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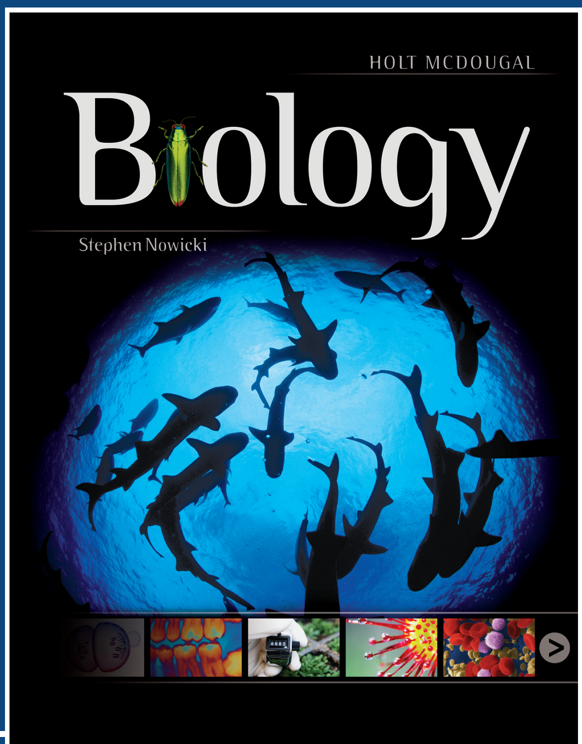

Correlation to the **Oklahoma Academic Standards for Science Biology 1**

Holt McDougal Biology

(Houghton Mifflin Harcourt) (Holt McDougal Biology)
CORRELATIONS WITH OKLAHOMA ACADEMIC STANDARDS

Health, Vocational Education and Computer Education/Instructional Technology and Grades PreK-12 Science, PreK-5 Science Content Reading

Grades 9–12
Biology I

Correlation Location	Oklahoma Academic Standards: Biology I
HS-LS1-1: From Molecules to Organisms: Structure and Processes	
Print or Online SE/TE: pages 8-9, 213-214, 225-228, 229-233, 244 **Online Labs:** Modeling Transcription (Section 8.4); Virtual Investigation: DNA, RNA, and Gene Expression (Ch. 8); Biochemical Evidence for Evolution (Section 10.5)	**Performance Expectation HS-LS1-1** *Students who demonstrate understanding can:* 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. **Clarification Statement:** Emphasis is on the conceptual understanding that DNA sequences determine the amino acid sequence, and thus, protein structure. Students can produce scientific writings, oral presentations and or physical models that communicate constructed explanations. **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.

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: pages 8-9, 68, 69, 71, 143-145, 170, 172, 212-214, 798-802 **Print or Online TE Only:** Page 211 **Online Labs:** Modeling Transcription (Section 8.4); Virtual Investigation: DNA, RNA, and Gene Expression (Ch. 8); Modeling Induction in Embryos (Section 5.5); Genetic Engineering (Section 9.4); Examining Human Cells (Section 28.1); Modeling the Cell (Section 3.2); Modeling Biochemical Compounds (Section 2.3); Biochemical Evidence for Evolution (Section 10.5) **Addtional Online Resources:** **Animated Biology:** Transcription (Section 8.4); Building a Protein (Section 8.5) **Biology Video Clip:** DNA as Genetic Material (Section 8.1); RNA and the Central Dogma (Section 8.4); Protein Synthesis (Section 8.5)	**Disciplinary Core Ideas for Standard HS-LS1-1** **Structure and Function:** • Systems of specialized cells within organisms help them perform the essential functions of life. • 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.
Online Labs: Designing an Experiment to Test a Hypothesis (Section 4.5); Modeling Transcription (Section 8.4); Virtual Investigation: DNA, RNA, and Gene Expression (Ch. 8); Hardy-Weinberg Equation (Section 11.4); Testing pH (Section 2.2); Seed Dispersal Prototype (Section 22.3); Modeling Viruses (Section 18.2); Modeling Viral Mutations (18.2); Preventing an Outbreak (Section 31.1); Examining Human Cells (Section 28.1); Modeling Chromosomes in Meiosis (Section 6.6)	**Science and Engineering Practice for Standard HS-LS1-1** **Constructing explanations (for science) and designing solutions (for engineering):** 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**

Correlation Location	Oklahoma Academic Standards: Biology I
	operate today as they did in the past and will continue to do so in the future.
Print or Online SE/TE: pages 8-9, 64-65, 68, 69-75, 216-219 **Online Labs:** Modeling Biochemical Compounds (Section 2.3); Modeling Joint Movement (Section 33.1); A Pumping Heart (Section 30.3); Examining Human Cells (Section 28.1)	**Crosscutting Concept for Standard HS-LS1-1** **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-LS1-2: From Molecules to Organisms: Structure and Processes	
Print or Online SE/TE: pages 143-145, 800 (Pre-AP Activity)	**Performance Expectation HS-LS1-2** *Students who demonstrate understanding can:* 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 the levels of organization including cells, tissues, organs, and systems of an organism. **Assessment Boundary:** Assessment does not include interactions and functions at the molecular or chemical level.
Print or Online SE/TE: pages 8-9, 11, 69-75, 143-147, 600-602, 798-802, 859-862, 915-918, 949-951 **Print or Online TE Only:** Pages 63 (Unit Project), 796-797 **Online Labs:** Stages of Human Development (Section 34.4); Comparing Plant	**Disciplinary Core Ideas for Standard HS-LS1-2** **Structure and Function:** • 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.

Correlation Location	Oklahoma Academic Standards: Biology I
Structures (Section 21.4); Development of an Embryo (Section 34.3); Monocot and Seed Structure (Section 22.3); Anatomy of a Sea Star (Section 23.6); Inside a Crayfish (Section 24.2); Roots and Stems (Section 21.3)	
Print or Online SE/TE: pages 8-9, 143-145, 800, 921 **Print or Online TE Only:** Page 63 (Unit Project) **Online Labs:** Animating Mitosis (Section 5.2); Modeling the Cell (Section 3.2); Modeling Alleles (Section 11.3); Modeling Predation (Section 14.2); Modeling Chromosomes in Meiosis (Section 6.6) **Additional Online Resources:** **Chapter Resources:** Chapter 3 Pre-AP Activity: Modeling Cell Receptors	**Science and Engineering Practice for Standard HS-LS1-2** **Developing and using models:** Modeling in 9–12 builds on K–8 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.**
Print or Online SE/TE: pages 8, 69-70, 79, 224, 262, 382, 393-395, 800, 807, 916-917, 921 **Online Labs:** Modeling Predation (Section 14.2)	**Crosscutting Concept for Standard HS-LS1-2** **Structure and Function:** 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.

