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Biology Curriculum

Course Title: Biology
Content Area: Biology
Grade Level(s): K9 -12
Date Revised__07/02/19
Date Adopted_

Course Description:
Unit 1. Introduction to Biology/Biochemistry/Ecology: This unit begins with the process of science. Through application of the scientific method, students will plan and carry out investigations that will produce valid data that they can then analyze and use in making decisions, skills that they will need as the course progresses. They will then compare and contrast organisms and nonliving objects to determine the characteristics common to all living things. Organisms will be placed in a continuum that ranges from atoms to the biosphere. The remainder of the unit details how nonliving matter (atoms, molecules) combine to form the structures of living things and how the properties of these materials allow living things to function. Particular emphasis is given to water and the various carbon molecules. Students will investigate the relationships that exist between organisms and the nonliving components of their surroundings, as well as organisms of both the same species and different species. Students will trace the flow of matter and energy as they pass through various ecosystems. They will consider how change in one part of an ecosystem can have considerable and often unforeseen impacts on other components of the system. Of considerable concern is the role of human activity on ecosystems, both on the local and global scales.
Unit 2. Respiration, Photosynthesis, cell and cell transportation, cell division**:** This unit details how the various activities needed to sustain life are all based on the structures and functions of cells. Students will examine cells under magnification to observe how various cells differ, and relate these differences to their functions. They will determine how cells allow organisms to obtain energy and needed materials, to grow and repair damage, and to reproduce. Of particular notice is the role of cell regulation of the process of differentiation plays in both the origin of cancer and the promise of stem cell research.
Unit 3. DNA, Genetics and Biotechnology**:** This unit covers how characteristics are passed from one generation to the next. From the experiments of Gregor Mendel, to the discovery of the structure of DNA by James Watson and Francis Crick, to the decoding of the human genome, students will learn how our knowledge of heredity has increased over time. Students will investigate the role of genes and chromosomes in the inheritance of traits, as well as the promise of emerging technologies
Unit 4. Evolution: This unit covers the idea that species change over time. Students will consider the logical arguments that make up Charles Darwin's theory of evolution by natural selection, as well as the evidence that supports it. Students will examine evolution as an ongoing process, analyzing data and making predictions based on it. Through the lens of evolutionary theory, students will follow the history of life on this planet, as it changes along with the planet itself.

Total Number of Units: 4

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Pacing Guide

Unit	Number of Days	Standard NJSLS	Skill What we want students to"DO"
Unit 1. Introduction to Biology/Biochemistry/Ecology	5	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. .
	3	HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
	2	HS-LS1-3.	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
	5	HS-LS1-6.	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules

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			may combine with other elements to form amino acids and/or other large carbon-based molecules.
	5	HS-LS2-1.	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
	3	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.
	3	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.
	3	HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

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	3	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 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
	5	HS-LS2-7	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
	3	HS-LS2-8.	

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Unit 2. Respiration, Photosynthesis, cell and cell transportation, cell division**:**	10	**HS-LS1-1**	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
	8	**HS-LS1-4**	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
	10	**HS-LS1-5**	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
	7	**HS-LS1-7**	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules. relative position of particles (objects).

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Unit 3: DNA, Genetics and Biotechnology	12 13 15	**HS-LS3-1**. **HS-LS3-2.** **HS-LS3-3.**	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. Explore sound waves. 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. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Unit 4: Evolution	7	**HS-LS4-1**	Explore Darwin's Theory of evolution to communicate scientific information that common ancestry and biological evolution are

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			supported by multiple lines of empirical evidence.
	8	**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 (3) competition, and (4) survive and reproduce in the environment.
	5	**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.
	10	**HS-LS4-4**	Construct an explanation based on evidence for how natural selection leads to adaptations of populations Explore History of Life to evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of

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	10	**HS-LS4-5**	some species, (2) the emergence of new species over time, (3) the extinction of other species and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Unit 1. Introduction to Biology/Biochemistry/Ecology:
Time Frame: 35 - 40 Days

Essential Questions

1. What role does science play in the study of life? What processes, skills and habits of mind do scientists employ to study nature, discover new information, answer questions and solve problems?

2. What characteristics distinguish living organisms from non-living matter?

3. How do the properties of water make it essential for all living things and how does the structure of carbon allow it to form so many biologically essential compounds?

4. Why is attention to proper procedures and safety concerns important in a laboratory setting?

5. How do organisms affect other organisms and/or their environment, and how do they affect them in turn?

6. How do the various feeding relationship within an ecosystem determine what organism, and in how great a number, can survive in the ecosystem?

Standards

Standards / CPIs (cumulative Progress Indicators) taught and assessed:
PERFORMANCE EXPECTATION

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- 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-LS1-2. 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.
- 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-LS2-3. 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-LS2-6. 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.

DISCIPLINARY CORE IDEAS

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). 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.

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- 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)

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-LS2-1),(HSLS2-2)

L**S2.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)

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).

SCIENCE and ENGINEERING PRACTICES

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).

Developing and Using Models

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- Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show how relationships among variables between systems and their components in the natural and designed worlds.
- Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5)

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)
- Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)

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.

CROSS CUTTING CONCEPTS

- **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), (HS-LS1-4)
- **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), (HS-LS1-6)
- **Stability and Change:** Feedback (negative or positive) can stabilize or destabilize a system. (HSLS1-3)
- **Cause and Effect:** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8)
- **Scale, Proportion, and Quantity**: The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1)

CONNECTIONS TO MATHEMATICS

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- **S-ID.A**. Summarize, represent, and interpret data on a single cont or measurement variable
- **MP.2** Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-6)
- **MP.4** Model with mathematics. **(**HS-LS2-1),(HS-LS2-2)
- **HSN.Q.A.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 displays. (HS-LS2-1),(HS-LS2-2)
- **HSN.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. (HS-LS2-1),(HS-LS2-2)
- **HSF-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (HS-LS1-4).
- **HSF-BF.A.1** Write a function that describes a relationship between two quantities. (HS-LS1-4)
- HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1),(HS-LS2-2)
- HSS-ID.A.1 Represent data with plots on the real number line. (HS-LS2-6)
- HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. (HS-LS2-6)

CONNECTIONS TO ELA/Literacy

Reading

- **RST.11-12.1.** Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
- **RST.11-12.3.** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- **RST.11-12.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- **RST.11-12.5.** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Writing

- **WHST.11-12.1**. Write arguments focused on *discipline-specific content.*
- **WHST.11-12.2**. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- **WHST.11-12.4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

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TECHNOLOGY:

8.2.2.C.4 Identify designed products and brainstorm how to improve one used in the classroom.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.
8.2.12.C.4 Explain and identify interdependent systems and their functions.
8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.

HIGHLIGHTED CAREER READY PRACTICES:

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies**.**
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP12. Work productively in teams while using cultural global competence**.**

SEL PRACTICES & COMPETENCIES:

Self-Awareness

· Recognize one's feelings and thoughts
· Recognize the impact of one's feelings and thoughts on one's own behavior
· Recognize one's personal traits, strengths and limitations
· Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management

· Understand and practice strategies for managing one's own emotions, thoughts and behaviors
· Recognize the skills needed to establish and achieve personal and educational goals
· Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness

· Recognize and identify the thoughts, feelings and perspectives of others
· Demonstrate and awareness of the differences among individuals, groups and others' cultural backgrounds
· Demonstrate an understanding of the need for mutual respect when viewpoints differ
· Demonstrate an awareness of the expectations for social interactions in a variety of settings

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Responsible Decision-Making

· Develop, implement and model effective problem solving and critical thinking skills

· Identify the consequences associated with one's actions in order to make constructive choices

· Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

· Establish and maintain healthy relationships

· Utilize positive communication and social skills to interact effectively with others

· Identify ways to resist inappropriate social pressure

· Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways

· Identify who, when, where, or how to seek help for oneself or others when needed Self -Awareness

Overall Goal (What is the big idea?)

Students will learn that

- Science as a way of knowing. Scientist make careful observations, ask questions based on their observations, from hypotheses, conduct experiments and analyze data. They communicate their findings to other scientists for review and try to avoid bias.

- Organism can be distinguished from nonliving matter in that living things grow, reproduce, maintain a stable internal environment, respond to environmental stimuli and have a limited lifespan.

- Water's ability to form solutions, its high specific heat and its density at the freezing point allows chemical reactions to take place and provides stability, while carbon's ability to bind with other carbon atoms to form chains, rings and branches, as well as single, double and triple bonds, permits carbon to form the basis of organic compounds that are necessary for living things (i.e., carbohydrates, lipids, proteins and nucleic acids)

- Attention to detail in the laboratory setting is vital to produce valid reliable data and prevent damage to equipment. It is also important to prevent injury to the individual performing the experiment, as well as others in the laboratory.

