Core Ideas with Extended Knowledge Students will know:	Practices of Science & Engineering with Additional Skills Students will be able to:	Cross Cutting Concepts Students will apply:
NJSLS-S **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**	**Scientific Knowledge and Explanations** ● Scientific knowledge is a special kind of knowledge based on collection of evidence. All scientific knowledge is subject to change in light of new evidence and new ways of thinking. ● In science, a law is a succinct description of relationships or patterns that are consistently observed in nature. Scientific laws are often expressed in mathematical terms. ● A scientific theory is a well-supported explanation of a natural phenomenon. ● A scientific hypothesis is a proposed explanation for a fairly narrow set of	**Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (**HS-LS1-2**) **Constructing explanations** • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(HSLS1-1)**	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **(HS-LS3-1),(HS-LS3-2)** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). **(HSLS3-3)** **Systems and System Models** IN• Models (e.g., physical, mathematical, computer models) can

amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]	phenomena, usually based on prior experience, scientific background knowledge, preliminary observations, and logic. A hypothesis may be used to make a prediction but is not the prediction itself. ● Scientists continuously revise predictions and explanations to account more completely for available evidence. ● Scientific models and understandings of fundamental concepts and principles are continuously refined as new evidence is considered. <u>Key Terms:</u> hypothesis, law, science, theory	**Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena or design solutions to support claims**. (HS-LS2-4)** **Critical Thinking, problem solving, and decision making** Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. (**Technology 8.1.12.F.1**)	be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. **(HSLS1-4)**

Structure and Function (ONGOING)

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
✓ The way in which a living thing is shaped and its substructures determine many of its properties and functions.	✓ What is the relationship between anatomical structure and physiological function? ✓ How does organization contribute to the proper function of the human body? ✓ How do location and direction contribute to anatomical functions?

Student Learning Objective	Disciplinary Core Ideas with Extended Knowledge Students will know:	Practices of Science & Engineering with Additional Skills Students will be able to:	Cross Cutting Concepts Students will apply:
NJSLS-S **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**	**Scientific Knowledge and Explanations** **Structure and Function** ● The body is divided up into distinct body cavities. The arrangement of organs in these cavities is significant in their function. ● Observations of internal structure require sectioning the body along varibous planes. ● Terms of relative position describe the location of one body part with respect to another.	**Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (**HS-LS1-2**) **Constructing explanations** • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **(HS-LS3-1),(HS-LS3-2)** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). **(HSLS3-3)** **Systems and System Models**

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.]	• The body is organized into various parts with an increasing level of complexity.
	• The body is made up of four major, distinct tissue types that have specific functions:
	  o Epithelial
	  o Connective
	  o Nervous
	  o Muscle
	✓ Identify the body cavities and the main organ systems contained in each
	✓ Justify the claim that the importance of an organ system can be determined by the degree of protection the body cavity gives
	✓ Use direction terms to describe anatomical structures
	✓ Model the levels of structural organization in a living organisms
	✓ Describe the function of each distinct tissue type
	✓ Use a dissection model to identify the major tissue types
	
	<u>Key Terms:</u> body cavities, anatomical planes, organizational levels, anatomical positions, tissue types
		and will continue to do so in the future. **(HSLS1-1)**
		
		Using Mathematics and Computational Thinking
		• Use mathematical representations of phenomena or design solutions to support claims**. (HS-LS2-4)**
		
		Critical Thinking, problem solving, and decision making
		Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. (**Technology 8.1.12.F.1**)
			IN• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. **(HSLS1-4)**

Hillside Township School District Human Anatomy and Physiology Curriculum

Unit 1: The Circulatory System

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
✓ The circulatory system transports oxygenated and deoxygenated blood throughout the body. ✓ The circulatory system works in conjunction with every other body system in order to maintain homeostasis in an organism.	✓ How do the external conditions influence the internal processes of the human body? ✓ What is the relationship between anatomical structure and physiological function? ✓ How is each body system dependent on other body systems?

Student Learning Objective	Disciplinary Core Ideas with Extended Knowledge Students will know:	Practices of Science & Engineering with Additional Skills Students will be able to:	Cross Cutting Concepts Students will apply:
NJSLS-S **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.]**	**Scientific Knowledge and Explanations** **The Heart and Blood Vessels** ● There is a structural separation in the heart betw ● een oxygenated and deoxygenated blood. ● Atria receive blood from outside the heart, and ventricles send blood outside the heart. ● Valves control the flow blood through the chambers of the heart. ● The nodes control the electrical conduction through the heart which contributes to the heartbeat.	**Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (**HS-LS1-2**) **Constructing explanations** • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(HSLS1-1)**	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **(HS-LS3-1),(HS-LS3-2)** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). **(HSLS3-3)** **Systems and System Models** IN• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy,

	• There are structural differences between the three types of blood vessels. These differences support to their functions.
	  o Arteries – thicker and contract
	  o Veins – thinner and have valves
	  o Capillaries – one cell thick and allow for diffusion
	• The only way materials enter and **l**eave the circulatory system is through the capillaries.
	
