



Prerequisites:	None
Department(s):	Science
District Sites:	ALL
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### Definitions

CALPADS	California Longitudinal Pupil Achievement Data System
CTE Technical Prep	A course within a CTE technical career pathway or program articulated with postsecondary education or through an apprenticeship program of at least 2 years following secondary instruction.
Instructional Level Code	Represents a nonstandard instructional level at which the content of a specific course is either above or below a 'standard' course instructional level. These levels may be identified by the actual instruction level or by equating the course content and level of instruction with a state or nationally recognized advanced course of study, such as IB or AP.
Instructional Level Honors, UC Certified	Includes all AP courses.
Instructional Level Honors, non UC Certified	Requires Board approval.
Instructional Level College	Includes ACE courses. Equivalent to college course and content, but not an AP course. Not related to section, but to course.

**EL DORADO UNION HIGH SCHOOL DISTRICT**

**EDUCATIONAL SERVICES**

**Course Title: Biology**

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\*These standards are tight standards that all El Dorado Union High School District students will master.

EL DORADO UNION HIGH SCHOOL DISTRICT

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Biology**

Course Number: **0311**

Unit Title: **Ecology**

**Content Area Standards** (Please identify the source): List content standards students will master in this unit.

All standards are from *Next Generation Science Standards*. These standards are organized thematically in the *California Science Framework*.

Grade-Level Standards: Grades Nine through Twelve - Life Science

<https://www.cde.ca.gov/ci/pl/documents/cangsshs-dcilifesci.pdf>

**Content Standards**

**HS-LS2-1** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

**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.

**HS-LS2-4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

**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.

**HS-LS2-7** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

**HS-LS2-8** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

**\*HS-ESS3-1** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

**Science and Engineering Practices (SEPs)**

**Using Mathematics and Computational Thinking**

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

- Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
- Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2) (HS-LS2-4)
- Create or revise a simulation of a phenomenon, designed device, process, or system. (HS-LS4-6)

**Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions

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

- Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade off considerations. (HS-LS2-7)
- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1)

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

- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)
- Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-8)

### **Cross-Cutting Concepts (CCC)**

#### **Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8),(HS-LS4-6)

#### **Scale, Proportion, and Quantity**

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

#### **Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

#### **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.(HS-LS2-4)

#### **Influence of Engineering, Technology, and Science on Society and the Natural World**

- Modern civilization depends on major technological systems. (HS-ESS3-1)

**Unit Outline:** A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

### **LS2.A: Interdependent Relationships in Ecosystems**

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS21),(HS-LS2-2)

### **LS2.B: 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. (HS-LS2-4)

### **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to

an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)

- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7) LS2.D:

**LS2.D: Social Interactions and Group Behavior**

- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)

**LS4.C: 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. (HS-LS4-6)

**LS4.D: Biodiversity and Humans**

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HS-LS2-7)
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by pres

**ESS3.A: Natural Resources**

- Resource availability has guided the development of human society. (HS-ESS3-1)

**ESS3.B: Natural Hazards**

- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)

**ETS1.B: Developing Possible Solutions**

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HS-LS2-7),(secondary to HS-LS4-6) Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (secondary to HS-LS4-6)

**Instructional Strategies:** Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Instructional strategies may include, but are not limited to:

- Multimedia instructor presentations and guided note taking
- Graphic organizers - students organize complex ideas into categories, compare and contrast, or sort terms.
- Discussion in pairs or groups
- Demonstrations - teacher uses models to show scientific phenomena in real time and space
- Informal investigations -students collect and/or analyze data and use it to draw conclusions about the phenomena they are studying
- Formal labs - generate hypotheses, and collect and analyze data; students practice applying the process of the scientific method and demonstrate competency in scientific writing
- Internet research - students use reliable, up-to-date web sources to delve into real life examples of key concepts
- Constructing models - students build 2- or 3-dimensional representations or construct mathematical representations of biological concepts that can be represented by functions.
- Assembling puzzles - students connect vocabulary terms, examples, or illustrations with clues to self-assess.
- Gizmos - such as Food Chain Gizmo, Forest Ecosystem Gizmo, Rabbit Population Season Gizmo, Biotic Factors Gizmo, Abiotic Factors Gizmo

**Assessments:** Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Teachers may use, but are not limited to, any of the following to assess student mastery.