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- The survival of organism is affected by interactions with each other and the environment, and can be altered by human manipulation.

- Feeding relationships between organism creates an interdependence between populations as organism attempt to obtain (or avoid becoming) food places limits on population size in an ecosystem.

Pre-Assessment: Beginning Year Test; Teacher made Unit 1 Test:

(SLO) Student Learning Objectives (with standards)	**Student Learning Strategies**	**Formative Assessment ***suggested but not limited to the following***	**Activities ***suggested but not limited to the following***	**Modifications & Reflections ***suggested but not limited to the following***
HS-LS1-1 HS-ETS1 **We are learning to (WALT):** a) State the essential steps in a scientific investigation by analyzing and designing an experiment; b) Demonstrate comprehension of safe laboratory procedures and use of laboratory	Interactive Essential Vocabulary: Scientific methods engineer, design process -ask questions, make observations, and gather information -focus on how to define and solve a problem -explore the five steps of a design process	Apply What You Know Self-check Do Now, Exit questions Lesson Check Project and home work Safety test Venn Diagrams Lab experiment report Compare and contrast living and nonliving organisms- T chart	NJSLS MP.2, MP.4, N-Q, HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3, HSA-SSE.A.1, HSA-CED.A.1; HSA-CED.A.2; 2.MD.D.10; RST.11-12.1, RST.11-12.7; WHST.9-12.2; WHST.9-12.7 Virtual lab : scientific method Simulation Lab: Estimation Virtual Lab-Dependent Variables	**RTI/Extra Support:** Supply students with flashcards that identify each step of the design process. Have students place them in order. **ELL/ELD Strategy:** Make use of labeled diagrams to understand the content and develop vocabulary in context. **Extension:** Challenge students to apply a design solution process to a problem in

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equipment by following proper lab protocols; c) Make accurate measurements using metric units, converting as necessary; d) Represent data using literal representations, such as graphs, tables, journals, concept maps and diagrams e) HSN.Q.A.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 displays.	engineers use to solve problems. -Cornell Notetaking in journals **-Instructional Strategies:** • Apply: Connect, Investigate, Synthesize, Demonstrate (CISD) model • Anchor chart • KWL chart • Think-Pair-Share • Evidence Notebook. • Talk moves • Making thinking visible through talk and argument • Wait time • Technology usage for research projects • Skill practice/Inquiry laboratory experiments • Tasks that are contextual or real life applicable • Peer evaluation and self-reflection • Problem solving	Lab Equipment and Safety LMA p. 1-4 **Video Focus Questions** (in supplemental folder) Review questions at the end of chapter Quiz **Assessment and standardized test** (page 39; Biology by Miller & Levine)	**Lab Safety posters Lab safety matching game Lab safety worksheet** Lab safety video Teacher **made practice sheet from** Metric measurement lab http://www.biologyjunction.com/metric_measurement_lab.htm SI Units Simulation: Conducting an Investigation: LabWrite: Graphing: Chain Reaction: The science of biology **Portfolio: Nobel Prize winner in biology with whom I share my**	their own lives. Have them make a poster or slide show to communicate results. **Suggested Strategies for Students with Special Needs: a)** Work in cooperative groups or with partners. b) Allow students to respond orally or illustrate answers instead of responding in a written format. c) Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions. Use Universal Design of Learning. Sorting trips to compare and contrast living and non living organisms

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f) WALT List and describe the major characteristics of life	practice		**birthday; Brochure/ project** Interactivity: Scientific Methodology: Video: Bugs in the Home Posters & gallery walk on the characteristics of life. Summarizing & Note Taking on characteristics of life Video on characteristics of life. Compare and contrast living and nonliving organisms- T chart **Video Focus Questions** (in supplemental folder) Gecko article 3 pt. essays for articles	
HS-LS1-1 HS-LS1-2	-Interactive Essential Vocabulary:		NJSLS MP.2, MP.4, N-Q, HSN-Q.A.1, HSN-	

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WALT: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms: a) Differentiate between living and nonliving things by identifying and utilizing the characteristics and needs shared by all living things. b) Sequence the levels of organization of living things from the atomic to the global level. c) Explain how organisms are made of matter and use energy. d) Explain how atoms combine to form compounds.	-Cornell Notetaking in journals **-Instructional Strategies:** • Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) model. • Anchor chart • KWL chart • Think-Pair-Share • Evidence Notebook. • Technology usage for research projects • Video on atomic structure	Answers of Do Now & Exit Questions. Lesson Review questions at the end of chapter 2 Quiz on Elements and atomic structures and test chapter 2 Lab/ Simulation/ Project performance based assessment	Q.A.2, HSN-Q.A.3, HSA-SSE.A.1, HSA-CED.A.1; HSA-CED.A.2; 2.MD.D.10; RST.11-12.1, RST.11-12.7; WHST.9-12.2; WHST.9-12.7 Sorting trips to compare and contrast living and nonliving organisms. Characteristics of living things concept map Develop a Solution LAB: Algae in water Lab Interactivity: Studying Life Lab : Investigating Hydroponics pg 34 **Lab Simulation:** Plan a Tilapia Farm. Science Skills Activity: Interactive Periodic Table	Use index cards to practice terms and definitions. Interaction between peers- class discussion on types of reactions.

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e) Construct and use atomic models to predict the behavior of atoms in interactions.			Drawing atomic structure using Bohr's model. Estimating # of atomic sub-atomic particles using a periodic table. Model making Drawing Bohr models for 20 elements Compare and contrast chemical reactions using column table. The Structure of Materials Chemical nutrients in food Model an Ionic Compounds	
WALT: a) Explain why water is considered the single most important compound in living things by listing and describing its properties and creating a molecular model to demonstrate its polar nature.	Facilitate a whole group discussion on importance of water for living things. Mini Notebook: 5 properties of water, what makes it so special. Demonstration Lab: Properties of water	Observations Review of Notebook work Vocabulary quiz Answers of Do Now & Exit Questions. Review of Notebook work. Lab report Chapter two test	Life's Little Essential - Liquid Water water for living things. Demonstration Lab: Properties of water Mini Notebook: 5 properties of water pH Scale: Phet simulation lab	

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b) Relate pH scale to the concentrations of various acids and bases.	PowerPoint presentations pH Scale: Phet simulation lab Guided inquiry www.biologyjunction.com/pwpt_biology.htm www.nbclearn.com/chemistry-now	**Lab/ Simulation/ Project performance based assessment:** Mini Notebook: 5 properties of water pH Scale: Phet simulation lab Guided inquiry: Acidic and basic foods	Guided inquiry: Acidic and basic foods	
HS-LS1-6, LS1.A WALT: 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: a) Relate carbon's structure to its ability to form many types of molecules. b) Represent and explain the relationship between	-Interactive Essential Vocabulary: -Cornell Notetaking in journals; Hands-on-activity; Problem solving; Critical- thinking; PowerPoint Presentations. **Instructional Strategies:** • Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) • Think-Pair-Share.	Practice problems. Do Now, Exit questions Lesson Review questions Projects, Home work Compare and contrast T table or Venn Diagrams Quizzes Tests (Chapters 2) **Lab/ Simulation/ Project performance based assessment:** Mini Notebook: Enzyme	NJSLS MP.2, MP.4, N-Q, HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3, HSA-SSE.A.1, 2.MD.D.10; RST.11-12.1, RST.11-12.7; WHST.9-12.2; WHST.9-12.7 Video: Chemistry of Durian Fruits Vocabulary game on Macromolecule *Organic Molecule Comparison Table* Interactivity: Understanding macromolecules	At Risk Students • Less complex reading level • Shortened assignments • Different tiered assignments • Extra time Students with IEP: Modifications are usually individualized as per IEP. Preferential seating • Have students work in pairs • Assistive technologies