Correlation Location	Oklahoma Academic Standards: Biology I
HS-LS1-3: From Molecules to Organisms: Structure and Processes	
Online Lab: Interactions Among Systems (Section 28.3)	**Performance Expectation HS-LS1-3** *Students who demonstrate understanding can:* Plan and conduct an investigation to provide evidence of the importance of maintaining homeostasis in living organisms. **Clarification Statement:** A state of homeostasis must be maintained for organisms to remain alive and functional even as external conditions change within some range. Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, root development in response to water levels, and cell response to hyper and hypotonic environments. **Assessment Boundary:** Assessment does not include the cellular processes involved in the feedback mechanism.
Print or Online SE/TE: Pages 9, 41, 79, 143, 150 (#23), 804-807, 808-811, 814 (#28, #36, #37), 844, 975 **Online Labs:** Negative and Positive Feedback (Section 28.2); Interactions Among Systems (Section 28.3); Hormones and Homeostasis (Section 28.2) **Additional Online Resources:** **Visual Concepts:** Comparing Positive and Negative Feedback (Section 28.2) **Biology Video Clips:** Maintaining Homeostasis, Skin (Section 28.2); Diabetes and the Immune System (Section 28.3) **Animated Biology:** Keep an Athlete Running (Section 28.2)	**Disciplinary Core Ideas for Standard HS-LS1-3** **Structure and Function:** • 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. Outside that range (e.g., at a too high or too low external temperature, with too little food or water available) the organism cannot survive.

Correlation Location	Oklahoma Academic Standards: Biology I
Online Labs: Interactions Among Systems (Section 28.3); Modeling Chromosomes in Meiosis (Section 6.6)	**Science and Engineering Practice for Standard HS-LS1-3** **Planning and carrying out investigations**: Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that 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.**
Print or Online SE/TE: Pages 9, 41, 79, 85, 143, 804-807, 808-811, 844, 975 **Online Labs:** Negative and Positive Feedback (Section 28.2); Interactions Among Systems (Section 28.3); Hormones and Homeostasis (Section 28.2) **Additional Online Resources:** **Visual Concepts:** Comparing Positive and Negative Feedback (Section 28.2)	**Crosscutting Concept for Standard HS-LS1-3** **Stability and Change:** Feedback (negative or positive) can stabilize or destabilize a system.
HS-LS1-4: From Molecules to Organisms: Structure and Processes	
Print or Online SE/TE: Page 224 **Print or Online TE Only:** Pages 138, 140 **Online Labs:** Animating Mitosis (Section 5.2); Mitosis in Onion Root Cells	**Performance Expectation HS-LS1-4** *Students who demonstrate understanding can:* Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. **Clarification Statement:** Emphasis is on conceptual understanding that mitosis passes on genetically identical materials via replication, not on the details of

Correlation Location	Oklahoma Academic Standards: Biology I
(Section 5.2)	each phase in mitosis. **Assessment Boundary:** Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.
Print or Online SE/TE: Pages 126-129, 130-134, 148-151, 157, 179-181, 968-971 **Print or Online TE Only:** Pages 124, 125, 972 **Online Labs:** Animating Mitosis (Section 5.2); Mitosis in Onion Root Cells (Section 5.2); Apoptosis (Section 5.3); **Virtual Investigation:** Phases of Mitosis (Chapter 5); **Video Lab:** Mitosis in Plant Cells (Section 5.2); Modeling Chromosomes in Meiosis (Section 6.6); Modeling Meiosis (Section 6.2); Stages of Human Development (Section 34.4); Development of an Embryo (Section 34.3)	**Disciplinary Core Ideas for Standard HS-LS1-4** **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.
Print or Online SE/TE: pages 8-9, 143-145, 800 **Print or Online TE Only:** Page 63 (Unit Project) **Online Labs:** Animating Mitosis (Section 5.2); Modeling the Cell (Section 3.2); Modeling Alleles (Section 11.3); Modeling Predation (Section 14.2);	**Science and Engineering Practice for Standard HS-LS1-4** **Developing and using models:** Modeling in 9–12 builds on K–8 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. • **Use a model based on evidence to illustrate the relationships between systems or between components of a system.**

Correlation Location	Oklahoma Academic Standards: Biology I
Modeling Chromosomes in Meiosis (Section 6.6) **Additional Online Resources:** **Chapter Resources:** Chapter 3 Pre-AP Activity: Modeling Cell Receptors	
Print or Online SE/TE: pages 8-9, 69-70, 79, 224, 262, 382, 393-395, 800, 807, 916-917 **Print or Online TE Only:** Pages 138, 140 **Online Labs:** Animating Mitosis (Section 5.2); Modeling Predation (Section 14.2)	**Crosscutting Concept for Standard HS-LS1-4** **Structure and Function:** 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-LS1-5: From Molecules to Organisms: Structure and Processes	
Online Labs: Rates of Photosynthesis (Section 4.2) **Additional Online Resources:** **That's Amazing! Video Inquiry:** Lungs of the Planet (Section 4.3)	**Performance Expectation HS-LS1-5** *Students who demonstrate understanding can:* 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, conceptual models, and/or laboratory investigations. **Assessment Boundary:** The assessment should provide evidence of students' abilities to describe the inputs and outputs of photosynthesis, not the specific biochemical steps. (e.g. photosystems, electron transport, and Calvin cycle)

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: pages 93, 97-99, 102-106, 122, 382-383 **Online Labs:** Rates of Photosynthesis (Section 4.2); Photosynthesis and Respiration (Section 4.4) **Additional Online Resources:** **That's Amazing! Video Inquiry:** Lungs of the Planet (Section 4.3)	**Disciplinary Core Ideas for Standard HS-LS1-5** **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.
Print or Online SE/TE: pages 8-9, 143-145, 800 **Print or Online TE Only:** Page 63 (Unit Project) **Online Labs:** Rates of Photosynthesis (Section 4.2); Animating Mitosis (Section 5.2); Modeling the Cell (Section 3.2); Modeling Alleles (Section 11.3); Modeling Predation (Section 14.2); Modeling Chromosomes in Meiosis (Section 6.6); Build a Terrarium (Section 13.3) **Additional Online Resources:** **Chapter Resources:** Chapter 3 Pre-AP Activity: Modeling Cell Receptors	**Science and Engineering Practice for Standard HS-LS1-5** **Developing and using models:** Modeling in 9–12 builds on K–8 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. • **Use a model based on evidence to illustrate the relationships between systems or between components of a system.**

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 382-383, 384-387, 388-392, 393-395, 397-398 **Print or Online TE Only:** Pages 370-371 **Online Lab:** Interdependence of Plants and Animals (Section 13.5)	**Crosscutting Concept for Standard HS-LS1-5** **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-LS1-6: From Molecules to Organisms: Structure and Processes	
Print or Online SE/TE: Pages 45-46, 96, 98-99, 105-106 **Online Labs:** Cellular Respiration (Section 4.4); Photosynthesis and Respiration (Section 4.4); **Virtual Investigation:** Photosynthesis and Cellular Respiration (Chapter 4)	**Performance Expectation HS-LS1-6** *Students who demonstrate understanding can:* 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 students constructing explanations for how sugar molecules are formed through photosynthesis and the components of the reaction (i.e., carbon, hydrogen, oxygen). This hydrocarbon backbone is used to make amino acids and other carbon-based molecules that can be assembled (anabolism) into larger molecules (such as proteins or DNA). **Assessment Boundary:** Assessment does not include the details of the specific chemical reactions or identification of macromolecules.

