Comprehensive Science Honors

Unit Title: Unit 1: Lab Safety & The Chemistry of Life

Stage 1: Desired Results

Standards & Indicators:

(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.
(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 (SEP)

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. 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. (HSLS1-3)

Constructing Explanations and Designing Solutions 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)

Disciplinary Core Idea (DCI)

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)

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)

Cross Cutting Concepts (CCC)

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)

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)

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Stability and Change_ Feedback (negative or positive) can stabilize or destabilize a system. (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)

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).	In order for members of our society to participate productively, information needs to be shared accurately and ethically.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.

Central Idea/Enduring Understanding:	Essential/Guiding Question:

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● "Common themes help to organize the study of life."
● "In studying nature, scientists make observations, form hypotheses, and test predictions with experiments."
● "Learning about biology helps us understand many issues involving science, technology, and society."
● "Living organisms are made of atoms of certain elements, mostly combined into compounds."
● "The structure of an atom determines what types of bonds it can form with other atoms."
● "The unique properties of water derive from the polarity of water molecules."
● "Carbon-containing compounds are the chemical building blocks of life."
  ○ "Carbohydrates serve as a call's fuel and building material."
  ○ "Lipids are hydrophobic molecules with diverse functions."
  ○ "Proteins are essential to the structure and function of life."
  ○ "Nucleic acids store, transmit, and help express hereditary information."
	"How do the structures of organisms enable life's functions?"

Content: Ch. 1 The Scientific Method Ch.2 The Chemical Basis of Life Ch. 3 The Molecules of the Cell	**Skills(Objectives):** ● Describe seven properties common to all life. ● Describe the levels of biological organization from molecules to the biosphere, noting the interrelationships between levels. ● Distinguish between quantitative and qualitative data.Compare the definitions and use of inductive and deductive reasoning in scientific investigations. ● Describe the structure of a controlled experiment and give an example. ● Compare the goals of science and technology. Explain why an understanding of science is essential to our lives. ● Define matter, an element, a compound, and a trace element.Explain how and why iodine, fluoride, and iron are added to the human diet. ● Distinguish between the size, location, and properties of protons, electrons, and neutrons. Define the atomic number and mass number of an atom. ● Define an isotope and explain what makes some isotopes radioactive. ● Explain how the electron configuration of an atom influences its chemical behavior. ● Distinguish between covalent bonds, nonpolar polar covalent bonds, polar covalent bonds, hydrogen bonds, and ionic bonds, noting their relative strengths and how and where they form.

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	● Identify the reactants and products of photosynthesis. ● Describe the special properties of water that make it vital to living systems. Explain how these properties are related to hydrogen bonding. ● Define and distinguish between cohesion, adhesion, and surface tension.Define and distinguish between heat and temperature. ● Explain how sweating helps to cool your body.Explain why ice floats. ● Define a solute, a solvent, and a solution. ● Explain how acids and bases directly or indirectly affect the hydrogen ion concentration of a solution. Explain the pH scale and explain how buffers function. ● Explain why carbon is unparalleled in its ability to form large, diverse molecules. ● Define organic compounds, hydrocarbons, a carbon skeleton, and isomer. Describe the properties of and distinguish between the six chemical groups important in the chemistry of life. ● List the four main classes of macromolecules important to life. Explain the relationship between monomers and polymers. Compare the process of dehydration synthesis and hydrolysis. ● Describe the structures, functions, properties, and types of carbohydrate molecules common in the human diet. ● Explain how and why high-fructose corn syrup is produced. ● Describe the structures, functions, properties, and types of lipid molecules. ● Describe the health risks associated with the use of anabolic steroids. ● Describe the structures, functions, properties, and types of proteins. ● Explain how a protein's shape determines its function. ● Compare the structures and functions of DNA and RNA, noting similarities and differences. ● Describe the adaptive advantage of lactose tolerance in people of East African decent

Interdisciplinary Connections:

- **ELA NJSLS**
  - **W.WR.9–10.5.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

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- **SL.UM.9–10.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.
- **RI.AA.9–10.7.** Describe and evaluate the argument and specific claims in an informational text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and reasoning.
- **RL.CR.9–10.1.** Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.