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the structure and function of each class of complex molecules using a variety of models c) Explain how the lock-and-key model describes an enzyme's specific function. d) Demonstrate the properties and functions of enzymes by designing and carrying out an experiment. e) Explain how the lock-and-key model describes an enzyme's specific function. f) Demonstrate the properties and functions of enzymes by designing and carrying out an experiment.	• Scaffolding • Evidence Notebook Mini Notebook: Enzyme Demonstration/ Exploration Lab Virtual Lab – Enzyme Controlled Reactions Review	Virtual Lab report– Enzyme Controlled Reactions Simulation: Optimum Conditions for Enzymes Paper Lab: Carbon Compounds Hydrolysis and Dehydration Synthesis Rubric summarization and Notes	Paper Lab: Carbon Compounds Hydrolysis and Dehydration Synthesis https://serendipstudio.org/sci_edu/waldron/#starch Simulation: Optimum Conditions for Enzymes Virtual Lab – Enzyme Controlled Reactions Toothpickase (enzyme simulation) http://www.biologyjunction.com/toothpickase.htm Lab: Exploration Lab:	• Reduced number of options on multiple choice exams • Use Larger print • Fewer problems on each page • More time during Test Visual and organization -Flow chart- text p. 5 Foldable of macro-Molecules cooperative learning- vocabulary game is played between student groups Enzyme Review: Index card Interactive vocabulary words

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HS-LS2-1, HS-LS2-2, HS-LS2 -6, HS-LS 2.C **HS-ESS3-5** **We are learning to (**WALT): 1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (HS-LS2-1): a) Describe how organisms are affected by their environment, and affect the environment in turn.	-Interactive Essential Vocabulary: -Cornell Notetaking in journals; -Hands-on-activity; -Problem solving; -Critical- thinking; -PowerPoint Presentations. **Instructional Strategies:** • Apply 5E or Connect,	Review of Notebook work Vocabulary quiz Answers of Do Now & Exit Questions. Review of Notebook work. Chapter 3: quiz and test	NJSLS MP.2, MP.4, N-Q, HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3, HSA-SSE.A.1, HSA-CED.A.1; HSA-CED.A.2; 2.MD.D.10; RST.11-12.1, RST.11-12.7; WHST.9-12.2; WHST.9-12.7 *Brainstorm definition of ecology* Compare and contrast living and nonliving parts of the environment Exploring Environmental Change: Interactivity: Global systems	**RTI/Extra Support:** Supply students with flashcards that identify each step of the design process. Have students place them in order. **ELL/ELD Strategy:** Make use of labeled diagrams to understand the content and develop vocabulary in context. **Extension:** Challenge students to apply a design solution process to a problem in their own lives. Have them make a poster or slide show to communicate their work.

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b) Why is ecology important? c) Compare and contrast living and nonliving parts of the environment **WALT: 2**. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales (HS-LS2-2): d) Identify various methods used to study the environment. e) Identify each major terrestrial biome, and describe each in terms of precipitation, temperature and native species. f) Application of models and systems in understanding biology.	Investigate, Synthesize, Demonstrate (CISD) • Think-Pair-Share. • Scaffolding • Evidence Notebook Interactivity: Global systems Videos *Random Sampling* Open-ended Inquiry	**Lab/ Simulation/ Project performance based assessment:** Abiotic factor and plant selection lab. Brochure/Poster Presentation: Biomes and aquatic ecosystems. As per rubric	Video: counting wild animals Abiotic factor and plant selection lab *Random Sampling Capture/Recapture Method* VirtualLab–Tracking Grizzlies Teaching Biology Through Systems, Models, & Argumentation Video: Alpine Tundra Simulation lab: Where organism Live *Aquatic Ecosystem Table* Saltmarsh article Brochure/Poster Presentation: Biomes and aquatic ecosystems. As per rubric 3 pt. essays for articles	**Suggested Strategies for Students with Special Needs: a)** Work in cooperative groups or with partners. b) Allow students to respond orally or illustrate answers instead of responding in a written format. c) Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions. Interactive vocabulary words Use index cards to practice terms and definitions Co-operative learning Enrichment Video: The Guide, A Biologist in Gorongosa Park Part1-3

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g) Identify each type of aquatic ecosystem and define each in terms of depth and salinity.				Video for Visual Learner: Ecosystems and Biomes Cooperative learning *Terrestrial Biome Puzzle* At Risk Students • Less complex reading level • Shortened assignments • Different tiered assignments • Extra time Students with IEP: Modifications are usually individualized as per IEP. Preferential seating • Have students work in pairs • Assistive technologies • Reduced number of options on multiple choice exams • Use Larger print
HS-LS2-3 HS-LS2-4 HS-LS2-5 HS-LSB **HS-ESS3-5** **WALT: 3.** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions (HS-LS2-3): a) Define the roles played by organisms in the environment in terms of how they obtain energy. b) Explain how energy is obtained and	-Interactive Essential Vocabulary: -Cornell Notetaking in journals; -Hands-on-activity; -Problem solving; -Critical- thinking; -PowerPoint Presentations. **-Instructional Strategies:** • Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD)	Do Now, Exit questions Lesson Review questions Projects, Home work Compare and contrast T table or Venn Diagrams **Quizzes** **Tests (Chapters 4)** **Lab/ Simulation/ Project performance based assessment:** Food web Lab One-pager	NJSLS MP.2, MP.4, N-Q, HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3, HSA-SSE.A.1, 2.MD.D.10; RST.11-12.1, RST.11-12.7; WHST.9-12.2; WHST.9-12.7 Food Chains and Energy in Ecosystems: HMHI Enrichment activity: Creating Chains and food web to model ecological relationship. Food web Lab One-pager	

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passed along through an ecosystem. c) Compare and contrast various ways of representing ecosystem structure (I.e., food webs, chains and ecological pyramids) **WALT: 4**. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem (HS-LS2-4). a) Demonstrate, using models, how internal and external sources of energy drive the hydrologic, carbon, nitrogen, phosphorus, sulfur, and oxygen cycles. b) Model how natural and man-made changes in the environment will	• Think-Pair-Share. • Scaffolding • Evidence Notebook Develop a solution lab: Effect of fertilizers on algae. Engineering interactivity Construct a wetland.	**Can Algal Blooms be Useful?** Page 136 Review of Notebook work Lab Nitrogen Fixation report Biogeochemical cycle poster preparation and presentation. Lab report Vocabulary quiz	**Surviving Winter in the Dust Bowl (Food Chains and Trophic Levels):** **Performance based project: Can Algal Blooms be Useful?** Page 136 Capturing Carbon – Where Do We Put It The Nitrogen Cycle **Of Microbes and Men:** Biogeochemical cycle activity Review for the test.	• Fewer problems on each page • More time during Test Visual learners- coloring the food chain/food web White boards used for group presentations/Lab stations activity

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affect individual organisms and the dynamics of populations.	Quick write strategy to summarize from whole class discussion on Global warming. PowerPoint presentations		Poster and/or PowerPoint Presentation. Virtual Lab – Model Ecosystems Global Climate Change - Understanding the Greenhouse Effect: Taking the Earth's Temperature: Practice review questions.	
HS-LS2-6, HS-LS2-7, HS-LS2-8, LS2.A LS2.C **WALT:** 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-LS2-6:	-Interactive Essential Vocabulary: -Cornell Notetaking in journals **-Instructional Strategies:** • Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) model.	Do Now, Exit questions Lesson Review questions Home work Compare and contrast T table or Venn Diagrams **Quizzes and Tests (Chapters 5)** **Projects/Lab/ Simulation/ Project**	NJSLS MP.2, MP.4, N-Q, HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3, HSA-SSE.A.1, HSA-CED.A.1; HSA-CED.A.2; 2.MD.D.10; RST.11-12.1, RST.11-12.7; WHST.9-12.2; WHST.9-12.7 Science skills activity: life on the reef Article- Fire ants http://www.biologyjunction.com/Marauding%20Fire%20Ants.pdf	

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c) Define the concept of an organism's niche, and explain how the environment and the presence of other organisms affect it. d) Discuss models and systems in biology using simulation. e) Describe how organisms change their environment over time. f) Model the rate of population growth in graphic form, and use data to draw conclusions about its impact. g) Explain how various factors determine the size of a population in a given area. **WALT**: Design, evaluate, and refine a solution for reducing the impacts of human	-Discussion Board: Fitting in -Compare and contrast using a T chart PowerPoint presentations Guided enquiry Lab.	**performance based assessment:** Tale of Two countries page 166, Pearson Text Book Virtual Lab. Guided enquiry. Lab **Test and Quizzes Chapter 6 & 7**	Symbiotic Strategies: http://www.teachersdomain.org/resource/nat08.living.eco.humeco.lpsymstra/ Guided enquiry lab: How does succession occurs Review for the test Virtual Lab – Population Biology Infectious Disease and Population Growth **Interactive activities:** **Extinction** **Population Balance** **Population Explosion** **Case Study**: How do species Species interactions shape ecosystems Page 173 Pearson Textbook	

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activities on the environment and biodiversity. (HS-LS2-7) c) Compare, over time, the impact of human population growth on the environment. d) Define types of biodiversity and biodiversity explain why it is critical to ecosystem stability. **WALT:** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce (HS-LS2-8). e) Model how natural and man-made changes in the environment will affect individual organisms and the dynamics of populations. f) Calculate your ecological footprint		**Unit review and Unit assessment**	Guided enquiry: Estimating population size Article- Preserving Mussels *Predator/Prey graph activity* ***TEST – HUMAN IMPACT*** **Project performance based:** Tale of Two countries page 166, Pearson Text Book Unit review and Unit assessment	

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and recognize which part of your ecological foot print could be reduced significantly then design a solution by describing a method for reducing it.				