- Tests & quizzes, including Illuminate DnA - assessment items may be tagged by topic so that teachers can identify areas of strength and need on a group and/or individual level. Teachers can use this data to determine appropriate interventions
- Gizmos
- Informal investigations
- Formal labs & written reports
- Data analysis & data representation, including through graphs
- Claim - Evidence - Reasoning
- Synthesis of argument from evidence
- Developing and using models
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information
- Exit Tickets

**Interventions:** Describe methods used to support students who fail to master unit Formative and Summative assessments.

Teachers may use, but are not limited to, one or more of the following methods to help students reach mastery.

- Direct reteaching on group or individual basis.
- Allowing corrections on assignments or assessments
- Study groups and group work with specific assigned roles
- Jigsaw
- Teacher notes & worksheets
- Guided homework support
- Peer tutoring
- Hands-on activities to engage with content
- Gizmos
- Direct vocabulary instruction
- Organization skill support
- Cloze notes and/or sentence frames
- Communication with parents
- Student trackers
- Graphic organizers, including guided notes, anchor charts, mind maps
- Close Reading
- Whiteboards to allow creative collaborative work
- Scientific writing practice
- Mini-Lessons
- Condensed google slides summaries of important content
- McGraw Hill textbook resources, such as SmartBook adaptive media
- Online resources such as: Khan Academy, Crash Course, Amoeba Sisters, Bozeman Science, PBS Learning, NOVA Videos, National Center for Case Studies in Science Teaching, Pear Deck, EdPuzzle, Learn Genetics Utah, PhET, The Wonder of Science, Stanford NGSS Assessment Project, CASE, NIH, Moana Loa Observatory, Scripps Institute, SIRC, SASP, CA Environmental Literacy Initiative, Exploratorium, California Academy of Science, Science Learning Hub (science learn.org), MBER, Concord Consortium,
- School intervention time (i.e., Flex period) - Teachers may use one or more of the following methods during designated intervention time to help students reach mastery:
  - Teacher reteaching
  - Formative/summative corrections, and/or formative/summative retakes
  - Peer tutoring

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Biology**

Course Number: **0311**

Unit Title: **Chemistry of Life**

**Content Area Standards** (Please identify the source): List content standards students will master in this unit.

All standards are from *Next Generation Science Standards*. These standards are organized thematically in the *California Science Framework*.

Grade-Level Standards: Grades Nine through Twelve - Life Science

<https://www.cde.ca.gov/ci/pl/documents/cangsshs-dcilifesci.pdf>

**Content Standards**

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

**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.

**Science and Engineering Practices (SEPs)**

**Planning and Carrying Out Investigations**

- Planning and carrying out investigations 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. (HS-ESS2-5)

**Constructing Explanations and Designing Solutions**

- Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories. Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

**Cross-Cutting Concepts**

**Structure and Function**

- The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5)

**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)

**Unit Outline:** A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

**ESS2.C: The Roles of Water in Earth's Surface Processes**

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5)

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

- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6)

**Instructional Strategies:** Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Instructional strategies may include, but are not limited to:

- Multimedia instructor presentations and guided note taking
- Graphic organizers - students organize complex ideas into categories, compare and contrast, or sort terms.
- Discussion in pairs or groups
- Demonstrations - teacher uses models to show scientific phenomena in real time and space
- Informal investigations - students collect and/or analyze data and use it to draw conclusions about the phenomena they are studying
- Formal labs - generate hypotheses, and collect and analyze data; students practice applying the process of the scientific method and demonstrate competency in scientific writing
- Internet research - students use reliable, up-to-date web sources to delve into real life examples of key concepts
- Constructing models - students build 2- or 3-dimensional representations or construct mathematical representations of biological concepts that can be represented by functions.
- Assembling puzzles - students connect vocabulary terms, examples, or illustrations with clues to self-assess.
- Gizmos - such as Identifying Nutrients Gizmo

**Assessments:** Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Teachers may use, but are not limited to, any of the following to assess student mastery.

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- Gizmos
- Informal investigations
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- Claim - Evidence - Reasoning
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- Using mathematics and computational thinking
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- Obtaining, evaluating, and communicating information
- Exit Tickets

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Teachers may use, but are not limited to, one or more of the following methods to help students reach mastery.