- **Math NJSLS**
  - **MP 4-**Model with mathematics.
  - **N.Q-1**-Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data display

Stage 2: Assessment Evidence

Performance Task(s):

Ch. 1
Analyzing and Interpreting Scientific Data(POGIL)
Virtual Lab-Dependent and Independent Variable
Mystery Powders Lab

Ch. 2
Build An Atom,Build An Ion- Virtual Simulation
Properties of Water Lab
Properties of Water POGIL
Acids, Bases, pH Lab

Ch. 3
Molecules of Life Lab
Biological Molecules POGIL
McMush Lab

Other Evidence:

Ch. 1
Quiz Scientific Process

Ch. 2
Basic Chemistry Quiz
Ch.2 Test Review
Ch. 2 The Chemical Basis of Life Test

Ch. 3
Macromolecule Foldable Project
Ch. 3 Test Review
Ch. 3 Molecules of the Cell(Macromolecules) Test

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- PPT notes and vocabulary for all chapters

Ch.1
- Are viruses alive-Article and Discussion
- Are viruses alive-Resources
- Scientific Method Skills Practice

Ch.2
- Atom and Ion Webquest
- Atoms Family Activity
- Electron Distribution Graphic Organizer

Ch.3
- Intro to Organic Chemistry Activity
- Organic Chemistry Table

Teach Like a Champion Strategies

Resources:

Reece, J.,Taylor, M., Simon, & E., Dickey, J. (2012). *Campbell Biology Concepts & Connections*. Upper Saddle River. Pearson Education Inc.

Google Suite(apps for education)

POGIL Activities for High School Biology

https://www.biointeractive.org/
https://quizizz.com
https://www.ck12.org
https://phet.colorado.edu/
https://www.biologyonline.com/
https://biomanbio.com/
https://ed.ted.com/
https://edpuzzle.com/home

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		Youtube.com Inclusive Science Classroom GLSEN Educator Resources	
Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation			
High-Achieving Students	**On Grade Level Students**	**Struggling Students**	**Special Needs/ELL**
Students will be given advanced level reading material. Formative assessments will be used to determine students' level of comprehension. Students may be given an additional assignment when their work is completed. Students will be given choices when appropriate to choose their end product for a lesson. Allow the use of technology on assignments Provide web-based projects to further expand class materials Allow students to collaborate in small groups	Lessons will be designed based on student learning styles. Formative assessments will be used to determine students' level of comprehension. Students will be given choices when appropriate to choose their end product for a lesson. Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Formative assessments will be used to determine students' level of comprehension. Students will be offered tutoring with the teacher or use weekly school tutoring. Teacher will develop an 8 minute model to help the student prior to referring student to I&RST Students will be given choices when appropriate to choose their end product for assessment. Graphic Organizers Shorten assignments Grade for content not spelling and grammar Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

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Unit Title: Unit 2-Energy Processing

Stage 1: Desired Results

Standards & Indicators:
(HS-LS1-5)- Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
(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.
(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.

Science and Engineering Practices (SEP)
Constructing Explanations and Designing Solutions 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)

Developing and Using Models Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-5), (HS-LS1-7) (HS-LS2-5)

Disciplinary Core Idea (DCI)
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)

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)(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. (HSLS1-7)

Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)

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)

Cross Cutting Concepts (CCC)
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) 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)

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Scientific Knowledge is Open to Revision in Light of New Evidence Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-3)

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)

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).	In order for members of our society to participate productively, information needs to be shared accurately and ethically.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.

Central Idea/Enduring Understanding:	Essential/Guiding Question:

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• "A cell's metabolic reactions transform energy, producing ATP, which drives cellular work." • "Enzymes speed up a cell's chemical reactions and provide precise control of metabolism." • "Cellular respiration oxidizes fuel molecules and generates ATP for cellular work." • "The main stages of cellular respiration are glycolysis, the citric acid cycle, and oxidative phosphorylation." • "Fermentation regenerates NAD^+, allowing glycolysis and ATP production to continue without oxygen." • "The breakdown pathways of cellular respiration intersect with biosynthetic pathways. " • "Plants and other photoautotrophs use the energy of sunlight to convert CO_2 and H_2O to sugar and O_2." • "In the thylakoids of a chloroplast, the light reactions generate ATP and NADPH." • "The Calvin cycle, which takes place in the stroma of the chloroplast, uses ATP and NADPH to reduce CO_2 to sugar." • "Photosynthesis provides the energy and building material for ecosystems. It also affects global climate and the ozone layer."	"How do organisms obtain and use energy they need to live and grow ?" "How do matter and energy move through ecosystems?"
Content: Ch. 5 Energy Rx and Enzymes Ch. 6 Cellular Respiration Ch. 7 Photosynthesis	**Skills(Objectives):** • Define and compare kinetic energy, potential energy, chemical energy, and heat, • Define the first and second law in thermodynamics. Explain how these laws of thermodynamics relate to energy use in the cell. • Define and compare endergonic and exergonic reactions. Explain how cells use cellular respiration and energy coupling to survive. • Describe the three main types of cellular work. • Explain how ATP functions as an energy shuttle. • Define activation energy and explain how enzymes speed up chemical reactions. • Describe the structure of an enzyme-substrate interaction. • Explain how the cellular environment affects enzyme activity. • Explain how competitive and noncompetitive inhibitors alter an enzyme's activity. • Describe the process of feedback inhibition. • Compare the process and locations of cellular respiration and photosynthesis. • Explain how breathing and cellular respiration are related. • Provide the overall chemical equation for cellular respiration.

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	● Explain how the human body uses its daily supply of ATP. ● Explain how the energy in glucose molecules is released during cellular respiration. ● Explain how redox reactions are used in cellular respiration. ● Describe the general roles of dehydrogenase, NADH, and the electron transport chain in cellular respiration. ● List the cellular regions where glycolysis, the citric acid cycle, and oxidative phosphorylation occur. Note whether substrate-level phosphorylation or chemiosmosis occur at each of these sites. ● Compare the reactants, products, and energy yield of the three stages of cellular respiration. Explain how rotenone, cyanide, carbon monoxide, oligomycin, and uncouplers interrupt critical events in cellular respiration. ● Compare the reactants, products, and energy yield of alcohol and lactic acid fermentation. ● Explain how carbohydrates, fats, and proteins are used as fuel for cellular respiration. Explain why a gram of fat yields more ATP than a gram of starch or protein. ● Define autotrophs, heterotrophs, producers, and photoautotrophs. ● Describe the structure of chloroplasts and their location in a leaf. Identify specifically where most light energy is converted to chemical energy. ● Explain how plants produce oxygen. ● Describe the role of redox reactions of photosynthesis and cellular respiration. ● Compare the reactants and products of the light reactions and the Calvin cycle. Explain how photosynthesis relates to these reactions. ● Explain how photosynthesis captures solar energy. ● Explain how the electron transport chain and chemiosmosis generate ATP, NADPH, and oxygen in the light reactions. ● Compare photophosphorylation and oxidative phosphorylation. ● Describe the reactants and the products of the Calvin cycle. Explain why this cycle is dependent upon the light reaction.
Interdisciplinary Connections: ● **ELA NJSLS** ○ **W.WR.9–10.5.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	

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- **RL.CR.9–10.1.** Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.

- **Math NJSLS**
  - **MP 4-**Model with mathematics.
  - **N.Q-1**-Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data display

Stage 2: Assessment Evidence

Performance Task(s):

Ch. 5
Potential and Kinetic Webquest
Virtual Enzyme Lab

Ch. 6
Exercise Lab-Cellular Respiration
Apple Cider & Yeast Respiration Lab

Ch. 7
Photosynthesis Virtual Lab
Overview of Photosynthesis Review Activity

Other Evidence:

Ch. 5
Quiz Energy-Reactions and Enzymes

Ch. 6
Ch. 6 Test Review
Ch. 6 Cellular Respiration Test

Ch.6 & Ch.7-Cellular Respiration & Photosynthesis
Foldable Project

Ch. 7
Ch. 7 Test Review
Ch. 7 Photosynthesis Test

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- PPT notes and vocabulary for all chapters

Ch.5
- Energy Webquest
- Enzyme Activity

Ch.6
- Cellular Respiration Photo Board
- Cellular Respiration Review Activity

Ch.7
- Adaptations to Photosynthesis activity
- Photosynthesis graphic organizer & photo board

Teach Like a Champion Strategies

Resources:

Reece, J.,Taylor, M., Simon, & E., Dickey, J. (2012). *Campbell Biology Concepts & Connections*. Upper Saddle River. Pearson Education Inc.