21st Century Theme Targeted – Global Awareness: Using 21st century skills to understand and address global issues					
21st Century Skills Targeted					
Creativity & Innovation	**Information Literacy**	**Media Literacy**	**Critical Thinking & Problem Solving**	**Communication & Collaboration**	**Life & Careers**
Design Mini book: 5 properties of water **Design a poster:** Poster Presentation: Biomes and aquatic ecosystems. As per rubric	**Leveled Readers:** Nobel laureate in Biology who shares birthday with me The Structure of Materials	Article- Preserving Mussels Article- Fire ants http://www.biologyjunction.com/Marauding%20Fire%20Ants.pdf	• Simulation lab Simulation: Optimum Conditions for Enzymes Virtual Lab – Population Biology **Interactive activities:** Extinction; Population Balance; Population Explosion	Food web Lab Abiotic factor and plant selection lab Lab : Investigating Hydroponics Develop a Solution LAB: Algae in water Lab	Global Climate Change - Understanding the Greenhouse Effect:

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Summative Assessments:
Pre Unit Test
Post Unit Test

Unit 1 Performance Task: Phet Simulation labs, Projects

Unit 2. Respiration, Photosynthesis, cell and cell transportation, cell division
Time Frame: 40-45 Days

Essential Questions

1. How do organisms obtain energy?
2. How are respiration and photosynthesis related?
3. What are the main points of the cell theory?
4. How do prokaryotic and eukaryotic cell differ?
5. How are cell structures adapted to their function.? Or How do the structures that comprise a cell allow it to perform the processes necessary to sustain life and, in the case of multicellular organisms, specific tasks?
6. How does the process of cell division relate to the growth, repair and maintenance of an organism, as well as diseases such as cancer?

Standards

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Standards / CPIs (cumulative Progress Indicators) taught and assessed:

PERFORMANCE EXPECTATIONS

- **HS-LS1-1** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms

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

- **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.

DISCIPLINARY CORE IDEAS

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)

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)

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)

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- 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 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)

SCIENCE and ENGINEERING PRACTICES

Developing and Using Models

Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HSLS1-4),(HS-LS1-5),(HS-LS1-7)

Planning and Carrying Out Investigations

- 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)

Using Mathematics and Computational Thinking

- Use mathematical representations of phenomena to support claims

Constructing Explanations and Designing Solutions

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- 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.
- Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations 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) ♣ 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

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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

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), (HS-LS1-4)

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), (HS-LS1-6)

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)
- Stability and Change Feedback (negative or positive) can stabilize or destabilize a system. (HSLS1-3)

CONNECTIONS TO MATH

MP.2 Reason abstractly and quantitatively
MP.4 Model with mathematics. (HS-LS1-4)
HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (HS-LS1-4)
HSF-BF.A.1 Write a function that describes a relationship between two quantities. (HS-LS1-4)

CONNECTIONS TO ELA

NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS1-1),(HS-LS1-6)
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1- 1),(HS-LS1-6)

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WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS1-6)
WHST.9-12.7 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. (HSLS1-3)
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)
WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6)
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2),(HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

Technology:
8.1.2.A.2 Create a document using a word processing application.
8.2.2.C.4 Identify designed products and brainstorm how to improve one used in the classroom.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.
8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.
8.2.2.D.2 Discover how a product works by taking it apart, sketching how parts fit, and putting it back together.
8.2.2.D.3 Identify the strengths and weaknesses in a product or system.

Highlighted career Ready practices:

- **CRP2. Apply appropriate academic and technical skills. .**
- **CRP4. Communicate clearly and effectively and with reason.**
- **CRP5. Consider the environmental, social and economic impacts of decisions.**
- **CRP6. Demonstrate creativity and innovation.**
- **CRP7. Employ valid and reliable research strategies.**
- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**

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- **CRP9. Model integrity, ethical leadership and effective management. .**
- **CRP11. Use technology to enhance productivity.**

SEL Practices & Competencies:

- Self-Management
- Social Awareness
- Responsible Decision-Making
- Relationship Skills

Overall Goal:

- Respiration releases energy stored in chemical bonds, and results in the production of CO_2 and H_2O, which are used in photosynthesis to store energy from light in the form of chemical bonds.
- Cell is the basic unit of life?
- The structures of the cell allow it to control what enters and leaves the cell, to move, to release energy and produce cell products. The structure of cells in multicellular organisms allow for coordinated actions such as movement and transmission of information and resources.
- Cell division allows unicellular organisms to reproduce and multicellular organisms to grow, replace damaged cells and maintain stability. Cancer occurs when cell division occurs rapidly and without restraint.

Pre-Assessment: Unit 2 Teacher made tests

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(SLO) Student Learning Objectives (with standards)	Student Learning Strategies	Formative Assessment ***suggested but not limited to the following***	Activities ***suggested but not limited to the following***	Modifications & Reflections ***suggested but not limited to the following***
HS-LS1-4 HS-LS1-1 LS1.A MS-LS1-1 MS-LS1-2 MS-LS1-3 HS-ETS1-4 WALT: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms (HS-LS1-4): a) Explain how the invention of the microscope led to the discovery of cells. b) Explore cell theory	-Explore concept that systems of specialized cells within organisms help them perform the essential functions of life. -Essential Interactive Vocabulary: -Cornell Notetaking in journals Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize,	Do Now, Exit questions Lesson Review questions Home work Compare and contrast T table or Venn Diagrams Case study: What is Happening to me? **Quizzes and Tests (Chapters 8)** ***TEST - CELLS*** **Projects/Lab/ Simulation/ Project Performance based assessment**	NJSLS MP.2, MP.4, HSF-IF.C7, HSF-BF.A1, NJSLSA.R1; RST.11-12.1, RST.11-12.1; WHST.9-12.2; WHST.9-12.5; **SL.11-12.5;** WHST.9-12.8 WHST.9-12.7 Using a Compound Microscope Microscope lab http://www.biologyjunction.com/Microscope%20Lab2.pdf *Microscope lab 2* *Observe Protists* *Cheek Cells* *Essay – Dance of the Phospholipids* *Plant vs. Animal Cell Venn Diagram* Using Microscopes: http://www.explorebiology.com/documents/LE/	**RTI/Extra Support**. Brainstorm a list of words that are associated with Cell structure & function, Cellular transport, cell divisions. **ELL/ELD Strategy:** Point out all labels, pictures, captions and headings throughout the lesson. Discuss real-life connections to content and provide hands-on examples of materials when possible via Case studies. **Extension:** Have students collect a variety of materials that can be categorized by their properties and make a poster or slide show to share what they found out with the class.

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c) Distinguish between prokaryotes and eukaryotes by constructing charts and cellular models. d) Compare and contrast plant and animal cells. **WALT: Construct models that explain the movement of molecules across membranes with membrane structure and function. (LS1.A):** e) Discuss and demonstrate the processes of diffusion, osmosis, facilitated diffusion and active transport by investigating and simulating a cell's response to a given set of environmental conditions. f) Explain why it is important for a cell to maintain a stable internal environment.	Demonstrate (CISD) model. Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding I do, We do, U do KWL chart Cooperative learning Think-Pair-Share Jigsaw		Lab07Microscope2009.pdf Antony Van Leeuwenhoek: http://www.ucmp.berkeley.edu/history/leeuwenhoek.html *Cell City Analogy* Cell Structure and Function: http://www.teachersdomain.org/resource/tdc02.sci.life.cell.lp_strufx/ Cell Anatomy Animation: http://www.johnkyrk.com/CellIndex.swf Inside a Cell: http://learn.genetics.utah.edu/content/begin/cells/insideacell/ Detecting Diffusion LMA p. 45-48, SE p. 218 Egg Osmosis lab Transport Across a Membrane Animations: http://highered.mcgraw-	**Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, document camera, charts, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions. Video for Audio- Visual learners: Introduction to cells: Structure of a cellProkaryotic and eukaryotic cells: Structure of a cellTour of a eukaryotic cell Membranes and transport