	• <u>Key Terms:</u> arteries, capillaries, veins, atrium, ventricle, valves, nodes, circulatory pathways, blood vessels, chambers
	  • he blood is made up of various components:
	  o Red blood cells are responsible for transporting oxygen from the respiratory system to the cells.
	  o White blood cells are responsible for working with the immune system to fight infectious disease and foreign pathogens throughout the body.
	  o Platelets are responsible for clotting to facilitating the repair of damaged blood vessels.
		Using Mathematics and Computational Thinking
		• Use mathematical representations of phenomena or design solutions to support claims**. (HS-LS2-4)**
		
		Critical Thinking, problem solving, and decision making
		Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. (**Technology 8.1.12.F.1**)
			matter, and information flows—within and between systems at different scales. **(HSLS1-4)**

	○ Plasma transports nutrients and gases throughout the body and regulates fluid balance. <u>Key Terms:</u> platelets, plasma, red blood cells, white blood cells, blood typing, clotting ● Graphically represent the flow of blood through the chambers of the heart ● Use evidence from dissection to describe the pathways and structure of the chambers and valves in the heart ● Create a representation to describe the electrical conduction through the heart for regulation of the cardiac cycle ● Graphically represent the structure and functional differences between the vessels ● Model how oxygen, nutrients and waste products diffuse through the walls of the capillaries ● Explain how different antibodies in the blood determine the blood types ● Analyze clotting data to determine the blood type of an individual ● Describe the amounts and function of the components in the blood and the amounts of those components ● Graphically represent the function of white blood cells and immune response		

Hillside Township School District Human Anatomy and Physiology Curriculum

Unit 2: The Respiratory System

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
✓ The respiratory system exchanges gases (O_2 and CO_2) with the atmosphere. ✓ The respiratory system works with the circulatory system to transport oxygen to the cells and retrieve CO_2 from the cells.	✓ How does the respiratory system function to exchange gases and maintain cellular respiration? ✓ What is the relationship between anatomical structure and physiological function? ✓ How is each body system dependent on other body systems?

Student Learning Objective	Disciplinary Core Ideas with Extended Knowledge Students will know:	Practices of Science & Engineering with Additional Skills Students will be able to:	Cross Cutting Concepts Students will apply:
NJSLS-S **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.]**	**Scientific Knowledge and Explanations** **Upper Respiratory** ● The nasal cavity works to clean, moisten and warm outside air. ● The larynx is the voice box for producing sound. ● The trachea transports and cleans air into the air into the lungs and transports air out of the lungs. Key Terms: nasal cavity, larynx, trachea **Lower Respiratory**	**Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (**HS-LS1-2**) **Constructing explanations** • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(HSLS1-1)**	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **(HS-LS3-1),(HS-LS3-2)** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). **(HSLS3-3)** **Systems and System Models** IN• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy,

	● Bronchi transport air into and out of the lungs. ● The alveolar sacs act as the site of gas exchange between the respiratory and circulatory systems. ● The mechanisms for moving air into and out of the body are called inspiration and expiration. <u>Key Terms:</u> bronchi, lungs, alveoli, inspiration , expiration, respiration, diaphragm, surfactant ● Graphically represent the pathway of oxygen from the outside atmosphere into the blood stream which goes from the upper respiratory system through the lower respiratory system ● Explain how the structures of the nasal cavity perform their functions ● Explain how and when the larynx and its associated structures act to generate sound ● Explain how the structure of the trachea allows it to efficiently transport air into and out of the lungs ● Create a model to show how the diaphragm creates pressure differences which allow for inspiration and expiration ● Explain and graphically represent the structures of the alveolar sacs as they	**Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena or design solutions to support claims**. (HS-LS2-4)** **Critical Thinking, problem solving, and decision making** Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. (**Technology 8.1.12.F.1**)	matter, and information flows—within and between systems at different scales. **(HSLS1-4)**

	relate to the circulatory system and gas exchange system ● Create a model to show how the reduction of size of the bronchial tubes and the presence of surfactants allows the respiratory system to maintain the pressure needed to complete a respiratory cycle ● Use volume bag data to make claims about lung capacity		