Google Suite(apps for education)

POGIL Activities for High School Biology

https://www.biointeractive.org/
https://quizizz.com
https://www.ck12.org
https://www.biologyonline.com/
https://biomanbio.com/
https://ed.ted.com/
https://edpuzzle.com/home
Youtube.com
Inclusive Science Classroom
GLSEN Educator Resources

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

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High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Students will be given advanced level reading material. Formative assessments will be used to determine students' level of comprehension. Students may be given an additional assignment when their work is completed. Students will be given choices when appropriate to choose their end product for a lesson. Allow the use of technology on assignments Provide web-based projects to further expand class materials Allow students to collaborate in small groups	Lessons will be designed based on student learning styles. Formative assessments will be used to determine students' level of comprehension. Students will be given choices when appropriate to choose their end product for a lesson. Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Formative assessments will be used to determine students' level of comprehension. Students will be offered tutoring with the teacher or use weekly school tutoring. Teacher will develop an 8 minute model to help the student prior to referring student to I&RST Students will be given choices when appropriate to choose their end product for assessment. Graphic Organizers Shorten assignments Grade for content not spelling and grammar Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: Unit 3 -Ecology (The Biosphere, Communities, and Ecosystems)

Stage 1: Desired Results

Standards & Indicators:

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

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(HS-ESS2-5)- Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
(HS-ESS2-6)- Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
(HS-ESS2-7)- Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
(HS-ESS2-4)- Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
(HS-ESS3-5)- Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Science and Engineering Practices (SEP)
Developing and Using Models Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS2-5) Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-6) Use a model to provide mechanistic accounts of phenomena. (HS-ESS2-4)

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)

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. Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7)

Disciplinary Core Idea (DCI)
Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)

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)

The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)

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)

Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6), (HS-ESS2-7)

Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6), (HS-ESS2-4)

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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)

Cross Cutting Concepts (CCC)

Energy and Matter Energy drives the cycling of matter within and between systems. (HS-LS2-3)

Scientific Knowledge is Open to Revision in Light of New Evidence Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-3)

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)

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

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).	In order for members of our society to participate productively, information needs to be shared accurately and ethically.
9.4.12.IML.6	Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).	In order for members of our society to participate productively, information needs to be shared accurately and ethically.

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9.4.12.IML.7	Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4).	Accurate information may help in making valuable and ethical choices.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.

Central Idea/Enduring Understanding: ● "The distribution and abundance of life in the biosphere is influenced by living and nonliving components of the environment." ● "In marine biomes, the salt concentration is generally around 3%. In freshwater biomes, the salt concentration is typically less than 1%." ● "The distribution of terrestrial biomes is primarily determined by temperature and rainfall." ● "Community ecologists examine factors that influence the species composition and distribution of communities and factors that affect community stability." ● "Ecosystem ecology emphasizes energy flow and chemical cycling."	**Essential/Guiding Question:** "How do organisms interact with the living and non-living environment to obtain matter and energy?" "How do the major Earth systems interact?" "How do the properties and movements of water shape Earth's surface and affect its systems?" "What regulates weather and climate?"
Content: Ch. 34 The Biosphere: An Introduction to Earth's Diverse Environments Ch. 37 Communities and Ecosystems	**Skills(Objectives):** ● Define and distinguish between the different levels within ecosystems. Distinguish between the biotic and abiotic components of an ecosystem. ● Summarize the subject and impact of Rachel Carson's influential book Silent Spring. ● Describe the abiotic factors that influence life in the biosphere. ● Describe the adaptations that enable pronghorns to survive in the open plains and shrub deserts of North America. ● Explain how global climate patterns are influenced by solar energy input as well as the movement of Earth through space. ● Explain how landforms affect local climate. ● Explain why the seasons of the year, prevailing winds, and ocean currents exist. ● Explain why species in widely separated biomes may have similar features. ● Explain why storms and fire are crucial factors in some biomes.