- Direct reteaching on group or individual basis.
- Allowing corrections on assignments or assessments
- Study groups and group work with specific assigned roles
- Jigsaw
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- Gizmos
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- Organization skill support
- Cloze notes and/or sentence frames
- Communication with parents
- Student trackers
- Graphic organizers, including guided notes, anchor charts, mind maps
- Close Reading
- Whiteboards to allow creative collaborative work
- Scientific writing practice
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- Condensed google slides summaries of important content
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  - Teacher reteaching
  - Formative/summative corrections, and/or formative/summative retakes
  - Peer tutoring

EL DORADO UNION HIGH SCHOOL DISTRICT

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Biology**

Course Number: **0311**

Unit Title: **Photosynthesis and Cellular Respiration**

**Content Area Standards** (Please identify the source): List content standards students will master in this unit.

All standards are from *Next Generation Science Standards*. These standards are organized thematically in the *California Science Framework*.

Grade-Level Standards: Grades Nine through Twelve - Life Science

<https://www.cde.ca.gov/ci/pl/documents/cangsshs-dcilifesci.pdf>

**Content Standards**

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

**HS-LS1-5** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

**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.

**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.

**\*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.

**\*HS-ESS2-6** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

**Science and Engineering Practices (SEPs)**

**Developing and Using Models**

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

- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-5),(HS-LS1-7)
- Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5) (HS-ESS2-6)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to

explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS2-3)

#### **Planning and Carrying Out Investigations**

- Planning and carrying out 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. (HS-LS1-3)

#### **Scientific Investigations Use a Variety of Methods**

- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

### **Cross-Cutting Concepts**

#### **Stability and Change**

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

#### **Systems and System Models**

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

#### **Energy and Matter**

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5)
- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.(HS-LS1-7)
- Energy drives the cycling of matter within and between systems. (HS-LS2-3)
- The total amount of energy and matter in closed systems is conserved. (HS-ESS2-6)

**Unit Outline:** A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

#### **LS1.A: 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. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

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

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-7)
- 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.(HS-LS1-7)

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

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small

fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)

- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)

**PS3.D: Energy in Chemical Processes** The main way that solar energy is captured and stored on

- Earth is through the complex chemical process known as photosynthesis. (secondary to HS-LS2-5)

**ESS2.D: Weather and Climate**

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6)
- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6),

**Instructional Strategies:** Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Instructional strategies may include, but are not limited to:

- Multimedia instructor presentations and guided note taking
- Graphic organizers - students organize complex ideas into categories, compare and contrast, or sort terms.
- Discussion in pairs or groups
- Demonstrations - teacher uses models to show scientific phenomena in real time and space
- Informal investigations -students collect and/or analyze data and use it to draw conclusions about the phenomena they are studying
- Formal labs - generate hypotheses, and collect and analyze data; students practice applying the process of the scientific method and demonstrate competency in scientific writing
- Internet research - students use reliable, up-to-date web sources to delve into real life examples of key concepts
- Constructing models - students build 2- or 3-dimensional representations or construct mathematical representations of biological concepts that can be represented by functions.
- Assembling puzzles - students connect vocabulary terms, examples, or illustrations with clues to self-assess.
- Gizmos - such as Cells Gizmo, Photosynthesis Gizmo, Paramecium Gizmo, Plants and Snails Gizmo, Carbon Cycle Gizmo

**Assessments:** Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Teachers may use, but are not limited to, any of the following to assess student mastery.

- Tests & quizzes, including Illuminate DnA - assessment items may be tagged by topic so that teachers can identify areas of strength and need on a group and/or individual level. Teachers can use this data to determine appropriate interventions
- Gizmos
- Informal investigations
- Formal labs & written reports
- Data analysis & data representation, including through graphs
- Claim - Evidence - Reasoning
- Synthesis of argument from evidence
- Developing and using models
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information
- Exit Tickets

**Interventions:** Describe methods used to support students who fail to master unit Formative and Summative assessments.

Teachers may use, but are not limited to, one or more of the following methods to help students reach mastery.

