2026-27 Biology Scope and Sequence

Biology Pacing Guide Overview

From the first day of school through Winter Break, there are approximately 80 instructional days. During this time:

- Unit 1 is recommended to take approximately 36 instructional periods
- Unit 2 is recommended to take approximately 40 instructional periods

To maintain alignment with pacing expectations, Units 1 and 2 should be completed prior to Winter Break.

This pacing is intentionally designed to provide sufficient time for phenomena-driven, three-dimensional (3D) instruction aligned to PA STEELS standards. It allows students to engage in sensemaking, modeling, and scientific discourse, while also providing time for embedded formative assessments and administration of the Classroom Diagnostic Tools (CDT).

These guidelines provide both structure and flexibility, allowing teachers to adjust pacing based on student needs while maintaining focus on priority standards and unit coherence. Teachers may need to adjust within units; however, significant deviations from the overall pacing may impact students' opportunity to engage in the full learning progression. Staying close to this pacing helps ensure that students experience the full sequence of the curriculum, including revisiting anchoring phenomena, refining models over time, and building toward a coherent understanding of core biological concepts.

From the return after Winter Break to the week prior to the Biology Keystone Exam, there are approximately 81 instructional days.

During the second semester:

- Unit 3 is recommended to take approximately 40 instructional periods
- Unit 4 is recommended to take approximately 40 instructional periods

This pacing ensures that all core content is taught prior to the Keystone Exam, while still allowing time for continued 3D learning experiences, strategic review and reinforcement of key concepts, and use of Keystone-style assessment items to prepare students for the structure and rigor of the exam.

Maintaining this pacing in the second semester is equally important, as it ensures that students have opportunities to apply their understanding in new contexts, strengthen their reasoning with evidence, and engage in the type of scenario-based thinking required for success on the Keystone Exam.

Unit 1: *Relationships in Ecosystems*	**Chapters: 2, 3, 4**
Anchoring Phenomena: *Sea Pig Population Fluctuation*	**Driving Question:** *Why did the sea pig population increase dramatically from 2011-2014?*
Chapter, Lessons, & Mini-labs	**STEELS Standards (Performance Expectations)**
Chapter 2: *Relationships in Ecosystems* 2.1: *Ecological Systems* 2.2: *Modeling the Transfer of Energy and Matter* 2.3: *Modeling Energy and Matter Distribution* **Minilab:** *Model a Biomass Pyramid* 2.4: *Cycling of Matter*	**3.1.9-12.I:** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. **3.1.9-12.J:** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. **3.1.9-12.H:** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. **3.1.9-12.K:** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
Chapter 3: *Biodiversity and Ecosystem Stability* 3.1: *Ecological Relationships* 3.2: Biodiversity 3.3: *Ecosystem Stability and Change* **Minilab:** *Observing Biodiversity in Pond Water*	**3.1.9-12.L:** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. **3.1.9-12.M:** 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. **3.1.9-12.N:** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
Chapter 4: *Population Measurements and Growth* 4.1: *Measuring Populations* **Minilab:** *Mark-Recapture Sampling* 4.2: *Modeling Population Growth Patterns* 4.3 *Factors that Limit Population Growth*	**3.1.9-12.I:** Use mathematical or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. **3.1.9-12.L:** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. **3.1.9-12.N:** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity **3.5.9-12.I (ETS):** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 2: Cell Systems	**Chapters: 5, 6, 7, 10.3, 10.4**
Anchoring Phenomena: *Sarah's Stomach*	**Driving Question:** *How do bacteria survive in your gut?*
Chapter and Lessons	**STEELS Standards (Performance Expectations)**
Chapter 5: *Molecules in Living Systems* 5.1: *Elements and Compounds* 5.2: *Water* **Minilab:** *Polar vs Nonpolar Molecules* 5.3: *Carbon-based Molecules* **Investigation:** *Crime Scene Cleaners* 5.4: *Chemical Reactions*	**3.1.9-12.A:** 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. **3.1.9-12.B:** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **3.1.9-12.E:** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. **3.1.9-12.F:** Construct and revise an explanation based on evidence of how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. **3.1.9-12.G:** 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. **3.1.9-12.J:** Construct and revise and explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. **3.1.9-12.K:** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
Chapter 6: *Cell Structures and Functions* *6.1: Cell Structures* 6.2: *Cell Membranes* Revisit Case Study **Minilab:** *Selectively Permeable Membrane* 6.3: *Photosynthesis and Cellular Respiration* **Investigation:** *Factors Affecting Cellular Respiration*	**3.1.9-12 E:** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. **3.1.9-12 G:** 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. **3.1.9-12 J:** Construct and revise and explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. **3.1.9-12 K:** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. **3.5.9-12Y(ETS):** Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering.