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	● Describe the characteristics used to define terrestrial biomes. Then use these characteristics to define the major terrestrial biomes: tropical forests, savannas, deserts, chaparral, temperate grasslands, temperate forests, coniferous forests, tundra, and polar ice. ● Explain how all parts of the biosphere are linked by the global water cycle. ● Define a biological community. Explain why the study of community ecology is important. ● Define interspecific competition, mutualism, predation, herbivory, and parasitism, and provide examples of each. ● Define an ecological niche. Explain how interspecific competition can occur when the niches of two populations overlap. ● Describe the mutualistic relationship between corals and dinoflagellates. ● Define predation. Describe the protective strategies potential prey employ to avoid predators. ● Explain why many plants have chemical toxins, spines, or thorns. ● Define coevolution and describe an example. ● Explain how parasites and pathogens can affect community composition. ● Identify and compare the trophic levels of terrestrial and aquatic food chains. ● Explain how food chains interconnect to form food webs. ● Describe the two components of species diversity. Explain why large fields of a single crop are vulnerable to devastating disease. ● Define a keystone species. Explain why the long-spined sea urchin is considered a keystone species. ● Explain how disturbances can benefit communities. Distinguish between primary and secondary succession. ● Explain how invasive species can affect communities. ● Compare the movement of energy and chemicals within and through ecosystems. ● Describe the movement of energy through a food chain. Explain why there are more producers than consumers and why eating meat counts as a great luxury. ● Explain how carbon, nitrogen, and phosphorus cycle within ecosystems. ● Explain how rapid eutrophication of aquatic ecosystems affects species diversity and oxygen levels.

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	● Explain how human activities are threatening natural ecosystems.

Interdisciplinary Connections:

- **ELA NJSLS**
  - **W.WR.9–10.5.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
  - **SL.UM.9–10.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.
  - **RI.AA.9–10.7.** Describe and evaluate the argument and specific claims in an informational text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and reasoning.
  - **RL.CR.9–10.1.** Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.
- **Math NJSLS**
  - **MP 4-**Model with mathematics.
  - **N.Q-1**-Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data display

Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
Ch. 34 Biome Viewer Interactive Exploring Biomes in Gorongosa National Park-Interactive Ch. 37 Analyzing Graphics: Carbon Cycle Succession cut and paste review activity Ecological Relationship POGIL Nutrient Cycle POGIL	Ch. 34 Biome Project Ch. 37 Ch. 37 Communities and Ecosystem Quiz

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- PPT notes and vocabulary for all chapters

Ch. 34

- Abiotic and Biotic Reading with Analysis Questions
- Ocean currents reading with analysis questions
- Atmosphere and climate reading with analysis questions
- Six degrees could change the world film activity

Ch. 37

- Species interactions reading with analysis questions
- Carbon transport reading with analysis questions

Resources:

Reece, J.,Taylor, M., Simon, & E., Dickey, J. (2012). *Campbell Biology Concepts & Connections*. Upper Saddle River. Pearson Education Inc.

Google Suite(apps for education)

POGIL Activities for High School Biology

https://www.biointeractive.org/
https://quizizz.com
https://www.ck12.org
https://www.biologyonline.com/
https://biomanbio.com/
https://ed.ted.com/

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• Ecological succession reading with analysis questions • The nitrogen, phosphorus, water and carbon cycle reading with analysis questions Teach Like a Champion Strategies	https://edpuzzle.com/home Youtube.com Inclusive Science Classroom GLSEN Educator Resources

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Students will be given advanced level reading material. Formative assessments will be used to determine students' level of comprehension. Students may be given an additional assignment when their work is completed. Students will be given choices when appropriate to choose their end product for a lesson. Allow the use of technology on assignments Provide web-based projects to further expand class materials Allow students to collaborate in small groups	Lessons will be designed based on student learning styles. Formative assessments will be used to determine students' level of comprehension. Students will be given choices when appropriate to choose their end product for a lesson. Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Formative assessments will be used to determine students' level of comprehension. Students will be offered tutoring with the teacher or use weekly school tutoring. Teacher will develop an 8 minute model to help the student prior to referring student to I&RST Students will be given choices when appropriate to choose their end product for assessment. Graphic Organizers Shorten assignments Grade for content not spelling and grammar Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

