



HIGH SCHOOL BIOLOGY

High School Life Sciences Standards:

Molecules to Organisms

- 1-1 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.
- 1-2 Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.
- 1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- 1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
- 1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- 1-6. 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.
- 1-7. 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.

Ecosystems: Interactions, Energy and Dynamics

- 2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- 2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- 2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.



- 2-4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
- 2-5.** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
- 2-6.** 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.
- 2-7.** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
- 2-8.** Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Heredity: Inheritance and Variation of Traits

- 3-1.** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- 3-2.** 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.
- 3-3.** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Biological Evolution: Unity and Diversity

- 4-1.** Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- 4-2.** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
- 4-3.** 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.

- 4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
- 4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
- 4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Other Relevant Standards:

HS –ESS2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface process.

Unit	Lesson Outline	NGSS
Unit 1: Biology Basics	1-1 Nature of Science and the Scientific Method 1-2 Hypotheses, Theories and Scientific Law 1-3 Technological Design Process 1-4 Chemistry of Life 1-5 Properties of Water 1-6 Macromolecules	HS-ESS2-5 HS-LS1-6
Unit 2: Cells	2-1 Cell Theory 2-2 Prokaryotic and Eukaryotic Cells 2-3 Cell Organelles 2-4 Passive Cellular Transport 2-5 Active Cellular Transport 2-6 Stem Cells 2-7 Cell Cycle (Mitosis) 2-8 Regulation of the Cell	HS-LS1-1 HS-LS1-2 HS-LS1-4
Unit 3: Classification and Taxonomy	3-1 Cladograms and Dichotomous Keys 3-2 Carolus Linnaeus System for Classifying Organisms 3-3 The Six Kingdoms of Life	HS-LS1-2
Unit 4: Ecology	4-1 Characteristics of Life 4-2 The Ecological Niche 4-3 Ecological Organization	HS-LS1-2 HS-LS2-1 HS-LS2-2

	4-4 Community Patterns 4-5 Relationships between Organisms 4-6 Population Growth Patterns 4-7 Sampling Communities 4-8 Human Impact on the Environment	HS-LS2-6 HS-LS2-7 HS-LS2-8
Unit 5: Energy Flow	5-1 Producers and Consumers 5-2 Photosynthesis 5-3 Respiration 5-4 ATP 5-5 Food webs 5-6 Trophic Pyramids 5-7 Nutrient Cycling	HS-LS1-5 HS-LS1-7 HS-LS2-2 HS-LS2-3 HS-LS2-4 HS-LS2-6
Unit 6: Genetics	6-1 DNA and RNA Structure 6-2 DNA Replication 6-3 Meiosis 6-4 Protein Synthesis 6-5 Enzymes 6-6 Mutations 6-7 Genetic Engineering	HS-LS1-1
Unit 7: Heredity	7-1 Mendelian Genetics 7-2 Monohybrid Inheritance 7-3 Dihybrid Inheritance 7-4 Modified Mendelian Ratios 7-5 Pedigrees 7-6 Genetic Disorders	HS-LS3-1 HS-LS3-2 HS-LS3-3
Unit 8: Evolution	8-1 Evolutionary Theory Pre-Darwin 8-2 Evidence for Evolution 8-3 Evolutionary Agents 8-4 Principles of Natural Selection 8-5 Modes of Natural Selection 8-6 Phylogenetic Trees 8-7 The Species concept 8-8 Patterns in Macroevolution	HS-LS4-1 HS-LS4-2 HS-LS4-3 HS-LS4-4 HS-LS4-5
Unit 9: Human Body Systems	9-1 Integumentary System 9-2 Skeletal System 9-3 Muscular System 9-4 Digestive System 9-5 Circulatory System	HS-LS1-2

	9-6 Lymphatic System 9-7 Respiratory System 9-8 Urinary System 9-9 Endocrine System 9-10 Reproductive System 9-11 Nervous System	
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