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g) Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem HS-ETS1-4			hill.com/sites/0072437316/student_view0/chapter6/animations.html# *Gummibear Osmosis* ***TEST – CELLS*** **Performance based assessment** Case study: What is Happening to me? **PhET Simulation: Membrane Diffusion:** **Membrane Channels Simulation:** : **performance based assessment:** **Case study: What is Happening to me page** Page271 Pearson Textbook	
HS-LS1-5 HS-LS1-7 LS1.A LS1.C HS-ETS1-4 WALT: **Use a model to illustrate how photosynthesis transforms light**	-Essential Interactive Vocabulary: -Cornell Notetaking in journals	Do Now, Exit questions	NJSLS MP.2, MP.4, HSF-IF.C7, HSF-BF.A1, NJSLSA.R1; RST.11-12.1, RST.11-12.1; WHST.9-12.2; WHST.9-12.5; **SL.11-12.5;** WHST.9-12.8 WHST.9-12.7	**RTI/Extra Support:** Allow students to explore Photosynthesis and respiration by

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energy into stored chemical energy, (HS-LS1-5): a) Compare organisms in terms of how they obtain the energy they need. b) Explain where plants and some microorganisms obtain the energy they need to produce food by discussing how the process of photosynthesis provides a vital connection between the Sun and the energy needs of living systems. c) Derive the overall equation for photosynthesis by conducting experiments to investigate how environmental factors (such as temperature, light intensity and water availability) can affect the rate of photosynthesis	Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) model. Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding I do, We do, U do KWL chart Cooperative learning Think-Pair-Share Jigsaw e Notebook Think-Pair-Share Jigsaw KWL chart **Scaffolding** **I do, We do, you do** Cooperative learning	Lesson Review questions Home work Compare and contrast T table or Venn Diagrams **Case study**: What would it takes to make an Artificial Leaf page 298 **Quizzes and Tests (Chapters 9 &10)** ***TEST - PHOTOSYNTHESIS*** **Projects/Lab/ Simulation/ Project** **Performance based assessment:** • Data from the corn Field Design a Solution • Can San Fransisco sourdough be copied?	*Chromatography / Chlorophyll* *Photosynthetic Production of Starch* What Waste Product is Produced During Photosynthesis? SE p. 234 Photosynthesis Cast of Characters: http://www.explorebiology.com/documents/LE/Photosynthesis.pdf **Performance based assessment:** 1-Data from the corn Field, Design a Solution Page 302 Pearson TextBook 2- What will it take to make an artificial leaf. Page 298 Pearson TextBook Cellular Respiration Cast of Characters: *Photosynthesis vs. Respiration Table*	simulation, Inquiry Lab and Case studies **ELL/ELD Strategy:** Point out all labels, pictures, captions and headings throughout the lesson. Discuss real-life connections to content and provide hands-on examples of materials when possible. **Extension:** Students can research careers that involve energy efficient machines and alternative sustainable energy sources. Provide print and online resources. Have students share research with class. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers

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WALT : 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-LS1-7): d) Explain how organisms break down glucose in order to obtain energy. e) Differentiate between the two forms of fermentation by demonstrating the applications of each process. f) a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on			Breathing and Holding Your Breath http://serendip.brynmawr.edu/sci_edu/waldron/#organic Muscles and Mitochondria: http://www.teachersdomain.org/resource/tdc02.sci.life.cell.lp_mitochon/ Marathon Mouse: http://www.teachersdomain.org/resource/nsn09.sci.life.stru.lpmouse/ **Case study**: What would it takes to make an Artificial Leaf page 298 **Simulation:** • **Leaf Photosynthesis NetLogo Model:** This Java-based NetLogo model allows students to investigate the chemical and energy inputs and outputs of photosynthesis through an	instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, document camera, charts, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions. Videos for audio-visual Learners: • Cellular respiration • Photosynthesis

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interactions within and between systems relevant to the problem HS-ETS1-4			interactive simulation. • **Eating & Exercise** • **Respiratory Rate During Exercise**	
HS-LS1-4 HS-ETS1-4 **WALT: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms:** a) Calculate how the different rates of growth in surface area versus volume prevent cells from growing too large. b) Compare and contrast sexual and asexual reproduction c) List and describe the main events of the	-Essential Interactive Vocabulary: -Cornell Notetaking in journals Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) model. Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding	Do Now, Exit questions Lesson Review questions & study guide. Home work Compare and contrast T table or Venn Diagrams **Case study**: Will Stem cell change the future of healing Page 362 Pearson TextBook **Quizzes and Tests (Chapters 11)** ***TEST - CELL DIVISION*** **Projects/Lab/ Simulation/ Project**	NJSLS MP.2, MP.4, HSF-IF.C7, HSF-BF.A1, NJSLSA.R1; RST.11-12.1, RST.11-12.1; WHST.9-12.2; WHST.9-12.5; **SL.11-12.5;** WHST.9-12.8 WHST.9-12.7 Cell size cubes http://www.biologyjunction.com/cell_size.htm *Modeling the Phases of the Cell Cycle* *Song of the Cell Cycle* *Mitosis* *Mitosis Microscope activity* Cancer Cell article http://www.biologyjunction.com/Can%20Cancer	At Risk Students • Less complex reading level • Shortened assignments • Different tiered assignments • Extra time Students with IEP: Modifications are usually individualized as per IEP. Preferential seating • Have students work in pairs • Assistive technologies

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cell cycle by creating a labeled diagram d) Demonstrate and summarize the events of mitosis by creating models and performing simulations. e) Explain how cancer is the result of a breakdown of the cell cycle, allowing rapid, uncontrolled cell growth to occur. f) Discuss the significance of cell specialization in multicellular organisms by creating analogies and describing modern applications of the regulation of cell differentiation and analysis of the benefits and risks. g) Use a computer simulation to model	I do, We do, U do KWL chart Cooperative learning Think-Pair-Share Jigsaw e Notebook Think-Pair-Share Jigsaw KWL chart **Scaffolding** **I do, We do, you do** Cooperative learning	**Performance based assessment:** Construct an explanation. Taxol: A drug, a poison or both	%20Tumors%20Be%20starved%20to%20death.pdf 3 pt. essays for articles http://www.biologyjunction.com/using_threepoint_essays_with_bi.htm Cell Division Animations: http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter11/animations.html# Meiosis and Mitosis Practice: http://www.explorebiology.com/documents/LE/MeiosisMitosisReview1.pdf Cell Replication and Cancerous Cells: http://www.teachersdomain.org/resource/tdc02.sci.life.cell.lp_divide/ Stem Cell Research: http://www.teachersdomain.org/resource/tdc	• Reduced number of options on multiple choice exams • Use Larger print • Fewer problems on each page • More time during Test Visual learners- Color different phases of Mitosis Audio-Visual Learners; **Cell division**

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the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem HS-ETS1-4 h) Model how natural and man-made changes in the environment will affect individual organisms and the dynamics of populations	REVIEWS AND ASSESSMENTS	***UNIT POSTTEST*** **MIDTERM EXAMINATION**	02.sci.life.cell.lp_specializ/ Stem Cells: http://learn.genetics.utah.edu/content/tech/stemcells/ **Case study**: Will Stem cell change the future of healing Page 362 Pearson TextBook **Performance based assessment:** Construct an explanation. Taxol: A drug, a poison or both Virtual Lab – Cell Cycle and Cancer REVIEWS AND ASSESSMENTS	

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21st Century Theme Targeted –Global Awareness: Using 21st century skills to understand and address global issues					
21st Century Skills Targeted					
Creativity & Innovation	**Information Literacy**	**Media Literacy**	**Critical Thinking & Problem Solving**	**Communication & Collaboration**	**Life & Careers**
-Data from the corn Field, Design a Solution. -Will Stem cell change the future of healing Page 362 Pearson TextBook	Cancer Cell article	http://www.teachersdomain.org/resource/tdc02.sci.life.cell.lp_specializ/	**Unit Project: Simulations** • Membrane Diffusion: • Membrane Channels Simulation: • Leaf Photosynthesis NetLogo Model • Virtual Lab – Cell Cycle and Cancer	Lab: - Using a Compound Microscope Microscope lab -Egg Osmosis lab	**Performance based assessment:** Construct an explanation. Taxol: A drug, a poison or both
Summative Assessments: (include rubrics & exemplars) **Unit 2 Summative Pre Unit test and Post Unit test; Midterm Test** **Unit 2 Performance Task: Simulations:** Construct an explanation. Taxol: A drug, a poison or both 1. Membrane Diffusion; 2 Membrane Channels Simulation; 3.Leaf Photosynthesis NetLogo Model; Egg Osmosis lab					

Unit 3. DNA, Genetics and Biotechnology **Time Frame: 35-40 Days**
Essential Questions • How is genetic information passed on from one generation to the next? • What does the double-helix model show about DNA?