Hillside Township School District Human Anatomy and Physiology Curriculum

Unit 3: The Nervous System

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
✓ The nervous system is responsible for detecting external and internal stimuli. ✓ The nervous system processes and responds to sensory input. ✓ The nervous system controls body movement through skeletal muscles. ✓ The nervous system maintains homeostasis by regulating other systems, including the circulatory system	✓ How do the external conditions influence the internal processes of the human body? ✓ What is the relationship between anatomical structure and physiological function? ✓ How is each body system dependent on other body systems? ✓ How does the nervous system act as a feedback mechanism for maintaining homeostasis

Student Learning Objective	Disciplinary Core Ideas with Extended Knowledge Students will know:	Practices of Science & Engineering with Additional Skills Students will be able to:	Cross Cutting Concepts Students will apply:
NJSLS-S **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**	**Scientific Knowledge and Explanations** **Sensory and Motor** • The neuron is the basic structure of the nervous system that reflects function. o A typical neuron has a cell body, axon, and dendrites. Many axons have a myelin sheath that acts as an electrical insulator. o The structure of the neuron allows for the detection, generation, transmission and	**Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (**HS-LS1-2**) **Constructing explanations** • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(HSLS1-1)**	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **(HS-LS3-1),(HS-LS3-2)** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). **(HSLS3-3)** **Systems and System Models** IN• Models (e.g., physical, mathematical, computer models) can

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.]	integration of signal information. o Schwann cells, which form the myelin sheath, are separated by gaps of unsheathed axon over which the impulse travels as the signal propagates along the neuron. ● Transmission of information between neurons occurs across synapses. o Transmission across synapses involves chemical messengers called neurotransmitters. Examples: ▪ Acetylcholine ▪ Epinephrine ▪ Norepinephrine ▪ Dopamine ▪ Serotonin ▪ GABA o Transmission of information along neurons and synapses results in a response. o The response can be stimulatory or inhibitory. <u>Key Terms:</u> sensory receptors, neurons, synapse, axon, dendrite, myelin, effector **Interpretive**	**Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena or design solutions to support claims**. (HS-LS2-4)** **Critical Thinking, problem solving, and decision making** Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. (**Technology 8.1.12.F.1**)	be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. **(HSLS1-4)**

	● Different regions of the brain have different functions. Examples: o Vision o Hearing o Muscle movement o Abstract thought and emotions o Neuro-hormone production o Forebrain (cerebrum) midbrain (brainstem) and hindbrain (cerebellum) o Right and left cerebral hemispheres in humans ● Spinal nerves and spinal cord organize and transmit signals from the peripheral nervous system to and from the brain ● The brain processes both autonomic (involuntary) and somatic (voluntary) signals. ● Sympathetic nervous system promotes a flight or fight response. The parasympathetic nervous system promotes normal function. <u>Key Terms:</u> spinal cord, spinal nerves, vertebrae, medulla, cerebrum, cerebellum, autonomic, somatic, sympathetic, parasympathetic ● Describe how nervous systems detect external and internal signals, transmit		

	and integrate information, and produce responses ● Create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses ● Create a visual representation to describe how nervous systems detect external and internal signals ● Create a visual representation to describe how nervous systems transmit information ● Describe how the senses act as a link from the nervous system to the outside world ● Create a visual representation to describe how the brain integrates information to produce a response ● Develop a classroom model for a typical nerve system response from stimuli to effect ● Explain and visually represent how nerve signals travel from spinal nerves to the spinal cord and then to the brain ● Describe how feedback from body systems is interpreted by the brain to maintain homeostasis		

	● Through the use of a dissection, locate and describe the lobes and regions of the brain		

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Unit 4: The Digestive System

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
✓ The digestive system brings nutrients into the body and removes wastes. ✓ The digestive system works with the circulatory system to transport nutrients to cells. ✓ Digestive system breaks down complex molecules into usable absorbable units	✓ How do the external conditions influence the internal processes of the human body? ✓ What is the relationship between anatomical structure and physiological function? ✓ How is each body system dependent on other body systems

Student Learning Objective	Disciplinary Core Ideas with Extended Knowledge Students will know:	Practices of Science & Engineering with Additional Skills Students will be able to:	Cross Cutting Concepts Students will apply:
NJSLS-S **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:**	**Digestion** ● The digestive system is composed of the alimentary canal and associated accessory organs. ● The oral cavity is responsible for beginning the mechanical and chemical breakdown of food. ● The esophagus acts as a structure to transport food from the oral cavity to the stomach through the process of peristalsis. ● The stomach with its associated glands produces acids and enzymes to further digest food.	**Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (**HS-LS1-2**) **Constructing explanations** • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(HSLS1-1)**	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **(HS-LS3-1),(HS-LS3-2)** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). **(HSLS3-3)** **Systems and System Models** IN• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy,