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Unit Title: **Unit 4 -Ecology (Population and Conservation Biology)**

Stage 1: Desired Results

Standards & Indicators:

(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-LS2-6)- 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-LS4-6)- Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*
(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-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.
(HS-ESS3-2)- Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*
(HS-ESS3-3)- Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
(HS-ESS3-4)- Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*
(HS-ESS3-6)- Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.*

Science and Engineering Practices (SEP)

Developing and Using Models Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-6)

Engaging in Argument from Evidence Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7) Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2)

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 a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3)

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 knowledge, principles, and theories.

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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)
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)

Disciplinary Core Idea (DCI)

Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6), (HS-ESS2-7)

Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6)

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)

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

All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)

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)

The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)

Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4)
Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6)

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-ESS3-1)

Stability and Change Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS2-7)Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4)

Systems and System Models When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6)

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-ESS3-2), (HS-ESS3-4) New technologies can have deep impacts on society and the environment, including some that were not anticipated. (HS-ESS3-3) Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2)

Science is a Human Endeavor Science is a result of human endeavors, imagination, and creativity. (HS-ESS3-3)

Science Addresses Questions About the Natural and Material World Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2) Science knowledge

indicates what can happen in natural systems— not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2) Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2)		
Career Readiness, Life Literacies and Key Skills		
Standard	**Performance Expectations**	**Core Ideas**
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).	In order for members of our society to participate productively, information needs to be shared accurately and ethically.
9.4.12.IML.6	Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).	In order for members of our society to participate productively, information needs to be shared accurately and ethically.
9.4.12.IML.7	Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4).	Accurate information may help in making valuable and ethical choices.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g.,	Collaborative digital tools can be used to access, record and share different

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	7.1.AL.IPERS.6).	viewpoints and to collect and tabulate the views of groups of people.

Central Idea/Enduring Understanding: ● "Population ecology is concerned with characteristics that describe populations,changes in population size, and factors that regulate populations over time." ● "The Principles of population ecology can be used to describe the growth of the human population and its limits." ● "Biodiversity is declining rapidly worldwide as a result of human activities." ● "Biologists are applying their knowledge of ecology to slow the loss of biodiversity and help define a sustainable future."	**Essential/Guiding Question:** "How do humans depend on Earth's resources?" "How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms?" "How does biodiversity affect humans?" "How do organisms interact with the living and non-living environment to obtain matter and energy?"
Content: Ch. 36 Population Ecology Ch. 38 Conservation Biology	**Skills(Objectives):** ● Define a population and population ecology. ● Describe the general type of work performed by population ecologists. ● Define population density and describe different types of dispersion patterns. ● Explain how life tables are used to track mortality and survivorship in populations. ● Compare Type I, Type II, and Type III survivorship curves. ● Describe and compare the exponential and logistic population growth models, illustrating both with examples. ● Explain the concept of carrying capacity. ● Describe the factors that regulate growth in natural populations. ● Define boom-and-bust cycles, explain why they occur, and provide examples. ● Compare r-selection and K-selection and indicate examples of each. ● Explain how the structure of the world's human population has changed and continues to change. ● Describe the key factors that affect human population growth. ● Explain how the age structure of a population can be used to predict changes in population size and social conditions. ● Explain the concept of an ecological footprint. ● Describe the three components of biodiversity. ● Explain how human activities threaten biodiversity. ● Describe the greatest current threats to biodiversity, providing examples of each. ● Describe the process of biological magnification.

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	● Describe the causes and consequences of global warming. ● Explain why the efforts to save the black-footed ferret and silversword plant from extinction are a good model for future conservation efforts. ● Describe the goals of landscape ecology. ● Describe the significance of edges and movement corridors in maintaining biodiversity. ● Describe the significance of biodiversity hotspots. ● Describe the challenges of protecting species that migrate or otherwise require great ranges. ● Explain how zoned reserves are being used to protect ecosystems. ● Describe the goals of the Yukon to Yellowstone Initiative. ● Describe the goals and methods of restoration ecology. ● Explain why sustainable development should be the ultimate goal for the long-term maintenance of human societies and the ecosystems that support them.