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 42-46, 48-51, 52-54, 57-58, 98-99, 102-106, 107-109, 111-115, 116-119, 121-122 **Online Lab:** Modeling Biochemical Compounds (Section 2.3)	**Disciplinary Core Ideas for Standard HS-LS1-6** **Organization for Matter and Energy Flow:** • (Builds on 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 large molecules (such as proteins or DNA), used for example to form new cells. • As matter and energy flow through different organization levels of living systems, chemical elements are recombined in different ways to form different products.
Online Labs: Designing an Experiment to Test a Hypothesis (Section 4.5); Chemical Reactions (Section 2.4); Modeling Transcription (Section 8.4); Virtual Investigation: DNA, RNA, and Gene Expression (Ch. 8); Hardy-Weinberg Equation (Section 11.4); Testing pH (Section 2.2); Seed Dispersal Prototype (Section 22.3); Modeling Viruses (Section 18.2); Modeling Viral Mutations (18.2); Preventing an Outbreak (Section 31.1); Examining Human Cells (Section 28.1); Modeling Chromosomes in Meiosis (Section 6.6); Modeling Biochemical Compounds (Section 2.4); Cellular Respiration (Section 4.4); **Virtual Investigation:** Photosynthesis and Cellular Respiration (Chapter 4)	**Science and Engineering Practice for Standard HS-LS1-6** **Constructing explanations (for science) and designing solutions (for engineering):** 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 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.**

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Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 94-96, 97-99, 102-106, 382-383, 384-387, 388-392, 393-395, 397-398 **Print or Online TE Only:** Pages 370-371 **Online Labs:** Modeling Biochemical Compounds (Section 2.3); Cellular Respiration (Section 4.4); Interdependence of Plants and Animals (Section 13.5)	**Crosscutting Concept for Standard HS-LS1-6** **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-LS1-7: From Molecules to Organisms: Structure and Processes	
Print or Online SE/TE: Page 118 **Print or Online TE Only:** Page 113 **Online Labs:** Cellular Respiration (Section 4.4); **Virtual Investigation:** Photosynthesis and Cellular Respiration (Chapter 4)	**Performance Expectation HS-LS1-7** *Students who demonstrate understanding can:* 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. Examples of models could include diagrams, chemical equations, conceptual models, and/or laboratory investigations. **Assessment Boundary:** Assessment should not include identification of the steps or specific processes involved in cellular respiration (e.g. glycolysis and Kreb's Cycle).

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 48-51, 98-99, 107-109, 111-115, 116-119, 121-122, 393 **Print or Online TE Only:** Pages 92-93 **Online Labs:** Cellular Respiration (Section 4.4); **Virtual Investigation:** Photosynthesis and Cellular Respiration (Chapter 4); Modeling Biochemical Compounds (Section 2.3); Photosynthesis and Respiration (Section 4.4); Effect of Temperature on Respiration (Section 4.6); Rates of Photosynthesis (Section 4.2);	**Disciplinary Core Ideas for Standard HS-LS1-7** **Organization for Matter and Energy Flow:** (Builds on HS-LS1-6) • As matter and energy flow through different organization levels of living systems, chemical elements are recombined in different ways to form different products. • As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. • Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. • Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.
Online Labs: Cellular Respiration (Section 4.4); **Virtual Investigation:** Photosynthesis and Cellular Respiration (Chapter 4); Rates of Photosynthesis (Section 4.2); Animating Mitosis (Section 5.2); Modeling the Cell (Section 3.2); Modeling Alleles (Section 11.3); Modeling Predation (Section 14.2); Modeling Chromosomes in Meiosis (Section 6.6); Build a Terrarium (Section 13.3); **Video Lab:** Ecosystem Change (Section 13.4)	**Science and Engineering Practice for Standard HS-LS1-7** **Developing and using models:** Modeling in 9–12 builds on K–8 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. • **Use a model based on evidence to illustrate the relationships between systems or between components of a system.**
Print or Online SE/TE: Pages 17, 393-395	**Crosscutting Concept for Standard HS-LS1-7** **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.

Correlation Location	Oklahoma Academic Standards: Biology I
HS-LS2-1: Ecosystems: Interactions, Energy, and Dynamics	
Print or Online SE/TE: Pages 416-417, 424 **Online Labs:** Predator-Prey Interactions (Section 14.4); **Video Lab:** Yeast Population Growth (Section 14.4) **Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4)	**Performance Expectation HS-LS2-1** *Students who demonstrate understanding can:* 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, or population changes gathered from simulations or historical data sets. **Assessment Boundary:** Assessment does not include deriving mathematical equations to make comparisons.
Print or Online SE/TE: Pages 401, 405-408, 414-418, 423-425, 454, 457, 792-794 **Print or Online TE Only:** Page 400 **Online Labs:** Monitoring Bird Populations (Section 14.1); Modeling Predation (Section 14.2); Natural Selection in African Swallowtails (Section 11.2); Exploring Adaptations (Section 11.6); Predator-Prey Interactions (Section 14.4); Modeling Biomes (Section 15.3); Build a Terrarium (Section 13.3); Nitrogen Fixation (Section 13.5); Interdependence of	**Disciplinary Core Ideas for Standard HS-LS2-1** **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.