- Direct reteaching on group or individual basis.
- Allowing corrections on assignments or assessments
- Study groups and group work with specific assigned roles
- Jigsaw
- Teacher notes & worksheets
- Guided homework support
- Peer tutoring
- Hands-on activities to engage with content
- Gizmos
- Direct vocabulary instruction
- Organization skill support
- Cloze notes and/or sentence frames
- Communication with parents
- Student trackers
- Graphic organizers, including guided notes, anchor charts, mind maps
- Close Reading
- Whiteboards to allow creative collaborative work
- Scientific writing practice
- Mini-Lessons
- Condensed google slides summaries of important content
- McGraw Hill textbook resources, such as SmartBook adaptive media
- Online resources such as: Khan Academy, Crash Course, Amoeba Sisters, Bozeman Science, PBS Learning, NOVA Videos, National Center for Case Studies in Science Teaching, Pear Deck, EdPuzzle, Learn Genetics Utah, PhET, The Wonder of Science, Stanford NGSS Assessment Project, CASE, NIH, Moana Loa Observatory, Scripps Institute, SIRC, SASP, CA Environmental Literacy Initiative, Exploratorium, California Academy of Science, Science Learning Hub (science learn.org), MBER, Concord Consortium,
- School intervention time (i.e., Flex period) - Teachers may use one or more of the following methods during designated intervention time to help students reach mastery:
  - Teacher reteaching
  - Formative/summative corrections, and/or formative/summative retakes
  - Peer tutoring

EL DORADO UNION HIGH SCHOOL DISTRICT

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Biology**

Course Number: **0311**

Unit Title: **Characteristics of Life**

**Content Area Standards** (Please identify the source): List content standards students will master in this unit.

All standards are from *Next Generation Science Standards*. These standards are organized thematically in the *California Science Framework*.

Grade-Level Standards: Grades Nine through Twelve - Life Science

<https://www.cde.ca.gov/ci/pl/documents/cangsshs-dcilifesci.pdf>

**Content Standards**

**HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

**Science and Engineering Practices (SEPs)**

**Developing and Using Models**

- Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

**Planning and Carrying Out Investigations**

- Planning and carrying out 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. (HS-LS1-3)

**Scientific Investigations Use a Variety of Methods**

- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

**Cross-Cutting Concepts**

**Stability and Change**

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

**Systems and System Models**

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

different scales. (HS-LS1-2)

**Unit Outline:** A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

**LS1.A: 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. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**Instructional Strategies:** Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Instructional strategies may include, but are not limited to:

- Multimedia instructor presentations and guided note taking
- Graphic organizers - students organize complex ideas into categories, compare and contrast, or sort terms.
- Discussion in pairs or groups
- Demonstrations - teacher uses models to show scientific phenomena in real time and space
- Informal investigations - students collect and/or analyze data and use it to draw conclusions about the phenomena they are studying
- Formal labs - generate hypotheses, and collect and analyze data; students practice applying the process of the scientific method and demonstrate competency in scientific writing
- Internet research - students use reliable, up-to-date web sources to delve into real life examples of key concepts
- Constructing models - students build 2- or 3-dimensional representations or construct mathematical representations of biological concepts that can be represented by functions.
- Assembling puzzles - students connect vocabulary terms, examples, or illustrations with clues to self-assess.
- Gizmos - such as Frogs Dissection Gizmo, Paramecium Gizmo

**Assessments:** Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Teachers may use, but are not limited to, any of the following to assess student mastery.

- Tests & quizzes, including Illuminate DnA - assessment items may be tagged by topic so that teachers can identify areas of strength and need on a group and/or individual level. Teachers can use this data to determine appropriate interventions
- Gizmos
- Informal investigations
- Formal labs & written reports
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- Obtaining, evaluating, and communicating information
- Exit Tickets

**Interventions:** Describe methods used to support students who fail to master unit Formative and Summative assessments.

Teachers may use, but are not limited to, one or more of the following methods to help students reach mastery.

- Direct reteaching on group or individual basis.
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- School intervention time (i.e., Flex period) - Teachers may use one or more of the following methods during designated intervention time to help students reach mastery:
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  - Peer tutoring

EL DORADO UNION HIGH SCHOOL DISTRICT

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Biology**

Course Number: **0311**

Unit Title: **Genetics**

**Content Area Standards** (Please identify the source): List content standards students will master in this unit.

All standards are from *Next Generation Science Standards*. These standards are organized thematically in the *California Science Framework*.

