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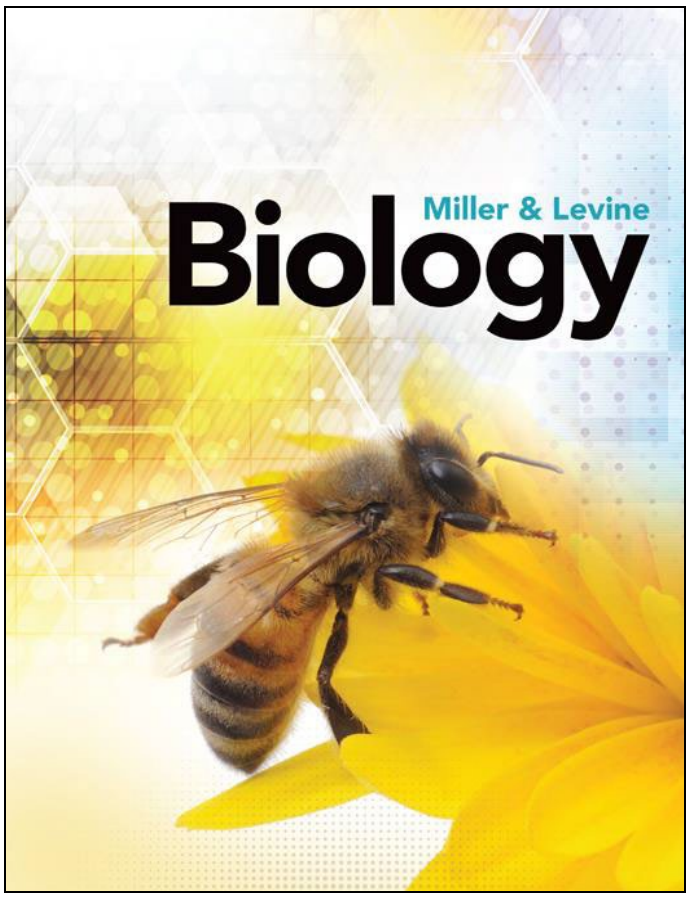

To the

Oklahoma
Academic Standards for Science
Biology

Pearson

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Introduction

This document demonstrates how ***Miller & Levine Biology ©2019*** supports the Oklahoma Academic Standards for Science. Correlation page references are to the Student and Teacher's Editions and cited at the page level.

Renowned Author Team Ken Miller and Joe Levine have created a comprehensive on-level program to inspire students to interact with trusted and up-to-date biology content. The authors' unique storytelling style engages students in biology, with a greater focus on written and visual analogies. This innovative and fresh new program was developed for modern biology classrooms with a focus on STEM integration and 21st century education.

Problem-Based Learning The Problem-Based Learning Strand introduced in each unit opener immerses students in an active learning environment with lab investigations, STEM projects, virtual activities, and authentic readings. When students each the end of the unit, they use their newly acquired scientific knowledge and data to design, test, and evaluate a solution to the presented problem.

Performance-Based Assessment Authentic assessments of STEM learning allow students to demonstrate mastery of the chapter concepts and new standards. All Performance-Based Assessments feature real-world problems and focus on science inquiry, engineering, and STEM practices.

Case Studies Students directly interact with science phenomena in every chapter as they learn about a real-world science problem. Throughout the lessons, students find case study connections in data analysis activities, labs, diagrams, illustrations, and interactivities.

Interactive Learning Students interact with digital art, videos, and animations through interactive prompts or questions, making ***Miller & Levine Biology*** relevant to their lives.

Reading and Study Support *Biology Foundations: Reading and Study Guide Workbook* includes lesson summaries, vocabulary help, and reading tools. Practice focuses on key concepts and science literacy to improve students' understanding of scientific text.

PearsonRealize.com PearsonRealize.com is your online destination for the complete Miller & Levine Biology digital curriculum. A single sign-on provides access to biology content, assessments, resources, management tools, and real-time student data. Realize directly syncs with providers such as Google® and OpenEd to provide a seamless digital experience.