Assessment does not include interactions and functions at the molecular or chemical reaction level.]	• The mixture of digested food and liquids from your stomach is called chyme. Key Terms: oral cavity, digestive enzymes, esophagus, sphincter, stomach, alimentary canal, peristalsis, chyme **Absorption** • Digestive chemicals are added to the chyme to aid in absorption. • The main location of absorption is the villi, which links the digestive system to the circulatory system. • The colon is responsible for the absorption of water from digested material and the excretion of waste from the body. Key Terms: small intestine, colon, villi, plicae circulares • Graphically represent the structures in the oral cavity that allow for breakdown • Create a model to represent the functions during the swallowing process • As a class, create a visual representation of peristalsis	**Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena or design solutions to support claims**. (HS-LS2-4)** **Critical Thinking, problem solving, and decision making** Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. (**Technology 8.1.12.F.1**)	matter, and information flows—within and between systems at different scales. **(HSLS1-4)**

	● Describe the process of digestion in the stomach as it relates to acids, enzymes and buffers ● Use a dissection model to identify all digestive structures and create a visual representation of their locations ● Model the breakdown of food molecules by enzymes and use lab evidence to make claims about the effects of temperature and pH on the process ● Construct a full length model of the alimentary canal ● Pose scientific questions about the relationship between the length of the small intestine and the efficiency of the digestive process ● Understand how the absorption of water through the small intestine interacts with the circulatory and excretory system to maintain homeostasis in the body		

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Unit 5: The Excretory System

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
✓ The excretory system removes wastes and maintains water balance in the body. ✓ The excretory system works with the circulatory system to retrieve wastes from the cells and filter these wastes and excess water from the blood. ✓ The excretory system helps maintain a level of homeostasis for electrolyte balance.	✓ How do the external conditions influence the internal processes of the human body? ✓ What is the relationship between anatomical structure and physiological function? ✓ How is each body system dependent on other body systems?

Student Learning Objective	Disciplinary Core Ideas with Extended Knowledge Students will know:	Practices of Science & Engineering with Additional Skills Students will be able to:	Cross Cutting Concepts Students will apply:
NJSLS-S **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**	**Excretion** ● The nephron is the functional unit of the kidney. ● Renal arteries carry large volumes of blood to the kidneys and renal veins carry it away. ● Waste is collected in the renal pelvis and removed from the kidneys through the ureter. ● The blood pressure forces substances through the capillary walls into the nephrons. Usable materials are then reclaimed by the blood before the blood leaves the kidneys.	**Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (**HS-LS1-2**) **Constructing explanations** • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(HSLS1-1)**	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **(HS-LS3-1),(HS-LS3-2)** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). **(HSLS3-3)** **Systems and System Models** IN• Models (e.g., physical, mathematical, computer models) can

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.]	• Waste products, urea and uric acid then form urine. Urine is transported through the ureters to the bladder. Urine leaves the body through the urethra. Key Terms: kidneys, ureters, bladder, urethra, descending aorta, renal artery, renal vein, nephron • Graphically represent the functional structures of the kidney • Describe the difference in control of the internal and external urethral sphincters • Understand how the nephron is the functional and structural unit of the kidney • Describe how the kidney works with the circulatory and nervous system to maintain homeostasis in the body • Create a model to test claims about diffusion across membranes within the nephron	**Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena or design solutions to support claims**. (HS-LS2-4)** **Critical Thinking, problem solving, and decision making** Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. (**Technology 8.1.12.F.1**)	be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. **(HSLS1-4)**

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Anatomy and Physiology Pacing

TIME FRAME	UNIT	PERFORMANCE TASKS ACTIVITIES/PROJECTS ASSESSMENTS	RESOURCES/INTERDISCIPLINARY CONNECTIONS
September (Then ongoing throughto ut year)	Scientific Practices / Structure and Function	Chicken Wing Dissection Lab – Four Tissue Types Directional Terms/Body Cavity Quiz Group Classroom Drawing Activity on Body Cavities	*Hole's Essentials:* Chapter 1: Introduction to Human Anatomy and Physiology Inside the Living Body Video
October - November	Circulatory System	Heart Dissection and Lab Report Chapter Review Exercises and Critical Thinking Heart Chambers Quiz Collaborative Graphic Representations Coloring Diagrams	*Hole's Essentials:* Chapter 11: Cardiovascular System *Anatomy & Physiology Coloring Workbook:* Chapter 11: The Cardiovascular System Discovery Videos Interactive: ECG Diagnosis Interactive: Virtual Heart Transplant Interactive: Virtual Stethoscope Tutorial: Anatomy of the Heart Tutorial: The Cardiac Cycle Tutorial: Pulmonary and Systemic Circulation
October - November	Blood Vessels	Blood Pressure Activity Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Coloring Diagrams	*Hole's Essentials:* Chapter 11: Cardiovascular System *Anatomy & Physiology Coloring Workbook:* Chapter 11: The Cardiovascular System Discovery Videos