Correlation Location	Oklahoma Academic Standards: Biology I
Plants and Animals (Section 13.5) **Additional Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4); **Animated Biology:** What Limits Population Growth? (Section 14.4);	
Print or Online SE/TE: Pages 412, 416-417, 424 **Online Labs:** Predator-Prey Interactions (Section 14.4); Hardy-Weinberg Equation (Section 11.4); Photosynthesis and Respiration (Section 4.4); **Virtual Investigation:** Experiments and Models of Heredity (Chapter 7); **Video Lab:** Yeast Population Growth (Section 14.4) **Additional Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4)	**Science and Engineering Practice for Standard HS-LS2-1** **Using mathematics and computational thinking:** Mathematical and computational thinking at the 9–12 level builds on K–8 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.**
Print or Online SE/TE: Pages 169, 353, 412 **Online Labs:** Predator-Prey Interactions (Section 14.4); **Virtual Investigation:** Experiments and Models of Heredity (Chapter 7) **Additional Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4); **That's Amazing! Video Inquiry:** Poison Frogs (Section 1.3)	**Crosscutting Concept for Standard HS-LS2-1** **Scale, Proportion, and Quantity:** The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

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Correlation Location	Oklahoma Academic Standards: Biology I
HS-LS2-2: Ecosystems: Interactions, Energy, and Dynamics	
Print or Online SE/TE: Pages 416, 424, 792-794 **Online Lab:** Modeling the Effects of Habitat Fragmentation (Section 16.4) **Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4)	**Performance Expectation HS-LS2-2** *Students who demonstrate understanding can:* Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. **Clarification Statement:** Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. **Assessment Boundary:** Assessment is limited to provided data.
Print or Online SE/TE: Pages 401, 405-408, 414-418, 423-425, 454, 457, 468-471, 477-478, 792-794 **Print or Online TE Only:** Page 400 **Online Lab:** Modeling the Effects of Habitat Fragmentation (Section 16.4); Interdependence of Plants and Animals (Section 13.5); Limiting Nutrients for Algae (Section 14.4); Predator-Prey Interactions (Section 14.4); Modeling Biomes (Section 15.3); Natural Selection in African Swallowtails (Section 11.2); Population Genetics (Section 11.4); Investigating an Anole Lizard Population (Section 11.4); Exploring Adaptations (Section 11.6); Interdependence of Plants and Animals	**Disciplinary Core Ideas for Standard HS-LS2-2** **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. **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

Correlation Location	Oklahoma Academic Standards: Biology I
(Section 13.5); Monitoring Bird Populations (Section 14.1); Modeling Predation (Section 14.2) **Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4) **That's Amazing! Video Inquiry:** Poison Frogs (Section 1.3)	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.
Print or Online SE/TE: Pages 412, 416-417, 424 **Online Labs:** Predator-Prey Interactions (Section 14.4); Hardy-Weinberg Equation (Section 11.4); Photosynthesis and Respiration (Section 4.4) **Additional Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4)	**Science and Engineering Practice for Standard HS-LS2-2** **Using mathematics and computational thinking:** Mathematical and computational thinking at the 9–12 level builds on K–8 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.**
Print or Online SE/TE: Pages 7, 22, 133, R16 **Online Lab:** Predator-Prey Interactions (Section 14.4)	**Crosscutting Concept for Standard HS-LS2-2** **Scale, Proportion, and Quantity:** Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.

<table>
<tr><th>Correlation Location</th><th>Oklahoma Academic Standards: Biology I</th></tr>
<tr><td colspan="2">HS-LS2-3: Ecosystems: Interactions, Energy, and Dynamics</td></tr>
<tr><td><u>Print or Online SE/TE:</u>
Pages 109, 115, 118, 122

<u>Print or Online TE Only:</u>
Page 107

<u>Online Labs:</u>
Action of Yeast (Section 2.5); Video Lab: Cellular Respiration (Section 4.5)</td><td>Performance Expectation HS-LS2-3

Students who demonstrate understanding can:

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 (e.g., chemosynthetic bacteria, yeast, and muscle cells).

Assessment Boundary:
Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.</td></tr>
<tr><td><u>Print or Online SE/TE:</u>
Pages 94-96, 97-99, 102-106, 107-109, 111-115, 116-119, 120-123

<u>Print or Online TE Only:</u>
Pages 92-93

<u>Online Labs:</u>
Rates of Photosynthesis (Section 4.2); Photosynthesis and Respiration (Section 4.4); Effect of Temperature on Respiration (Section 4.6); Cellular Respiration (Section 4.4); Video Lab: Cellular Respiration (Section 4.5)</td><td>Disciplinary Core Ideas for Standard HS-LS2-3

Cycles of Matter and Energy Transfer in Ecosystems:
• Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.</td></tr>
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CORRELATIONS WITH OKLAHOMA ACADEMIC STANDARDS

Correlation Location	Oklahoma Academic Standards: Biology I
Online Labs: Action of Yeast (Section 2.5); Designing an Experiment to Test a Hypothesis (Section 4.5); Chemical Reactions (Section 2.4); Modeling Transcription (Section 8.4); Virtual Investigation: DNA, RNA, and Gene Expression (Ch. 8); Hardy-Weinberg Equation (Section 11.4); Testing pH (Section 2.2); Seed Dispersal Prototype (Section 22.3); Modeling Viruses (Section 18.2); Modeling Viral Mutations (18.2); Preventing an Outbreak (Section 31.1); Examining Human Cells (Section 28.1); Modeling Chromosomes in Meiosis (Section 6.6); Modeling Biochemical Compounds (Section 2.4); Cellular Respiration (Section 4.4); **Virtual Investigation:** Photosynthesis and Cellular Respiration (Chapter 4)	**Science and Engineering Practice for Standard HS-LS2-3** **Constructing explanations (for science) and designing solutions (for engineering):** 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 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.**
Print or Online SE/TE: Pages 97, 384, 386 **Online Lab:** Aquatic Primary Productivity (Section 15.5)	**Crosscutting Concept for Standard HS-LS2-3** **Energy and Matter:** Energy drives the cycling of matter within and between systems.
HS-LS2-4: Ecosystems: Interactions, Energy, and Dynamics	
Print or Online SE/TE: Pages 393-395 **Online Labs:** Interdependence of Plants and Animals (Section 13.5)**;** Nitrogen Fixation (Section 13.5) **Additional Online Resources:** **That's Amazing! Video Inquiry:** Vegetarian Alligators (Chapter 13)	**Performance Expectation HS-LS2-4** *Students who demonstrate understanding can:* Use a mathematical representation 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

Correlation Location	Oklahoma Academic Standards: Biology I
	ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem. **Assessment Boundary:** The assessment should provide evidence of students' abilities to develop and use energy pyramids, food chains, food webs, and other models from data sets.
Print or Online SE/TE: Pages 384, 386-387, 389-392, 393-395 **Online Labs:** Interdependence of Plants and Animals (Section 13.5)**;** Nitrogen Fixation (Section 13.5)**;** Build a Terrarium (13.3); Interdependence of Plants and Animals (13.5); Monitoring Bird Populations (14.1); Modeling Predation (14.2); Predator-Prey Interactions (14.4)	**Disciplinary Core Ideas for Standard HS-LS2-4** **Cycles of Matter and Energy Transfer in Ecosystems:** • 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.
Print or Online SE/TE: Pages 375, 377 **Online Labs:** Predator-Prey Interactions (Section 14.4); Photosynthesis and Respiration (Section 4.4); Action of Yeast (Section 2.5)	**Science and Engineering Practice for Standard HS-LS2-4** **Using mathematics and computational thinking:** Mathematical and computational thinking at the 9–12 level builds on K–8 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 representations of phenomena or design solutions to**