Grade-Level Standards: Grades Nine through Twelve - Life Science

<https://www.cde.ca.gov/ci/pl/documents/cangsshs-dcilifesci.pdf>

**Content Standards**

**\*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.

**HS-LS1-4** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

**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.

**\*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.

**\*HS-LS3-3** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

**Science and Engineering Practices (SEPs)**

**Constructing Explanations and Designing Solutions**

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

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

**Asking Questions and Defining Problems**

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

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

**Developing and Using Models**

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

- Use a model based on evidence to illustrate the relationships between systems or between

components of a system. (HS-LS1-4)

### **Analyzing and Interpreting Data**

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

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS3-3)

### **Engaging in Argument from Evidence**

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

- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

## **Cross-Cutting Concepts**

### **Structure and Function**

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

### **Cause and Effect**

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

### **Scale, Proportion, and Quantity**

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

### **Systems and System Models**

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

### **Science is a Human Endeavor**

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3) Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

**Unit Outline:** A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

### **LS1.A: Structure and Function**

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1), (HS-LS3-1.)

### **LS1.B: Growth and Development of Organisms**

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

### **LS3.A: Inheritance of Traits**

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

### **LS3.B: Variation of Traits**

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell

division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)

- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)

**Instructional Strategies:** Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

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- Internet research - students use reliable, up-to-date web sources to delve into real life examples of key concepts
- Constructing models - students build 2- or 3-dimensional representations or construct mathematical representations of biological concepts that can be represented by functions.
- Assembling puzzles - students connect vocabulary terms, examples, or illustrations with clues to self-assess.
- Gizmos - such as Building DNA Gizmo, Cell Division Gizmo, Meiosis Gizmo

**Assessments:** Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Teachers may use, but are not limited to, any of the following to assess student mastery.

- Tests & quizzes, including Illuminate DnA - assessment items may be tagged by topic so that teachers can identify areas of strength and need on a group and/or individual level. Teachers can use this data to determine appropriate interventions
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- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information
- Exit Tickets

**Interventions:** Describe methods used to support students who fail to master unit Formative and Summative assessments.

Teachers may use, but are not limited to, one or more of the following methods to help students reach mastery.

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  - Formative/summative corrections, and/or formative/summative retakes
  - Peer tutoring

EL DORADO UNION HIGH SCHOOL DISTRICT

EDUCATIONAL SERVICES

Department: **Science**

Course Title: **Biology**

Course Number: **0311**

Unit Title: **Evolution**

**Content Area Standards** (Please identify the source): List content standards students will master in this unit.

All standards are from *Next Generation Science Standards*. These standards are organized thematically in the *California Science Framework*.

Grade-Level Standards: Grades Nine through Twelve - Life Science

<https://www.cde.ca.gov/ci/pl/documents/cangsshs-dcilifesci.pdf>

**Content Standards**

**HS-ESS1-5** Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

**HS-ESS2-7** I Can: Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

**HS-ESS3-4** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

**HS-LS4-1** Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

**\*HS-LS4-2** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

**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.

**HS-LS4-4** Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

**HS-LS4-5** Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

**HS-LS4-6** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity

**HS-ESS3-1** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

**Science and Engineering Practices (SEPs)**

### **Engaging in Argument from Evidence**

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

- Evaluate evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-ESS1-5)
- Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7)

### **Constructing Explanations and Designing Solutions**

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

- Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ESS3-4)

### **Using Mathematics and Computational Thinking**

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

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

### **Analyzing and Interpreting Data**

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

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

### **Constructing Explanations and Designing Solutions**

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

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4) (HS-ESS3-1)

### **Engaging in Argument from Evidence**

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

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

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

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

### **Connections to Nature of Science Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

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

## **Cross-Cutting Concepts**

**Patterns**

- Empirical evidence is needed to identify patterns. (HS-ESS1-5), (HS-LS4-1),(HS-LS4-3)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS2-7)

**Cause and Effect**

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

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-ESS3-4)

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

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

**Unit Outline:** A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

**Disciplinary Core Ideas (DCIs)****ESS1.C: The History of Planet Earth**

- Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5)

**ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (HS-ESS1-5)

**PS1.C: Nuclear Processes**

- Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (HS-ESS1-5)