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HS-LS1 From Molecules to Organisms: Structure and Processes	
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. 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.	**SE/TE:** The Role of DNA, 416 The Components of DNA, 418-419 Solving the Structure of DNA, 420-421 The Double-Helix Model, 422-423 Copying the Code, 424-426 Quick Lab: Modeling DNA Replication, 426 Replication in Living Cells, 426-427 Comparing RNA and DNA, 440-441 The Role of RNA, 440-442 Transcription, 443 RNA Synthesis, 443-444 Lesson 14.1 Review, 444 The Genetic Code, 445-446 Translation, 447-449
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 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.	**SE/TE:** Figure 8.23: Levels of Organization, 268 Lesson 8.4 Review, Question #4, 269 Levels of Organization, 802 Organs, 905

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HS-LS1-3 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 does not include the cellular processes involved in the feedback mechanism.	**SE/TE:** 8.4 Homeostasis and Cells, 266-269 Lesson 8.4 Review, Question #6, 269 Homeostasis, 907-909 Exploration: Exercise and Heart Rate, 917
HS-LS1-4 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 each phase in mitosis. Clarification Statement Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.	**SE/TE:** Cell Division and Reproduction, 341-342 Mitosis, 346-347 Quick Lab: Make a Model of Mitosis, 347 Lesson 11.2 Review, 348 Cytokinesis, 348-349 Controls of Cell Division, 350-352
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, 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).	**SE/TE:** An Overview of Photosynthesis, 289-290 Lesson 9.2 Review, Question #4, 290 Factors Affecting Photosynthesis, 296-297 Performance-Based Assessment: Data from the Corn Field, 302-303

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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 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 does not include the details of the specific chemical reactions or identification of macromolecules.	**SE/TE:** Macromolecules, 53-57 Lesson 2.3 Review, Questions #2, 3, 4, 5, 57 Overview of Cellular Respiration, 311-312 Comparing Photosynthesis and Cellular Respiration, 313 Lesson 10.1 Review: Questions #1-5, 313 Modeling Lab: Making a Model of Cellular Respiration, 320
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. Examples of models could include diagrams, chemical equations, conceptual models, and/or laboratory investigations. Assessment Boundary should not include identification of the steps or specific processes involved in cellular respiration (e.g. glycolysis and Kreb's Cycle).	**SE/TE:** Overview of Cellular Respiration, 311-312 Modeling Lab: Making a Model of Cellular Respiration, 320 The Totals, 320

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HS-LS2 Ecosystems: Interactions, Energy, and Dynamics	
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, or population changes gathered from simulations or historical data sets. Assessment Boundary does not include deriving mathematical equations to make comparisons.	**SE/TE:** 5.1 How Populations Grow, 144-151 Guided Inquiry: Estimating Population Size, 148 Immigration and Emigration, 148 5.2 Limits to Growth, 152-157 Analyzing Data: Monarchs in Decline, 155 Performance-Based Assessment: A Tale of Two Countries-China and India, 166-167 Chapter 5 Assessment: Questions #34-39, 170
HS-LS2-2 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 is limited to provided data.	**SE/TE:** Limiting Factors, 152 Density-Dependent Limiting Factors, 153-155 Analyzing Data: Monarchs in Decline, 155 Density-Independent Limiting Factors, 156-157 Limiting Factors and Extinction, 157 Performance-Based Assessment: The Populations of Yellowstone, 194-195 Climate Change, 208 Performance-Based Assessment: Biodiversity in the Everglades, 230-231 Patterns of Extinction, 654 Mass Extinction, 656

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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 (e.g., chemosynthetic bacteria, yeast, and muscle cells). Assessment Boundary does not include the specific chemical processes of either aerobic or anaerobic respiration.	**SE/TE:** Life Without Light, 115 9.1 Energy and Life, 282-285 Overview of Cellular Respiration, 311-312 Oxygen and Energy, 312 Comparing Photosynthesis and Cellular Respiration, 313 Fermentation, 321-323 Energy and Exercise, 324-325
HS-LS2-4 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 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.	**SE/TE:** Primary Producers, 114 Consumers, 116-117 Food Chains and Food Webs, 118-120 Quick Lab: How Can You Model Energy Flow in Ecosystems, 121 Ecological Pyramids, 121-122 Recycling in Nature, 123-124 Performance-Based Assessment: Data from the Corn Field, 302-303
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 (e.g., chemical equations that demonstrate the relationship between photosynthesis and cellular respiration. Assessment Boundary does not include the specific chemical steps of photosynthesis and respiration.	**SE/TE:** Performance-Based Assessment: Investigating Hydroponics, 34-35 The Carbon Cycle, 126-128 An Overview of Photosynthesis, 289-290 Performance-Based Assessment: Data from the Corn Field, 302-303 Overview of Cellular Respiration, 311-312 Comparing Photosynthesis and Cellular Respiration, 313