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- How does the structure of the DNA molecule enable it to regulate the functions of the cell?
- How does the genetic code works?
- What ethical and societal issues must be considered regarding genetic issues and technology?

Standards

Standards / CPIs (cumulative Progress Indicators) taught and assessed:
PERFORMANCE EXPECTATIONS

- **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.

DISCIPLINARY CORE IDEAS

LS1.A: Structure and Function

- 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. (s econdary to HS - LS3 - 1) (Note: This Disciplinary Core Idea is also addressed by HS - LS1 - 1 .)

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)

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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)

SCIENCE and ENGINEERING PRACTICE

Asking Questions and Defining Problems:

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

Analyzing and Interpreting 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

- 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

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). (HSLS3-3)

CONNECTIONS TO MATH

- **MP.2** Reason abstractly and quantitatively. (HS-PS4-1).
- **MP.4** Model with mathematics. (HS-PS4-1).

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CONNECTIONS TO ELA

- **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS - LS3 - 1), (HS - LS3 - 2)
- **RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS - LS3 - 1)
- **WHST.9-12.1** Write arguments focused on discipline - specific content. (HS-LS3-2)

TECHNOLOGY:

8.1.2.A.2 Create a document using a word processing application.
8.1.2.A.4 Demonstrate developmentally appropriate navigation skills in virtual environments (i.e. games, museums)
8.2.2.C.4 Identify designed products and brainstorm how to improve one used in the classroom.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.
8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.
8.2.2.D.2 Discover how a product works by taking it apart, sketching how parts fit, and putting it back together.
8.2.2.D.3 Identify the strengths and weaknesses in a product or system.

HIGHLIGHTED CAREER READY PRACTICES:

- **CRP2.** Apply appropriate academic and technical skills.
- **CRP4.** Communicate clearly and effectively and with reason.
- **CRP5.** Consider the environmental, social and economic impacts of decisions.
- **CRP6.** Demonstrate creativity and innovation.
- **CRP7.** Employ valid and reliable research strategies.
- **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP9.** Model integrity, ethical leadership and effective management.
- **CRP11**. Use technology to enhance productivity.

SEL PRACTICES & COMPETENCIES:

- Self-Management
- Social Awareness
- Responsible Decision-Making
- Relationship Skills

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Overall Goal (What is the big idea?)
• There are predictable patterns of inheritance, and the variation that exists within a species is related to its mode of reproduction (asexual or sexual). • The complementary strands of a DNA molecule, with their sequences of nucleotides, allow it to make copies of itself, to produce RNA molecules to transfer the information stored, and through RNA, direct the production of proteins. These proteins, in turn, make up the structural components of the cell, and regulate chemical reactions within and outside of the cell. • Considerations include benefit versus risk assessment, the propriety of human research, and the possibility of unforeseen consequences of genetic interventions (i.e., gene therapy, genetically modified organisms, etc.). Thought must also be given to differences of opinion within society about such issues.
Pre-Assessment: Unit 3 **Teacher made Test**

(SLO) Student Learning Objectives (with standards)	**Student Learning Strategies**	**Formative Assessment ***suggested but not limited to the following***	**Activities ***suggested but not limited to the following***	**Modifications & Reflections ***suggested but not limited to the following***
HS-LS3-1 **LS3.A** **HS-LS3-3** **LS3.B** HS-ETS1-4 **MS-LS3-1** **MS-L3-2** **WALT: Ask questions to clarify relationships about the role of DNA**	- Essential Interactive Vocabulary: -Cornell Notetaking in journals Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize,	Do Now, Exit questions Lesson Review questions & study guide. Home work Compare and contrast T table or Venn Diagrams **Quiz**	NJSLS MP.2, MP.4, HSA-SSE.A.1, HSA-CED.A .4, HSA-SSE.B.3,; RST.11-12.1, RST.11-12.7;, WHST.9-12 .2, WHST.11.12.8; Interactivity: Examining Mendel's Pea Plant Experiments	**ELL/ELD Strategy:** Have students use index cards to write features of Mendel Laws (one feature per card). Have students sort the cards into different characteristics of waves. and energy **Extension:** Have students work in pairs to play simulation games

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and chromosomes in coding the instructions for characteristic traits passed from parents to off-springs. (HS-LS3-1): a) Explain how Mendel's use of probability and statistics allowed him to develop his laws of heredity. b) Summarize the laws of heredity and discuss the consequences of each law. **WALT: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population (HS-LS3-3)** c) Explain how probability allows us to predict the outcome of specific crosses by	Demonstrate (CISD) model. Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding I do, We do, U do KWL chart Cooperative learning Think-Pair-Share e Notebook Think-Pair-Share	The Work of Gregor Mendel **Projects/Lab/ Simulation/ Project**	Simulation: Dominant or Recessive? *Dihybrid crosses* *Child characteristics* Heredity & Traits: http://learn.genetics.utah.edu/content/begin/traits/ Chromosome Tutorial: http://www.johnkyrk.com/chromostructure.swf What is a Chromosome: http://learn.genetics.utah.edu/content/begin/tour/ Dragon Genetics http://serendip.brynmawr.edu/sci_edu/waldron/#organic *Punnett Squares* Virtual Lab – Punnett Squares *Probability lab* graph – Human Blood types SE p. 320 Using Blood Type to Identify Babies and Criminals	that teaches about nature of different waves. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions. **Videos –audio-visual learner:**

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constructing Punnett squares. d) Compare and contrast various modes of inheriting traits. e) Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem HS-ETS1-4			Dragon Genetics http://serendip.brynmawr.edu/sci_edu/waldron/#organic Genetics Practice 2 – Non-Mendelian Genetics: http://www.explorebiology.com/documents/LE/GeneticsProblems2.pdf Genetics Practice 3 – Blood Type Genetics: http://www.explorebiology.com/documents/LE/GeneticsProblems3.pdf Science Skills Activity: Guinea Pig Genetics	Classical and molecular genetics • Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA) • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques- auditory/visual aids; pictures,
HS-LS3-2 **LS3.A, LS3.B** **HS-LS1-1** **LS1**.A **WALT: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic**	- Essential Interactive Vocabulary: -Cornell Notetaking in journals Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize,	Lesson Review questions & study guide. Home work **Case study**: Will Stem cell change the future of healing Page 362 Pearson TextBook	NJSLS MP.2, MP.4, HSA-SSE.A.1, RST.11-12.1, RST.11-12.9;, WHST.9-12 .1; Modeling Meiosis LMA p. 67-72, SE p. 330 Calculating Haploid and Diploid Numbers SE p. 327	

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combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors: a) Summarize the events of meiosis by constructing models. b) Compare and contrast the processes of meiosis and mitosis by creating Venn diagrams. c) Explain how scientists determine the location of specific genes on a chromosome. **WALT: Construct an explanation based on evidence that all cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the**	Demonstrate (CISD) model. Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding I do, We do, U do KWL chart Cooperative learning Think-Pair-Share e Notebook Think-Pair-Share	**Tests (Chapters 12)** ***TEST - Genetics*** **Projects/Lab/ Simulation/ Project** **Performance based assessment:** Growing More and better Corn Page 404 Pearson Textbook	*Crossing Over lab* Portfolio Project: Case Study, Genetic disorders. Understanding the odds. Page 400 Pearson Text book. **Performance based assessment:** Growing More and better Corn Page 404 Pearson Textbook Simulation: Lily Breeding DNAi - Timeline: http://www.dnai.org/timeline/index.html DNAi – Finding the Structure: http://www.dnai.org/a/index.html	illustrations, graphs, charts, data tables, multimedia, modeling). • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). Audio-visual learners:

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instructions that code for the formation of proteins, which carry out most of the work of cells. (LS1.A ; LS3.A) d) Explain how nucleic acid that stores and transmits genetic information from one generation to another of an organism to another by analyzing the results of major experiments that led to our current knowledge of DNA. e) Describe and analyze the structure of a DNA molecule by constructing functional models. **WALT: Construct an explanation based on evidence for how all cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated**			*DNA Poster (scientists who contributed to DNA structure)* Extracting DNA LMA p. 73-76 Article – Crick and Watson Paper http://www.biologyjunction.com/WatsonCrickPaper.pdf DNAi Teacher Guide – Origami DNA Model: *Portfolio Project* *Amino Acid Lab* *DNA Booklet* Virtual Lab- DNA and Genes Genetics http://serendip.brynmawr.edu/sci_edu/waldron/#organic DNA model http://www.biologyjunction.com/dna_model.htm Learn Genetics The Nuts and Bolts of DNA Replication:	**DNA as the genetic material** **Central dogma (DNA to RNA to protein)** **Gene regulation**