Correlation Location	Oklahoma Academic Standards: Biology I
	support claims.
Print or Online SE/TE: Pages 17, 393-395	**Crosscutting Concept for Standard HS-LS2-4** **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-LS2-5: Ecosystems: Interactions, Energy, and Dynamics	
Online Lab: Photosynthesis and Respiration (Section 4.4)	**Performance Expectation HS-LS2-5** *Students who demonstrate understanding can:* 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 (e.g., chemical equations that demonstrate the relationship between photosynthesis and cellular respiration. **Assessment Boundary:** Assessment does not include the specific chemical steps of photosynthesis and respiration.
Print or Online SE/TE: Pages 97-99, 383, 390 **Print or Online TE Only:** Page 382 **Online Labs:** Rates of Photosynthesis (Section 4.2); Photosynthesis and Respiration	**Disciplinary Core Ideas for Standard HS-LS2-5** **Cycles of Matter and Energy Transfer in Ecosystems:** • 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. **Energy in Chemical Processes:** **(**Secondary to HS-LS2-5)

Correlation Location	Oklahoma Academic Standards: Biology I
(Section 4.4); Cellular Respiration (Section 4.4)	• The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis.
Print or Online SE/TE: pages 8-9, 143-145, 800 **Print or Online TE Only:** Page 63 (Unit Project) **Online Labs:** Photosynthesis and Respiration (Section 4.4); Animating Mitosis (Section 5.2); Modeling the Cell (Section 3.2); Modeling Alleles (Section 11.3); Modeling Predation (Section 14.2); Modeling Chromosomes in Meiosis (Section 6.6); **Video Lab:** Ecosystem Change (Section 13.4) **Additional Online Resources:** **Chapter Resources:** Chapter 3 Pre-AP Activity: Modeling Cell Receptors	**Science and Engineering Practice for Standard HS-LS2-5** **Developing and using models**: Modeling in 9–12 builds on K–8 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 a model based on evidence to illustrate the relationships between systems or components of a system.**
Print or Online SE/TE: Pages 8-9, 22 **Print or Online TE Only:** Pages 2-3 **Online Labs:** Interdependence of Plants and Animals (Section 13.5); Build a Terrarium (Section 13.3); Modeling Predation (Section 14.2); Predator-Prey Interactions (Section 14.4); **Video Lab:** Ecosystem Change (Section 13.4)	**Crosscutting Concept for Standard HS-LS2-5** **Systems and 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.

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CORRELATIONS WITH OKLAHOMA ACADEMIC STANDARDS

Correlation Location	Oklahoma Academic Standards: Biology I
HS-LS2-6: Ecosystems: Interactions, Energy, and Dynamics	
Print or Online SE/TE: Pages 405-408, 414-418, 423-424 **Online Labs:** Modeling Predation (Section 14.2); Predator-Prey Interactions (14.4); Monitoring Bird Populations (14.1) **Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4)	**Performance Expectation HS-LS2-6** *Students who demonstrate understanding can:* 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. **Assessment Boundary:** The assessment should provide evidence of students' abilities to derive trends from graphical representations of population trends. Assessments should focus on describing drivers of ecosystem stability and change, not on the organismal mechanisms of responses and interactions.
Print or Online SE/TE: Pages 414-418, 423-424 **Online Labs:** Modeling the Effects of Habitat Fragmentation (Section 16.4)**;** Interdependence of Plants and Animals (Section 13.5); Limiting Nutrients for Algae (Section 14.4); Predator-Prey Interactions (Section 14.4); Modeling Biomes (Section 15.3); Natural Selection in African Swallowtails (Section 11.2); Population Genetics (Section 11.4); Investigating an Anole Lizard Population (Section 11.4); Exploring Adaptations (Section 11.6); Interdependence of Plants and Animals (Section 13.5); Monitoring Bird Populations (Section 14.1); Modeling	**Disciplinary Core Ideas for Standard HS-LS2-6** **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.

Correlation Location	Oklahoma Academic Standards: Biology I
Predation (Section 14.2) **Online Resources:** **Data Analysis Smart Grapher Activity:** Population Growth and Carrying Capacity (14.4)	
Print or Online SE/TE: Pages 16 (Pre-AP Activity), 30 (#23), 272 (#33) **Print or Online TE Only:** Pages 292, 298, 325 **Online Labs:** Biotechnology and Food Products (Section 1.5); Fruit Preservation (Section 1.3)	**Science and Engineering Practice for Standard HS-LS2-6** **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 natural and designed worlds. 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.**
Print or Online SE/TE: Pages 13-17 **Online Labs:** Limiting Nutrients for Algae (Section 14.4); Investigating an Anole Population (Section 11.4)	**Crosscutting Concept for Standard HS-LS2-6** **Stability and Change:** Much of science deals with constructing explanations of how things change and how they remain stable.
HS-LS2-8: Ecosystems: Interactions, Energy, and Dynamics	
Print or Online SE/TE: Pages 769, 775-776, 779-784 **Online Labs:** Feeding Hydra (Section 23.3); Using an Ethogram to Describe Animal Behavior (Section 27.3); Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2)	**Performance Expectation HS-LS2-8** *Students who demonstrate understanding can:* Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. **Clarification Statement:** Emphasis is on advantages of grouping behaviors (e.g., flocking, schooling,