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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. 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.	**SE/TE:** Limiting Factor, 152 Density-Dependent Limiting Factors, 153-155 Analyzing Data: Monarchs in Decline, 155 Density-Independent Limiting Factors, 156-157 Primary Succession, 182-183 6.2 Succession, 182-185 Secondary Succession, 183 Why Succession Happens, 184 Quick Lab: How Does Succession Occur?, 184 Climax Communities, 184-185
HS-LS2-8 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, 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.	**SE/TE:** Behavior and Evolution, 822 Learned Behavior, 823-824 Behavioral Cycles, 824 Modeling Lab: The Role of Group Behavior, 825 Social Behavior, 825-826 Communication, 827

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HS-LS3 Heredity: Inheritance and Variation of Traits	
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. 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 may include codominance, incomplete dominance, and sex-linked traits, but should not include dihybrid crosses.	**SE/TE:** Mendel's Experiments, 378-380 Segregation, 381-382 Quick Lab: Simulating Segregation, 382 Probability and Heredity, 383-386 Independent Assortment, 387 A Summary of Mendel's Principles, 389 Beyond Dominance and Recessive Alleles, 389-391 The Role of DNA, 416-417 The Genetic Code, 445-446 Karyotypes, 474--475 Transmission of Human Traits, 476-477 Human Pedigrees, 478-479 Quick Lab: How Can You Analyze a Pedigree?
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 does not include the phases of meiosis or the biochemical mechanisms of specific steps in the process.	**SE/TE:** Gene Mapping, 399 Harmful and Helpful Mutations, 460-461 Chromosomal Disorders, 480 From Molecule to Phenotypes, 481-484 Mutations, 582 Genetic Rearrangement, 597 Growth, Reproduction, and Recombination, 692

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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 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.	**SE/TE:** Genes and the Environment, 382 Probability and Heredity, 383-386 Using Punnett Squares, 386-387 Quick Lab: Simulating Segregation, 392 Analyzing Data: Crack the Code, 447 Variation and Adaptation, 556 18.1 Genes and Variations, 580-584 Populations and Gene Pools, 581
HS-LS4 Biological Unity and Diversity	
HS-LS4-1 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).	**SE/TE:** Performance-Based Assessment: Making a Better Bread - Mastering Fermentation, 330-331 Recent Fossil Finds, 561-562 Comparing Anatomy and Development, 562-564 Genetics and Molecular Biology, 564-565 Exploration Lab: Evidence of Evolution, 565 18.3 The Process of Speciation, 592-595 Performance-Based Assessment: Good Grief! When Weeds Fight Back!, 604-605 Evolutionary Classification, 619 Cladograms, 620-623 Guided Inquiry: Construct a Cladogram, 628 Performance-Based Assessment: Build a Cladogram, 634-635 Adaptation and Extinction, 653

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HS-LS4-2 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 does not include genetic drift, gene flow through migration, and co-evolution.	**SE/TE:** Evolution by Natural Selection, 555-557 Testing Natural Selection, 565-567 Genetics Joins Evolutionary Theory, 580-581 Mutations, 582 Sources of Genetic Variation, 582-583 How Natural Selection Works, 585-587 How Natural Selection Works, 585-587 Isolating Mechanisms, 592-593 18.3 The Process of Speciation, 592-595 Speciation in Darwin's Finches, 594-595 Modeling Lab: Competing for Resources, 595 Adaptation and Extinction, 653
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 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.	**SE/TE:** 17.3 Darwin's Theory: Natural Selection, 555 Natural Selection, 567 How Natural Selection Works, 585-587 Quick Lab: Modeling Genetic Drift, 588

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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 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.	**SE/TE:** 17.3 Darwin's Theory: Natural Selection, 555 Natural Selection, 567 Performance-Based Assessment: Evolution in Action-Beak Size Among Darwin's Finches, 572-573 How Natural Selection Works, 585-587 Genetic Drift, 588-589 Evolution Versus Equilibrium, 589-591 Isolating Mechanisms, 592-593 Speciation in Darwin's Finches, 594-595 Modeling Lab: Competing for Resources, 595 Performance-Based Assessment: When Weeds Fight Back!, 604-605
HS-LS4-5 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.	**SE/TE:** Limiting Factors and Extinction, 157 Putting the Puzzle Together, 548 Isolating Mechanisms, 592-593 Speciation in Darwin's Finches, 594-595 Speciation and Extinction, 652-654