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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 (LS3.A): f) Summarize the process of DNA replication by constructing models. g) Compare and contrast the three types of RNA by creating Venn diagrams and developing real-life analogies. h) Compare and contrast the structure and function of DNA and RNA by utilizing models. i) Summarize the overall process of protein synthesis (transcription and translation) by		***TEST- DNA AND RNA*** **Performance based assessment:** Tracking Royal Blood: Evaluate and Communicate information. Page 498 Pearson Textbook.	http://www.teachersdomain.org/resource/tdc02.sci.life.gen.nutsbolts/ *RNA Venn Diagram* DNA and RNA Structure: http://media.pearsoncmg.com/bc/bc_campbell_biology_7/media/interactivemedia/activities/load.html?16&B From DNA to Protein Synthesis LMA p. 77-80, SE p. 384 DNA and Protein Synthesis in the Cell: Case Study: How does plant remember winter? Page 462 Pearson textbook Virtual Lab- Sex-linked Traits What Makes a Firefly Glow:	**Biotechnology**

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performing simulation activities. **WALT: Create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. (LS3.B):** j) Explain how changes to the sequence of nucleotides occur and what are the possible consequences of such changes. k) Discuss the ways in which the functions of genes are controlled. **WALT: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population (HS-LS3-3)**		***TEST - HUMAN HEREDITY***	Virtual Lab – Knocking Out Genes http://www.biologyjunction.com/karyotype_lab.htm Pedigree lab **Performance based assessment:** Tracking Royal Blood: Evaluate and Communicate information. Page 498 Pearson Textbook. Make a Karyotype: http://learn.genetics.utah.edu/content/begin/traits/karyotype/ Using Karyotypes to Predict Genetic Disorders: http://learn.genetics.utah.edu/content/begin/traits/predictdisorder/ Inheritance of Genetic Disorders: http://www.teachersdom	

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l) Identify techniques used by scientists to study genetic disorders in humans by constructing and analyzing karyotypes and pedigrees. m) Give relevant information about specific genetic disorders by creating a presentation. n) Describe how humans have produced desirable plants and animals through selective breeding for specific traits. o) Discuss how modern genetic technology and procedures can be used in medicine, industry and law enforcement. p) Present the pros and cons of a particular genetic technology, with consideration to societal values and ethical issues.		***TEST – GENE TECHNOLOGY*** ***UNIT POSTTEST***	ain.org/resource/tdc02.sci.life.gen.lp_disorder/ Genetic Disorders Library: http://learn.genetics.utah.edu/content/disorders/whataregd/ *Design brochures: Genetic Disorders* The Human Genome Project: http://www.teachersdomain.org/resource/tdc02.sci.life.gen.lp_hgpwhat/ Issues in Genomics: http://www.lessonplansinc.com/science.php/biology/detail/issues_in_genomics/ *Genome issues reports and debate* The Perfect Cow?: http://www.teachersdomain.org/resource/nat08.living.gen.geneng.lpperccow/ *Compare dog breeds*	

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q) Explain how Mendel's use of probability and statistics allowed him to develop his laws of heredity. r) Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem HS-ETS1-4			DNA Extraction Virtual Lab: *DNA Fingerprinting* Using DNA to Identify Human Remains LMA p. 81-87, SE p. 410 Inserting Genetic Markers Virtual Lab – Gene Splicing Genetically Modified Crops in the United States SE p. 429 Biotechnology Animations: Cloning: *Genetic Ethics Questions Discussion* Bioengineered Food?: It's All in the Genes – Exploring Issues About Genetically Modified Foods: Gene Therapy:	

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			Explain how Mendel's use of probability and statistics allowed him to develop his laws of heredity. Summarize the laws of heredity and discuss the consequences of each law. REVIEWS for the unit test	

21st Century Theme Targeted – Global Awareness: Using 21st century skills to understand and address global issues					
21st Century Skills Targeted					
Creativity & Innovation	**Information Literacy**	**Media Literacy**	**Critical Thinking & Problem Solving**	**Communication & Collaboration**	**Life & Careers**
Design brochures: Genetic Disorders	Bioengineered Food?: **Case study**: Will Stem cell change the future of healing Page 362 Pearson TextBook	Cloning: It's All in the Genes – Exploring Issues About Genetically Modified Foods: Gene Therapy:	**Simulations** • Simulation: Lily Breeding • DNA Extraction Virtual Lab • Virtual Lab – Gene Splicing • Virtual Lab – Knocking Out Genes	**Skills Practice Labs** • Pedigree lab • DNA Extraction Lab • *Probability lab*	**Performance based assessment:** Growing More and better Corn Page 404 Pearson Textbook **Case study**: Will Stem cell change the future of healing Page 362 Pearson TextBook
Summative Assessments:					

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Unit 3 Summative: Teacher made tests
Unit 3 Performance Tasks :

- **Performance based assessment:** Growing More and better Corn Page 404 Pearson Textbook;
- DNA Extraction Virtual Lab, Virtual Lab – Gene Splicing; Pedigree lab

Unit 3 Performance Task Scoring: Rubric

Unit 4: Evolution
Time Frame: 40-45 Days

Essential Questions

- What evidence do we have that organisms have undergone change throughout the Earth's history?
- How do scientists account for the variety of organisms that have lived on Earth over time, and how they have changed?
- How does natural selection encourage intra- and inter-specific diversity over time?

Standards

Standards / CPIs (cumulative Progress Indicators) taught and assessed:
PERFORMANCE EXPECTATIONS
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 (3) competition, and (4) 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 adaptations of populations.

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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, (3) the extinction of other species and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

HS-ESS-2-7 Construct an argument based on evidence about the simultaneous coevolution of the Earth's systems and life on Earth.

DISCIPLINARY CORE IDEAS

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)

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- 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.

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 - 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**.**

SCIENCE and ENGINEERING PRACTICES

Developing and Using Models

- Use mathematical representations of phenomena to describe explanations

Planning and Carrying Out Investigations

- 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-PS2-5)

Using Mathematics and Computational Thinking.

- Use mathematical representations of phenomena to describe explanations. (HS-PS2-4)

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Theories and laws provide explanations in science. (HS-PS2-4)
- Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-4)

CROSS CUTTING 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)

Cause and Effect

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- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS42),(HS-LS4-4),(HS-LS4-5),(HS-LS4-6)

CONNECTIONS TO MATH

- **MP.2** Reason abstractly and quantitatively. (HS-PS4-1).
- **MP.4** Model with mathematics. (HS-PS4-1).

CONNECTIONS TO ELA

- **RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS - LS4 - 1), (HS-LS4-2), (HS - LS4 - 3), (HS-LS4-4)**
- **RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS4-5)**
- **WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS - LS4 - 1), (HS-LS42) ,(HS - LS4 - 3), (HS-LS4-4)**
- **WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience . (HS - LS4 - 6)**
- **WHST.9-12.7 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.(HS-LS4-6)**
- **WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS - LS4 - 1), (HS-LS4-2), (HS - LS4 - 3) , (HS-LS4-4),(HS-LS4-5)**
- **SL.11-12.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. . (HS - LS4 - 1), (HS-LS4-2)**

TECHNOLOGY:

8.1.2.A.2 Create a document using a word processing application.
8.1.2.A.4 Demonstrate developmentally appropriate navigation skills in virtual environments (i.e. games, museums)
8.2.2.C.4 Identify designed products and brainstorm how to improve one used in the classroom.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.
8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.

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8.2.2.D.2 Discover how a product works by taking it apart, sketching how parts fit, and putting it back together.
8.2.2.D.3 Identify the strengths and weaknesses in a product or system.

HIGHLIGHTED CAREER READY PRACTICES:

- **CRP2.** Apply appropriate academic and technical skills.
- **CRP4.** Communicate clearly and effectively and with reason.
- **CRP5.** Consider the environmental, social and economic impacts of decisions.
- **CRP6.** Demonstrate creativity and innovation.
- **CRP7.** Employ valid and reliable research strategies.
- **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP9.** Model integrity, ethical leadership and effective management. .
- **CRP11**. Use technology to enhance productivity.

SEL PRACTICES & COMPETENCIES:

- Self-Management
- Social Awareness
- Responsible Decision-Making
- Relationship Skills

Overall Goal (What is the big idea?)