Correlation Location	Oklahoma Academic Standards: Biology I
	herding) and cooperative behaviors (e.g., hunting, migrating, swarming) on survival and reproduction. **Assessment Boundary:** The assessment should provide evidence of students' abilities to: (1) distinguish between group versus individual behavior, (2) identify evidence supporting the outcomes of group behavior, and (3) develop logical and reasonable arguments based on evidence.
Print or Online SE/TE: Pages 779-784 **Online Labs:** Feeding Hydra (Section 23.3); Using an Ethogram to Describe Animal Behavior (Section 27.3); Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2)	**Disciplinary Core Ideas for Standard HS-LS2-8** **Social Interactions and Group Behavior:** • Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.
Print or Online SE/TE: Pages 16 (Pre-AP Activity), 30 (#23), 272 (#33) **Print or Online TE Only:** Pages 292, 298, 325 **Online Labs:** Biotechnology and Food Products (Section 1.5); Fruit Preservation (Section 1.3)	**Science and Engineering Practice for Standard HS-LS2-8** **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 natural and designed worlds. 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.**
Print or Online SE/TE: Pages 13-17, 30, 295, 906 (#37) **Online Labs:** Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2);	**Crosscutting Concept for Standard HS-LS2-8** **Cause and Effect:** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Correlation Location	Oklahoma Academic Standards: Biology I
Natural Selection in African Swallowtails (Section 11.2)	
HS-LS3-1: Heredity: Inheritance and Variation of Traits	
Online Labs: Exploring Protein Crystallization (Section 8.7); Allele Combinations and Punnett Squares (Section 6.5); Modeling Chromosomes in Meiosis (Section 6.6); Incomplete Dominance (Section 7.2); Codominance (Section 7.2); **Virtual Investigation:** Breeding Mutations in Fruit Flies (Section 6.5)	**Performance Expectation HS-LS3-1** *Students who demonstrate understanding can:* Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. **Clarification Statement:** Emphasis should be on asking questions and making predictions to obtain reliable information about the role of DNA and chromosomes in coding the instructions for traits (e.g., pedigrees, karyotypes, genetic disorders, Punnett squares). **Assessment Boundary:** Assessments may include codominance, incomplete dominance, and sex-linked traits, but should not include dihybrid crosses.
Print or Online SE/TE: Pages 6, 23, 45-46, 68, 126-127, 130-131**,** 170-172, 212-214, 216-219, 224, 225-228, 229-233, 234-237, 243-244 **Online Labs:** Modeling Biochemical Compounds (Section 2.3); Genetic Engineering (Section 9.4); Modeling Transcription (Section 8.4); **Virtual Investigation:** DNA, RNA, and Gene Expression (Ch. 8); Natural Selection in African Swallowtails (Section 11.2); Exploring Dog Genetics And Evolution (Section 11.5); Biochemical Evidence for Evolution (Section 10.5)	**Disciplinary Core Ideas for Standard HS-LS3-1** **Structure and Function:** (secondary to HS-LS3-1) • 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. **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.

Correlation Location	Oklahoma Academic Standards: Biology I
	• 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 protein, some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known functions.
Print or Online SE/TE: Pages 13-17, 921 **Online Labs:** Modeling Induction in Embryos (Section 5.5); Exploring Dog Genetics and Evolution (Section 11.5); Modeling Chromosomes in Meiosis (Section 6.6); Preventing an Outbreak (Section 31.1); The Scientific Process (Chapter 1)	**Science and Engineering Practice for Standard HS-LS3-1** **Asking questions (for science) and defining problems (for engineering):** Asking questions and defining problems in grades 9–12 builds from grades 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.**
Print or Online SE/TE: Pages 13-17, 30, 295, 906 (#37) **Online Labs:** Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2); Natural Selection in African Swallowtails (Section 11.2)	**Crosscutting Concept for Standard HS-LS3-1** **Cause and Effect:** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
HS-LS3-2: Heredity: Inheritance and Variation of Traits	
Print or Online SE/TE: Pages 161, 162, 241 **Print or Online TE Only:** Pages 156-157, 164, 165, 238 **Online Labs:** Modeling Chromosomes in Meiosis (Section 6.6); Microevolution and	**Performance Expectation HS-LS3-2** *Students who demonstrate understanding can:* 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.

Correlation Location	Oklahoma Academic Standards: Biology I
Antibiotic-Resistant Bacteria (Section 11.6); Modeling Alleles (Section 11.3)	**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 mechanisms of specific steps in the process.
Print or Online SE/TE: Pages 161, 162, 179-181, 182, 183, 221-224, 238-241, 242, 243-244, 307, 308-309, 310-313, 315-318, 320-323, 324-326, 327-331, 333-334 **Print or Online TE Only:** Pages 156-157, 304, 305, 306-307 **Online Labs:** Modeling Alleles (Section 11.3); Modeling Chromosomes in Meiosis (Section 6.6); Microevolution and Antibiotic-Resistant Bacteria (Section 11.6); Exploring Adaptations (Section 11.6); Exploring Dog Genetics And Evolution (Section 11.5); Natural Selection in African Swallowtails (Section 11.2); Predator-Prey Pursuit (Section 10.4); Defining species (Section 17.4); Adaptations in Beaks (Section 10.3); Investigating an Anole Lizard Population (Section 11.4); Population Genetics (Section 11.4); Hardy-Weinberg Equation (Section 11.4); **Video Lab:** Natural Selection Simulation (Section 10.3)	**Disciplinary Core Ideas for Standard HS-LS3-2** **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 occur and result in mutations, which are also cause mutations in genes, and variables mutations are inherited. • Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in the population. Thus the variation and distribution of traits observe depends on both genetic and environmental factors.
Print or Online SE/TE: Pages 161, 162, 179-181, 182, 183, 221-224, 238-241, 242, 243-244, 307, 308-309, 310-313, 315-318, 320-323, 324-326, 327-331, 333-334 **Print or Online TE Only:** Pages 156-157, 304, 305, 306-307	**Science and Engineering Practice for Standard HS-LS3-2** **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 natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.

Correlation Location	Oklahoma Academic Standards: Biology I
Online Labs: Modeling Chromosomes in Meiosis (Section 6.6); Microevolution and Antibiotic-Resistant Bacteria (Section 11.6)	• **Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.**
Print or Online SE/TE: Pages 13-17, 30, 295, 317, 839, 906 (#37) **Online Labs:** Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2); Natural Selection in African Swallowtails (Section 11.2); Population Genetics (Section 11.4); **Video Lab:** Natural Selection Simulation (Section 10.3)	**Crosscutting Concept for Standard HS-LS3-2** **Cause and Effect:** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
HS-LS3-3: Heredity: Inheritance and Variation of Traits	
Print or Online SE/TE: Pages 175, 177, 190 **Print or Online TE Only:** Pages 173, 174, 311 **Online Labs:** Probability Practice (Section 6.3); Modeling Chromosomes in Meiosis (Section 6.6); Allele Combinations and Punnett Squares (Section 6.5); Modeling Alleles (Section 11.3) **Additional Online Resources:** **Reinforcement:** Reinforcement Worksheet (Section 6.6); **Chapter Resources:** Chapter 11 Pre-AP Activity: Calculating Gene Frequencies; Unit 3 Project: Interpreting a Pedigree	**Performance Expectation HS-LS3-3** *Students who demonstrate understanding can:* Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. **Clarification Statement:** Emphasis is on distribution and variation of traits in a population and the use of mathematics (e.g., calculations of frequencies in Punnett squares, graphical representations) to describe the distribution. **Assessment Boundary:** The assessment should provide evidence of students' abilities to use mathematical reasoning to explain the variation observed in a population as a combination of genetic and environmental factors. Hardy-Weinberg calculations are beyond the intent.