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October - November	The Blood	Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Circulatory Unit Exam Coloring Diagrams Circulatory Unit Project - Disease	*Hole's Essentials:* Chapter 12: Blood *Anatomy & Physiology Coloring Workbook:* Chapter 11: The Cardiovascular System Discovery Videos Interactive: Blood Typing Game Tutorial: Blood Groups Tutorial: Red Blood Cells Tutorial: White Blood Cells
November - December	Upper Respiratory	Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Upper Respiratory Exam Coloring Diagrams	*Hole's Essentials:* Chapter 16: Respiratory System *Anatomy & Physiology Coloring Workbook:* Chapter 13: Respiratory System Discovery Videos Tutorial: Air Flow in Mammals Tutorial: Respiratory Basics
November – December	Lower Respiratory	Lung Volume Activity Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Coloring Diagrams Lower Respiratory Exam Respiratory Unit Project - Disease	*Hole's Essentials:* Chapter 16: Respiratory System *Anatomy & Physiology Coloring Workbook:* Chapter 13: The Respiratory System Lung Volume Bag Set Discovery Videos
December – January	Nervous System: Sensory & Motor	Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Coloring Diagrams Classroom Nervous System Pathways Demonstration and Summary Neuron Function Quiz Sensory & Motor Exam	*Hole's Essentials:* Chapter 9: Nervous System *Hole's Essentials:* Chapter 10: Somatic and Special Senses *Anatomy & Physiology Coloring Workbook:* Chapter 7: The Nervous System Discovery Videos Animation: Action Potential (simple) Animation: Action Potential (complex) Animation: Action Potential Animation: Channel Gating During an Action Potential Interactive Quiz: The Structures of the Eye Tutorial: Action Potential Tutorial: Anatomy of the Ear

			Tutorial: Membrane Potential Tutorial: Physiological Events at the Neural Synapse Tutorial: Synaptic Transmission Interactive: Mouse Party
January – February	Nervous System: Interpretive	Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Coloring Diagrams Sheep Brain Dissection and Report Central Nervous System Exam Nervous System Project - Disease	*Hole's Essentials:* Chapter 9: Nervous System *Hole's Essentials:* Chapter 10: Somatic and Special Senses *Anatomy & Physiology Coloring Workbook:* Chapter 7: The Nervous System Discovery Videos Tutorial: Reflex Arcs
February – March	Digestion	Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Coloring Diagrams Oral Cavity Quiz Introductory Frog Dissection and Report Upper Digestive System Exam	*Hole's Essentials:* Chapter 15: Digestion and Nutrition *Anatomy & Physiology Coloring Workbook:* Chapter 14: The Digestive System and Body Metabolism Digestion Bio-Kit Discovery Videos Animation: Acid Reflux Animation: Neutralization of Stomach Acid Animation: Organs of Digestion Animation: Three Phases of Gastric Secretion
March – April	Absorption	Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Coloring Diagrams Rat Dissection and Report Complete Digestive System Representation Digestive System Unit Exam Digestive Project - Disease	*Hole's Essentials:* Chapter 15: Digestion and Nutrition *Anatomy & Physiology Coloring Workbook:* Chapter 14: The Digestive System and Body Metabolism Discovery Videos
April - May	Excretion	Chapter Review Exercises and Critical Thinking Collaborative Graphic Representations Coloring Diagrams Kidney Function Activity and Assessment Excretory System Unit Exam	*Hole's Essentials:* Chapter 17: Urinary System *Hole's Essentials:* Chapter 18: Water, Electrolyte, and Acid-Base Balance *Anatomy & Physiology Coloring Workbook:* Chapter 15: The Urinary System Modeling Kidney Function Kit

			Discovery Videos Interactive: Kidney Function Tutorial: The Mammalian Kidney Tutorial: Concentrating Urine
May - June	END OF COURSE PROJECT: FETAL PIG DISSECTION		

Modifications

Teacher Note: Teachers identify the modifications that they will use in the unit.

- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities

NGSS Resources

Appendix F Science & Engineering Practices
Appendix G Crosscutting Concepts