**ESS2.D: Weather and Climate**

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-7)

**ESS2.E: Biogeology**

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7)

**ESS3.A: Natural Resources**

- Resource availability has guided the development of human society. (HS-ESS3-1)

**ESS3.B: Natural Hazards**

- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)

**ESS3.C: Human Impacts on Earth Systems**

- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4)

**ETS1.B: Developing Possible Solutions**

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ESS3-4)

**LS4.A: Evidence of Common Ancestry and Diversity**

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

**LS4.B: Natural Selection**

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

**LS4.C: Adaptation**

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in

number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)
- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. (HS-LS4-5)
- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)
- Crosscutting Concepts Patterns Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1),(HS-LS4-3)

#### **LS4.C: 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. (HS-LS4-6)

#### **LS4.D: Biodiversity and Humans**

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

#### **ETS1.B: Developing Possible Solutions**

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

#### **Connections to Nature of Science**

- Scientific Knowledge Assumes an Order and Consistency in Natural Systems - Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1),(HS-LS4-4) HS.Natural Selection and Evolution evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-LS4-1)

**Instructional Strategies:** Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Instructional strategies may include, but are not limited to:

- Multimedia instructor presentations and guided note taking
- Graphic organizers - students organize complex ideas into categories, compare and contrast, or sort terms.
- Discussion in pairs or groups
- Demonstrations - teacher uses models to show scientific phenomena in real time and space
- Informal investigations -students collect and/or analyze data and use it to draw conclusions about the phenomena they are studying
- Formal labs - generate hypotheses, and collect and analyze data; students practice applying the process

of the scientific method and demonstrate competency in scientific writing

- Internet research - students use reliable, up-to-date web sources to delve into real life examples of key concepts
- Constructing models - students build 2- or 3-dimensional representations or construct mathematical representations of biological concepts that can be represented by functions.
- Assembling puzzles - students connect vocabulary terms, examples, or illustrations with clues to self-assess.
- Gizmos - such as GMO and the Environment Gizmo, Building Pangea Gizmo, Mutation and Selection Gizmo

**Assessments:** Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Teachers may use, but are not limited to, any of the following to assess student mastery.

- Tests & quizzes, including Illuminate DnA - assessment items may be tagged by topic so that teachers can identify areas of strength and need on a group and/or individual level. Teachers can use this data to determine appropriate interventions
- Gizmos
- Informal investigations
- Formal labs & written reports
- Data analysis & data representation, including through graphs
- Claim - Evidence - Reasoning
- Synthesis of argument from evidence
- Developing and using models
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information
- Exit Tickets

**Interventions:** Describe methods used to support students who fail to master unit Formative and Summative assessments.

Teachers may use, but are not limited to, one or more of the following methods to help students reach mastery.

- Direct reteaching on a group or individual basis.
- Allowing corrections on assignments or assessments
- Study groups and group work with specific assigned roles
- Jigsaw
- Teacher notes & worksheets
- Guided homework support
- Peer tutoring
- Hands-on activities to engage with content
- Gizmos
- Direct vocabulary instruction
- Organization skill support
- Cloze notes and/or sentence frames
- Communication with parents
- Student trackers
- Graphic organizers, including guided notes, anchor charts, mind maps
- Close Reading
- Whiteboards to allow creative collaborative work
- Scientific writing practice
- Mini-Lessons
- Condensed google slides summaries of important content
- McGraw Hill textbook resources, such as SmartBook adaptive media
- Online resources such as: Khan Academy, Crash Course, Amoeba Sisters, Bozeman Science, PBS Learning, NOVA Videos, National Center for Case Studies in Science Teaching, Pear Deck, EdPuzzle, Learn Genetics Utah, PhET, The Wonder of Science, Stanford NGSS Assessment Project, CASE, NIH, Moana Loa Observatory, Scripps Institute, SIRC, SASP, CA Environmental Literacy Initiative, Exploratorium, California Academy of Science, Science Learning Hub (science learn.org), MBER, Concord

Consortium,

- School intervention time (i.e., Flex period) - Teachers may use one or more of the following methods during designated intervention time to help students reach mastery:
  - Teacher reteaching
  - Formative/summative corrections, and/or formative/summative retakes
  - Peer tutoring