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 308-309, 310-313, 315-318, 320-323, 324-326, 327-331, 333-334 **Online Labs:** Modeling Alleles (Section 11.3); Probability Practice (Section 6.3); Allele Combinations and Punnett Squares (Section 6.5); Predator-Prey Pursuit (Section 10.4); Investigating an Anole Lizard Population (Section 11.4); Population Genetics (Section 11.4); Hardy-Weinberg Equation (Section 11.4) **Additional Online Resources:** **Chapter Resources:** Chapter 11 Pre-AP Activity: Calculating Gene Frequencies; Unit 3 Project: Interpreting a Pedigree; **Reinforcement:** Reinforcement Worksheet (Section 6.6)	**Disciplinary Core Ideas for Standard HS-LS3-3** **Variation of Traits:** • Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in the population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.
Print or Online SE/TE: Pages 175, 177, 190, 353, 677, 722 **Print or Online TE Only:** Pages 173, 174, 311 **Online Labs:** Probability Practice (Section 6.3); Hardy-Weinberg Equation (Section 11.4); Modeling Chromosomes in Meiosis (Section 6.6); Preventing an Outbreak (Section 31.1) **Additional Online Resources:** **Chapter Resources:** Chapter 11 Pre-AP Activity: Calculating Gene Frequencies	**Science and Engineering Practice for Standard HS-LS3-3** **Analyzing and interpreting data:** Analyzing data in 9–12 builds on K–8 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.**

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 677, 734 (#35, #36, #37), R17 **Online Lab:** Hardy-Weinberg Equation (Section 11.4)	**Crosscutting Concept for Standard HS-LS3-3** **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-LS4-1: Biological Unity and Diversity	
Print or Online SE/TE: Pages 294-296, 299-301, 303-304, 493, 714, 734 **Print or Online TE Only:** Pages 294, 298 **Online Labs:** Biochemical Evidence for Evolution (Section 10.5); Homologies in Vertebrate Skeletons (Section 25.1)	**Performance Expectation HS-LS4-1** *Students who demonstrate understanding can:* Analyze and evaluate how evidence such as similarities in DNA sequences, anatomical structures, and order of appearance of structures during embryological development contribute to the scientific explanation of biological diversity. **Clarification Statement:** Emphasis is on identifying sources of scientific evidence. **Assessment Boundary:** The assessment should provide evidence of students' abilities to evaluate and analyze evidence (e.g. cladograms, analogous/homologous structures, and fossil records).
Print or Online SE/TE: Pages 280-281, 292-296 **Print or Online TE Only:** Pages 278-279 **Online Labs:** Biochemical Evidence for Evolution (Section 10.5); Homologies in	**Disciplinary Core Ideas for Standard HS-LS4-1** **Evidence of Common Ancestry and Diversity:** • Genetic information provides evidence of common ancestry and diversity. 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

Correlation Location	Oklahoma Academic Standards: Biology I
Vertebrate Skeletons (Section 25.1); Natural Selection in African Swallowtails (Section 11.2); Exploring Dog Genetics and Evolution (Section 11.5); Defining species (Section 17.4); Adaptations in Beaks (Section 10.3)	embryological evidence.
Print or Online SE/TE: Pages 416, 433, R16 **Print or Online TE Only:** Page 310 **Online Labs:** Modeling Chromosomes in Meiosis (Section 6.6); Microevolution and Antibiotic-Resistant Bacteria (Section 11.6)	**Science and Engineering Practice for Standard HS-LS4-1** **Analyzing and interpreting data:** Analyzing data in 9-12 builds on K-8 experiences and progress to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. • **Analyze and interpret data to determine similarities and differences in findings.**
Print or Online SE/TE: Pages 319, 321, 334 **Print or Online TE Only:** Page 312 **Online Labs:** Examining Banding Patterns in Polytene Chromosomes (Section 7.3); Biomimicry in Engineering (Section 1.2); Modeling Induction in Embryos (Section 5.5); Modeling Chromosomes in Meiosis (Section 6.6); Hardy-Weinberg Equation (Section 11.4); Exoskeleton Strength (Section 24.1); Modeling Viral Mutations (Section 18.2); Preventing an Outbreak (Section 31.1); Homologies in Vertebrate Skeletons (Section 25.1); Stages of Human Development (Section 34.4); Natural Selection in African Swallowtails (Section 11.2)	**Crosscutting Concept for Standard HS-LS4-1** **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.

Correlation Location	Oklahoma Academic Standards: Biology I
HS-LS4-2: Biological Unity and Diversity	
Print or Online SE/TE: Pages 309, 313, 317, 318, 323, 334 **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); **Video Lab:** Natural Selection Simulation (Section 10.3); Population Genetics (Section 11.4); Investigating an Anole Lizard Population (Section 11.4)	**Performance Expectation HS-LS4-2** *Students who demonstrate understanding can:* Construct an explanation based on evidence that biological diversity is influenced by (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 genetic drift, gene flow through migration, and co-evolution.
Print or Online SE/TE: Pages 288-291 **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); **Video Lab:** Natural Selection Simulation (Section 10.3)	**Disciplinary Core Ideas for Standard HS-LS4-2** **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.

Correlation Location	Oklahoma Academic Standards: Biology I
Additional Online Resources: **Animated Biology:** Principles of Natural Selection (Section 10.1); Natural Selection (Section 10.3)	
Print or Online SE/TE: Pages 309, 313, 317, 318, 323, 334 **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); **Video Lab:** Natural Selection Simulation (Section 10.3); Designing an Experiment to Test a Hypothesis (Section 4.5); Modeling Transcription (Section 8.4); Virtual Investigation: DNA, RNA, and Gene Expression (Ch. 8); Hardy-Weinberg Equation (Section 11.4); Testing pH (Section 2.2); Seed Dispersal Prototype (Section 22.3); Modeling Viruses (Section 18.2); Modeling Viral Mutations (18.2); Preventing an Outbreak (Section 31.1); Examining Human Cells (Section 28.1); Modeling Chromosomes in Meiosis (Section 6.6)	**Science and Engineering Practice for Standard HS-LS4-2** **Constructing explanations (for science) and designing solutions (for engineering):** 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.**
Print or Online SE/TE: Pages 13-17, 30, 295, 317, 839, 906 (#37) **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); Population Genetics (Section 11.4); Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2); **Video Lab:** Natural Selection Simulation (Section 10.3)	**Crosscutting Concept for Standard HS-LS4-2** **Cause and Effect:** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