- · Evidence of change over time includes the fossil record, structural and biochemical similarities between species.
- Changes in the environment have altered the conditions faced by organisms over time. As evidenced by the fossil record, many species have gone extinct, while others have either remained relatively unchanged or have evolved into new species that are better suited to survive in a changed environment.
- The diversity and changing of life forms over many generations is the result of natural selection, in which organisms with advantageous traits survive, reproduce and pass those traits to offspring.

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Pre-Assessment: Unit 4 Teacher made Pretest and tests

(SLO) Student Learning Objectives (with standards)	**Student Learning Strategies**	**Formative Assessment ***suggested but not limited to the following***	**Activities ***suggested but not limited to the following***	**Modifications & Reflections ***suggested but not limited to the following***
HS-LS4-1. HS-LS4.A **HS-ESS-2-7** **WALT: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (**HS-LS4-1) a) Analyze the pattern Darwin observed among organisms of the Galapagos Islands by investigating and simulating their various adaptations. b) Explain the development of the modern day theory of evolution by examining the	Essential Interactive Vocabulary: -Cornell Notetaking in journals Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) model. Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding I do, We do, U do	Lesson Review questions & study guide. Home work **Case study**: Page Pearson TextBook ***UNIT PRETEST*** ***TEST – EVOLUTION*** **Tests (Chapter17)** ***TEST -*** **Projects/Lab/ Simulation/ Project** **Performance based assessment:**	NJSLS MP.2, MP.4, SL.11-12.4 HSA-SSE.A.1, RST.11-12.1, RST.11-12.8;, WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.9-12.9 WHST.9-12 .1; *Bird Selection Lab* Natural selection Hand adaptations http://www.biologyjunction.com/human_hand_adaptations.htm The History of the Theory of Evolution: Charles Darwin: Evolution in Action article	**RTI/Extra Support:** Ask students to find more pictures of extinct organisms on the internet or in books. Have them draw a picture that predicts what are their present day relative. Then show it by demonstration. Help them to play games using simulations to master the concept. **Extension:** Group students into groups of three. Assign each student one of the following topics: related to case studies: the Pearson Text book to learn about career or to understand how things work

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scientific investigations that led to it. c) Analyze the theory that Earth's present day species evolved from earlier, distinctly different species by providing a scientific explanation for the history of life on earth using scientific evidence (I.e., fossil record, DNA, protein, structures, etc.,).	KWL chart Cooperative learning	Project and Lab reports Quizzes chapters Chapter tests for Pearson chapter 17	http://www.biologyjunction.com/Catching%20Evolution%20in%20Action.pdf Case Study: How can antibiotics keep up with the drug – resistant bacteria, Make your case, page 600 of the Pearson Textbook ***TEST – EVOLUTION***	**Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions. **At Risk Students** 1. Less complex reading level 2. Shortened assignments 3. Different goals 4. Extra time Fewer problems on each page

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				• More time • Test administered in a quieter setting • Tests read orally • Chunking of assignments or assessments into smaller segments • Taping of lectures or providing a peer note-taker • Modifications for summative and formative assessments as per IEP **Advanced Students:** • Alternative assignments with higher rigor • Independent studies **Mentoring of other students** Videos for Audio-Visual Learners:
HS-LS4-2 HS-LS4-3 HS-LS4-4 LS4.B LS4.C **WALT: 1-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**	Essential Interactive Vocabulary: -Cornell Notetaking in journals Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) model. Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding I do, We do, U do	Lesson Review questions & study guide. Home work ***TEST – EVOLUTION*** **Tests (Chapter 18)** **Projects/Lab/ Simulation/ Project** **Performance based assessment:** Project and Lab reports Quizzes chapter 18 Chapter 1 8 tests for Pearson Textbook	NJSLS MP.2, MP.4, SL.11-12.4 HSA-SSE.A.1, RST.11-12.1, RST.11-12.8;, WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.9-12.9 WHST.9-12 .1; Evolution by Natural Selection http://serendip.brynmawr.edu/sci_edu/waldron/#organic Ecosystems and Speciation LMA p. 249-254 How Evolution Works: http://www.teachersdomain.org/resource/tdc02.s	

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in the environment. HS-LS4-2 **WALT: 2-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-LS4-3 **WALT: 3-Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-4** a) Explain how variation and mutations within a population can drive evolutionary change. b) Describe how populations change over time c) Describe how separation of	KWL chart Cooperative learning		ci.life.evo.lp_howevowork/ Amino Acid Sequences: Indicators of Evolution LMA p. 95-100, SE p. 474 Allele Frequency SE p. 491 Natural Selection of Butterflies: Competing for Resources LMA p. 101-106, SE p. 502 How New Species Form: http://www.teachersdomain.org/resource/tdc02.sci.life.evo.lp_newspecies/ Molecular Evidence for Evolutionary Relationships: Virtual Lab – Dinosaur Dig	**Evolution and the tree of life** **History of life on Earth**

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populations can lead to speciation d) . Explain how variation and mutations within a population can drive evolutionary change. e) Describe how populations change over time f) Describe how separation of populations can lead to speciation.				
HS-LS4-5 LS4.B LS4.C **WALT: 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-LS4-5:**	Essential Interactive Vocabulary: -Cornell Notetaking in journals Evidence Notebook **-Instructional Strategies:** -Apply 5E or Connect, Investigate, Synthesize, Demonstrate (CISD) model.	Lesson Review questions & study guide. Home work **Case study**: It is a duck, no it is a beaver, no it is a Platypus! Make your case Page 634 Pearson text book ***UNIT PRETEST***	NJSLS MP.2, MP.4, SL.11-12.4 HSA-SSE.A.1, RST.11-12.1, RST.11-12.8;, WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.9-12.9 WHST.9-12 .1; Using index Fossils LMA p. 115-123 Investigating Hominoid Fossils	

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a) Describe how scientists believe that biochemically important molecules developed over time b) Identify evidence for the age of the earth and give examples of events used to define each era. c) Summarize the process by which scientists believe that life first developed on Earth. d) Compare early systems of classification, which grouped organisms by visible characteristics, to modern systems of classification, which group organisms by similarities at the molecular level, by classifying various organisms according	Problem Base Learning: Lab, Simulation Lab -Direct instruction, PowerPoint Presentations. -Scaffolding I do, We do, U do KWL chart Cooperative learning	***TEST – EVOLUTION*** **Tests (Chapters 18 to 20)** **Projects/Lab/ Simulation/ Project** **Performance based assessment** Build a Cladogram, Construct a model Page 634 Pearson text book Project and Lab reports Quizzes chapters Chapter tests for Pearson chapter 19 &20 *Science Fair Project* ***UNIT POSTTEST*** **FINAL EXAMINATION**	LMA p. 157-162 *Geologic Time Scale Comparison* Dichotomous Keys Making Cladograms: **Performance based assessment** **Build a Cladogram, Construct a model Page 634 Pearson text book** **Case study: It is a duck, no it is a beaver, no it is a Platypus! Make your case Page 634 Pearson text book** Virtual Lab – Classifying Using Biotechnology Virtual Lab – Classifying Arthropods Invertebrate Diversity	

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to each type of system. e) Differentiate between Eubacteria, Archea, Protista, Fungi, Plantae and Animalia by creating and discussing comparison tables.			http://serendip.brynmawr.edu/sci_edu/waldron/#organic ***TEST – HISTORY OF LIFE*** *Domains Comparison Table* ***TEST - CLASSIFICATION***	

21st Century Theme Targeted – Global Awareness: Using 21st century skills to understand and address global issues					
21st Century Skills Targeted					
Creativity & Innovation	**Information Literacy**	**Media Literacy**	**Critical Thinking & Problem Solving**	**Communication & Collaboration**	**Life & Careers**
Unit Project: Performance based assessment: Build a Cladogram, Construct a model Page	The History of the Theory of Evolution: Charles Darwin: Case Study: How can antibiotics keep up with the drug – resistant bacteria, Make your case, page	Natural Selection of Butterflies:	**Unit Performance Task –** Virtual Lab – Classifying Using Biotechnology Virtual Lab – Classifying Arthropods Virtual Lab – Dinosaur Dig	**Skill Practice Lab** *Bird Selection Lab* Natural selection	**Case study: It is a duck, no it is a beaver, no it is a Platypus! Make your case**

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634 Pearson text book	600 of the Pearson Textbook				**Page 634 Pearson text book**

Summative Assessments:
Unit 4 Summative Teacher made tests
Unit4 Performance Tasks - Build a Cladogram, Construct a model**;** *Bird Selection Lab* Natural selection*;* Virtual Lab – Classifying Using Biotechnology; Classifying Arthropods; Virtual Lab – Dinosaur Dig

Unit 4 Performance Task Scoring: Rubric
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