Unit 2: Cell Systems	Chapters: 5,6,7,10.3, 10.4
Anchoring Phenomena: *Sarah's Stomach*	**Driving Question:** *How do bacteria survive in your gut?*
Chapter and Lessons	**STEELS Standards (Performance Expectations)**
Chapter 7: *Cell Growth* **Case Study:** *Immortal Cells: The Story of Henrietta Lacks* 7.1: *Cell Cycles* 7.2: *Mitosis* **Minilab:** Modeling Mitosis	**3.1.9-12.A:** 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. **3.1.9-12.B:** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
Chapter 10: *Animal Systems* **Minilab:** *Reaction Speed* 10.3: *Maintaining Homeostasis* 10.4: Animal Behavior **Investigation:** The Effects of Exercise on Homeostasis	**3.1.9-12 B:** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **3.1.9-12.C:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. **3.1.9-12.O:** Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. **5.5.9-12.I (ETS):** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 3: Genetics	Chapters: 11, 12, 13
Anchoring Phenomena: *Covid 19 A Global Pandemic*	**Driving Question:** *How can we slow the spread of a virus?*
Chapter & Lessons	**STEELS Standards (Performance Expectations)**
Chapter 11: *DNA, RNA, and Proteins* 11.1: *Genetic Information* 11.2: *Replication, Transcription, and Translation* **Minilab:** *Modeling DNA Replication, Transcription, and Translation* 11.3: *Regulation Gene Expression*	**3.1.9-12.A:** 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. **3.1.9-12.R:** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Chapter 12: *Genetic Variation and Heredity* 12.1: *Meiosis* 12.2: *Mutations* 12.3: *Mendelian Inheritance* 12.4: *Other Patterns of Inheritance* **Minilab:** *Modeling Inheritance*	**3.1.9-12.A:** 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. **3.1.9-12.P**: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. **3.1.9-12.Q :** 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. **3.1.9-12.R:** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Chapter 13 *Genetic Technologies* **Anchoring Phenomena:** *Covid 19 A Global Pandemic* 13.1: *Tools of Technology* **Simulation:** *PCR and Gel Electrophoresis* 13.2: *Genetic Engineering* **Minilab:** *Herd Immunity*	**3.1.9-12.N:** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **3.5.9-12.T (ETS):** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **3.5.9-12.Y (ETS):** Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering. **3.5.9-12.I (ETS):** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 4: Evolution	**Chapters: 14, 15, 16**
Anchoring Phenomena: *Hummingbirds*	**Driving Question:** *How did hummingbirds develop such a long beak?*
Chapter & Lessons	**STEELS Standards (Performance Expectations)**
Chapter 14: *Evidence for Evolution* 14.1 *Lines of Evolution* **Minilab:** *Organizing Fossil Evidence* 14.2 *Fossil and Geological Evidence* 14.3 *Developmental, Anatomical, And Genetic Evidence*	**3.1.9-12.S**: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
Chapter 15: *The Theory of Evolution* 15.1: *Developing the Theory of Evolution* **Minilab:** *Hawks and Mice* 15.2: *Evolution in Populations* 15.3: *Other Mechanisms of Evolution* **Investigation:** *Evolution of Antibiotic Resistance in Bacteria*	**3.1.9-12.R:** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. **3.1.9-12.T:** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. **3.1.9-12.U:** 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. **3.1.9-12.W:** Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

Unit 4: Evolution	Chapters: 14, 15, 16
Anchoring Phenomena: *Hummingbirds*	**Driving Question:** *How did hummingbirds develop such a long beak?*
Chapter & Lessons	**STEELS Standards (Performance Expectations)**
Chapter 16: *Survival in Changing Environments* 16.1: *Speciation* 16.2: *Extinction* 16.3: *Human Impact on the Environment* 16.4: *Reducing Human Impact on the Environment* **Minilab:** *Modeling Human-caused Changes in the Environment* **Alternative Activity:** *HHMI Rock Pocket Mice*	**3.1.9-12.N:** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **3.1.9-12.X:** Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. **HS-LS4-6:** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* **3.5.9-12.Y (ETS):** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **3.5.9-12.I (ETS):** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. **3.5.9-12.K (ETS):** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.