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Correlation Location	Oklahoma Academic Standards: Biology I
HS-LS4-3: Biological Unity and Diversity	
Print or Online TE Only: Page 312 (Inclusion activity), 313 (Assess and Reteach) **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); **Video Lab:** Natural Selection Simulation (Section 10.3) **Chapter Resources:** Chapter 11 Pre-AP Activity: Calculating Gene Frequencies	**Performance Expectation HS-LS4-3** *Students who demonstrate understanding can:* 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 for adaptations. **Assessment Boundary:** The assessment should provide evidence of students' abilities to analyze shifts in numerical distribution of traits as evidence to support explanations. Analysis is limited to basic statistical and graphical analysis, not gene frequency calculations.
Print or Online SE/TE: Pages 284-285, 286-291, 308-309, 310-313, 315-319, 327-331, 366-368, 776-77 **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); Exploring Adaptations (Section 11.6); Adaptations in Beaks (Section 11.6); **Video Lab:** Natural Selection Simulation (Section 10.3) **Additional Online Resources:** **Animated Biology:** Principles of Natural Selection (Section 10.1); Natural Selection (Section 10.3) **Chapter Resources:** Chapter 11 Pre-AP Activity: Calculating Gene	**Disciplinary Core Ideas for Standard HS-LS4-3** **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. • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. **Adaptation:** • 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

Correlation Location	Oklahoma Academic Standards: Biology I
Frequencies	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. • Adaptation also means that the distribution of traits in a population can change when conditions change.
Print or Online SE/TE: Pages 175, 177, 190, 353, 677, 722 **Print or Online TE Only:** Pages 173, 174, 311 **Online Labs:** Probability Practice (Section 6.3); Hardy-Weinberg Equation (Section 11.4); Modeling Chromosomes in Meiosis (Section 6.6); Preventing an Outbreak (Section 31.1) **Additional Online Resources:** **Chapter Resources:** Chapter 11 Pre-AP Activity: Calculating Gene Frequencies	**Science and Engineering Practice for Standard HS-LS4-3** **Analyzing and interpreting data:** Analyzing data in 9–12 builds on K–8 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.**
Print or Online SE/TE: Pages 319, 321, 334 **Print or Online TE Only:** Page 312 **Online Labs:** Natural Selection in African Swallowtails (11.2); Examining Banding Patterns in Polytene Chromosomes (Section 7.3); Biomimicry in Engineering (Section 1.2); Modeling Induction in Embryos (Section	**Crosscutting Concept for Standard HS-LS4-3** **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.

Correlation Location	Oklahoma Academic Standards: Biology I
5.5); Modeling Chromosomes in Meiosis (Section 6.6); Hardy-Weinberg Equation (Section 11.4); Exoskeleton Strength (Section 24.1); Modeling Viral Mutations (Section 18.2); Preventing an Outbreak (Section 31.1); Homologies in Vertebrate Skeletons (Section 25.1); Stages of Human Development (Section 34.4)	
HS-LS4-4: Biological Unity and Diversity	
Print or Online SE/TE: Pages 290-291, 309 **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); **Video Lab:** Natural Selection Simulation (Section 10.3); Exploring Adaptations (Section 11.6); Adaptations in Beaks (Section 11.6)	**Performance Expectation HS-LS4-4** *Students who demonstrate understanding can:* 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 adaptation of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations. One example could be that as climate became more arid, grasses replaced forests, which led to adaptation in mammals over time (e.g. Increase tooth enamel and size of teeth in herbivores). **Assessment Boundary:** The assessment should measure students’ abilities to differentiate types of evidence used in explanations.

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CORRELATIONS WITH OKLAHOMA ACADEMIC STANDARDS

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 284-285, 286-291, 292-296, 309, 327-331, 445, 766-767 **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); Exploring Adaptations (Section 11.6); Adaptations in Beaks (Section 11.6); **Video Lab:** Natural Selection Simulation (Section 10.3)	**Disciplinary Core Ideas for Standard HS-LS4-4** **Adaptation:** • 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. • 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.
Print or Online SE/TE: Pages 309, 313, 317, 318, 323, 334 **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); **Video Lab:** Natural Selection Simulation (Section 10.3); Designing an Experiment to Test a Hypothesis (Section 4.5); Modeling Transcription (Section 8.4); Virtual Investigation: DNA, RNA, and Gene Expression (Ch. 8); Hardy-Weinberg Equation (Section 11.4); Testing pH (Section 2.2); Seed Dispersal Prototype (Section 22.3); Modeling Viruses (Section 18.2); Modeling Viral Mutations (18.2); Preventing an Outbreak (Section 31.1); Examining Human Cells (Section 28.1); Modeling Chromosomes in Meiosis (Section 6.6)	**Science and Engineering Practice for Standard HS-LS4-4** **Constructing explanations (for science) and designing solutions (for engineering):** 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.**

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 13-17, 30, 295, 317, 839, 906 (#37) **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); Population Genetics (Section 11.4); Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2); **Video Lab:** Natural Selection Simulation (Section 10.3)	**Crosscutting Concept for Standard HS-LS4-4** **Cause and Effect:** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
HS-LS4-5: Biological Unity and Diversity	
Print or Online SE/TE: Pages 290-291, 331 **Online Labs:** Modeling Alleles (Section 11.3); Adaptations in Beaks (Section 11.6)	**Performance Expectation HS-LS4-5** *Students who demonstrate understanding can:* Synthesize, communicate, and evaluate the information that describes how changes in environmental conditions can affect the distribution of traits in a population causing: 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. **Assessment Boundary:** The assessment should provide evidence of students' abilities to explain the cause and effect for how changes to the environment affect distribution or disappearance of traits in species.

Correlation Location	Oklahoma Academic Standards: Biology I
Print or Online SE/TE: Pages 290-291, 330-331 **Online Labs:** Modeling Alleles (Section 11.3); Adaptations in Beaks (Section 11.6)	**Disciplinary Core Ideas for Standard HS-LS4-5** **Adaptation:** • 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. • 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' adaptation over time is lost.
Print or Online SE/TE: Pages 16 (Pre-AP Activity), 30 (#23), 272 (#33) **Print or Online TE Only:** Pages 292, 298, 325 **Online Labs:** Adaptations in Beaks (Section 11.6); Biotechnology and Food Products (Section 1.5); Fruit Preservation (Section 1.3)	**Science and Engineering Practice for Standard HS-LS4-5** **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 natural and designed worlds. Arguments may also come from current scientific or historical episodes in science. • **Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments.**
Print or Online SE/TE: Pages 13-17, 30, 295, 317, 839, 906 (#37) **Online Labs:** Natural Selection in African Swallowtails (Section 11.2); Population Genetics (Section 11.4); Pill Bug Behavior (Section 27.1); Investigating Behavior (Section 27.2); **Video Lab:** Natural Selection Simulation (Section 10.3)	**Crosscutting Concept for Standard HS-LS4-5** **Cause and Effect:** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.