Interdisciplinary Connections:

- **ELA NJSLS**
  - **W.WR.9–10.5.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
  - **SL.UM.9–10.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.
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  - **RL.CR.9–10.1.** Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.
- **Math NJSLS**
  - **MP 4-**Model with mathematics.
  - **N.Q-1**-Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data display

Stage 2: Assessment Evidence

Performance Task(s):	**Other Evidence:**
Ch. 36 Elephant Census-Interactive Sampling Normal Distribution Interactive Zombies Invade Lab Ch. 38 Paleoclimate-Interactive	Ch. 36 Ch. 36 Quiz Population Ch. 38 Environmental Issues Project Ecology Unit Test Review Chapters 34, 36, 37, & 38

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Articles on Global Warming followed by class discussion ● "Warming Toll_1 Degree Hotter, Trillions of Tons of Ice Gone" ● "Scientists Find Oil From Deepwater Horizon Blowout on Ocean Floor"	Ecology Unit Test Chapters 34, 36, 37, & 38

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
● PPT notes and vocabulary for all chapters Ch. 36 ● Human Population Growth Activity ● Population Ecology Review Graph Activity ● How Many People Can Live on Planet Earth?-Video and analysis questions Ch. 38 ● Bill Nye Global Meltdown Video Activity ● Deepwater Horizon Video & Analysis Questions Teach Like a Champion Strategies	Reece, J.,Taylor, M., Simon, & E., Dickey, J. (2012). *Campbell Biology Concepts & Connections*. Upper Saddle River. Pearson Education Inc. Google Suite(apps for education) POGIL Activities for High School Biology https://www.biointeractive.org/ https://quizizz.com https://www.ck12.org https://www.biologyonline.com/ https://biomanbio.com/ https://ed.ted.com/ https://edpuzzle.com/home Youtube.com Inclusive Science Classroom GLSEN Educator Resources

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Students will be given advanced level reading material. Formative assessments will be used to determine students' level of comprehension. Students may be given an additional assignment when their work is completed. Students will be given choices when appropriate to choose their end product for a lesson. Allow the use of technology on assignments Provide web-based projects to further expand class materials	Lessons will be designed based on student learning styles. Formative assessments will be used to determine students' level of comprehension. Students will be given choices when appropriate to choose their end product for a lesson. Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Formative assessments will be used to determine students' level of comprehension. Students will be offered tutoring with the teacher or use weekly school tutoring. Teacher will develop an 8 minute model to help the student prior to referring student to I&RST Students will be given choices when appropriate to choose their end product for assessment. Graphic Organizers Shorten assignments	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency

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Allow students to collaborate in small groups		Grade for content not spelling and grammar Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Provide word banks Allow for translators, dictionaries

Pacing Guide

Course Name	Resource text title	Standards
MP		
UNIT 1 Lab Safety & The Chemistry of Life (29 Days)	**CHAPTERS** Chapters 1,2, & 3 Days 1-29	HS-LS1-2 HS-LS1-3 HS-LS1-6
MP		
UNIT 2 Energy Processing (26 Days)	**CHAPTERS** Chapters 5, 6, & 7 Days 30-56	HS-LS1-5 HS-LS1-6 HS-LS1-7 HS-LS2-3 HS-LS2-5
MP		
UNIT 3 Ecology (The Biosphere, Communities, and Ecosystems) (17 Days)	**CHAPTERS** Chapters 34 & 37 Days 57-73	HS-LS2-3 HS-LS2-4 HS-LS2-5 HS-ESS2-5 HS-ESS2-6 HS-ESS2-7 HS-ESS2-4 HS-ESS3-5
MP		

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UNIT 4 Ecology (Population and Conservation Biology) (12 Days)	**CHAPTERS** Chapters 36 & 38 Days 75-85	HS-LS2-1 HS-LS2-2 HS-LS2-6 HS-LS2-7 HS-LS2-8 HS-LS4-6 HS-LS4-5 HS-ESS3-1 HS-ESS3-2 HS-ESS3-3 HS-ESS3-4 HS-ESS3-6