Grade, Subject/Course: 8th Grade Life Science	
Unit: Nature of Science	**__X___ Essential _____ Important _____ Compact**
Big Idea: Science involves making observations, forming hypotheses, conducting experiments, analyzing data, and drawing conclusions. It is a systematic and evidence-based approach to understanding the natural world.	
PA Core Content Standards/Anchors (or National Standards): CC.3.5.6-8.D: 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 6-8 texts and topics. PA Core Standard: ELA CC.3.6.6-8.B: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. PA Core Standard: ELA CC.2.2.6.B.3: Represent and analyze qualitative relationships between dependent and independent variables. PA Core Standard: Math CC.3.5.6-8.G: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**Interdisciplinary Standards (if applicable):**
Essential Questions: 1. How can root words be used to better understand scientific terminology? 2. What methods are used to conduct a controlled scientific investigation? 3. What is the difference between qualitative and quantitative data?	**Understandings (CCCs - Cross-cutting Concepts [themes]):** ● Students will know that science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.

Knowledge (DCIs - Disciplinary Core Ideas [what they will know]):	**Do/Skills (SEPs - Science and Engineering Practices [what they do]):**
Students will know that larger scientific words are often composed of smaller root words. Students will know that the meaning of a large word can often be deduced by understanding the root words. Students will know following intentional steps and isolating variables can help answer questions about how nature works. The scientific method can look different and is not used to answer all questions. Students will know the difference between qualitative and quantitative data.	**Planning and Carrying Out Investigations** Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. **Scientific Knowledge Is Based on Empirical Evidence** • Science knowledge is based upon logical and conceptual connections between evidence and explanations. • Science disciplines share common rules of obtaining and evaluating empirical evidence. **Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) 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 (uniformitarianism). • Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.
Vocabulary: 1. scientific method 2. constant 3. control group 4. experimental group 5. independent variable 6. dependent variable 7. hypothesis 8. qualitative data 9. quantitative data 10. observation 11. inference 12. a 13. auto 14. aqua 15. anti 16. bi 17. bio 18. cardio 19. chloro 20. chrom	**Core Resources:** Unit notes slideshows, unit notes, lab equipment and supplies

21. cyto 22. derm 23. endo 24. exo 25. gen 26. glu 27. hetero 28. homo 29. itis 30. macro 31. mater 32. meter 33. micro 34. multi 35. mut 36. ology 37. ovi 38. pater 39. photo 40. pseudo 41. stasis 42. terra 43. therm 44. troph 45. uni 46. zoo	
Common Assessment(s): Unit quizzes, lab activities	**Supplemental Resources:** Gizmos, Gimkit, Quizlet, Quizizz, Edpuzzle, Science World, NewsELA

Grade, Subject/Course: 8th Grade Life Science	
Unit: Cells	**___X__ Essential _____ Important _____ Compact**
Big Idea: Organisms have characteristic structures that enable functions and behaviors that allow them to grow, reproduce, and die. The structures, functions, and behaviors of organisms allow them to obtain, use, transport, and remove the matter and energy needed to live. The structures, functions, and behaviors of organisms allow them to obtain, use, transport, and remove the matter and energy needed to live. Animals have external and internal sensory receptors that detect different kinds of information that then gets processed by the brain.	
PA Core Content Standards/Anchors (or National Standards): 3.1.6-8.A - Conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells. 3.1.6-8.B - Develop and use a model to describe the function of a cell as a whole and the ways that parts of cells contribute to the function. 3.1.6-8.C - Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. 3.1.6-8.F - Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. 3.1.6-8.G - Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	**Interdisciplinary Standards (if applicable):**

3.1.6-8.H - Gather and synthesize information about how sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	
Essential Questions: How do the structures of organisms enable life's functions? How do organisms obtain and use the matter and energy they need to live and grow? How do organisms detect, process, and use information about the environment?	**Understandings (CCCs - Cross-cutting Concepts [themes]):** Students will know that… **Energy and Matter** ● Within a natural system, the transfer of energy drives the motion and/or cycling of matter. ● Matter is conserved because atoms are conserved in physical and chemical processes. **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems. **Scale, Proportion, and Quantity** Phenomena that can be observed at one scale may not be observable at another scale. **Structure and Function** Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. **Systems and System Models** Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
Knowledge (DCIs - Disciplinary Core Ideas [what they will know]): All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.	**Do/Skills (SEPs - Science and Engineering Practices [what they do]):** Students will be able to… **Planning and Carrying Out Investigations** Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. **Developing and Using Models** Develop and use a model to describe phenomena. **Engaging in Argument from Evidence** Use a written argument supported by evidence to support or refute an explanation or a model for a phenomenon.

Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. The chemical reaction by which plants produce complex food molecules (sugars) requires energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. Cellular respiration in plants and animals involve chemical reactions with oxygen that releases stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.	
Vocabulary: 1. cell 2. cell theory 3. tissue 4. organ 5. organ system 6. unicellular organism 7. multicellular organism 8. organelle 9. nucleus	**Core Resources:** Unit notes slideshows, unit notes, lab equipment and supplies

10. cell membrane 11. cell wall 12. mitochondria 13. chloroplast 14. chlorophyll 15. vacuole 16. cytoplasm 17. permeable 18. diffusion 19. osmosis 20. energy 21. photosynthesis 22. cellular respiration	
Common Assessment(s): Unit quizzes, lab activities	**Supplemental Resources:** Gizmos, Gimkit, Quizlet, Quizizz, Edpuzzle, Science World, NewsELA

Grade, Subject/Course: 8th Grade Life Science	
Unit: Genetics	**___X__ Essential _____ Important _____ Compact**
Big Idea: Offspring resemble, but are not identical to, their parents due to traits being passed from one generation to the next via genes. Variation among individuals of the same species can be explained by both genetic and environmental factors. The characteristic structures, functions, and behaviors of organisms change in predictable ways as they progress from birth to old age (through the life cycle).	

PA Core Content Standards/Anchors (or National Standards):	**Interdisciplinary Standards (if applicable):**
3.1.6-8.E - Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. 3.1.6-8.M - Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. 3.1.6-8.N - Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	
Essential Questions: How are the characteristics of one generation related to the previous generation? Why do individuals of the same species vary in how they look, function, and behave? How do organisms grow and develop?	**Understandings (CCCs - Cross-cutting Concepts [themes]):** Students will know that… **Structure and Function** Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems. **Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. • Cause and effect relationships may be used to predict phenomena in natural systems.
Knowledge (DCIs - Disciplinary Core Ideas [what they will know]): Genetic factors as well as environmental conditions affect the growth of organisms. Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. Organisms reproduce, either sexually or asexually, and transfer	**Do/Skills (SEPs - Science and Engineering Practices [what they do]):** Students will be able to… **Developing and Using Models** Develop and use a model to describe phenomena. **Constructing Explanations and Designing Solutions** Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events.

their genetic information to their offspring. Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.	
Vocabulary: 1. inherited trait 2. acquired trait 3. heredity 4. genetics 5. DNA 6. gene 7. chromosome 8. cell cycle 9. mitosis 10. sexual reproduction 11. asexual reproduction 12. meiosis 13. gamete 14. fertilization 15. zygote 16. sex chromosome 17. allele 18. dominant trait 19. recessive trait 20. genotype 21. phenotype 22. heterozygous 23. homozygous 24. Punnett square 25. pedigree 26. artificial selection	**Core Resources:** Unit notes slideshows, unit notes, lab equipment and supplies

Common Assessment(s):	**Supplemental Resources:**
Unit quizzes, lab activities	Gizmos, Gimkit, Quizlet, Quizizz, Edpuzzle, Science World, NewsELA

Grade, Subject/Course: 8th Grade Life Science	
Unit: Natural Selection	**__X___ Essential _____ Important _____ Compact**
Big Idea: The characteristic structures, functions, and behaviors of organisms change in predictable ways as they progress from birth to old age (through the life cycle). Comparisons between species provides evidence that species evolved from common ancestors which explains the similarities and differences between species. In any environment individuals with particular traits may be more likely than others to survive and produce offspring. When the environment changes, some individuals in a population may have traits that provide a reproductive advantage which over many generations can change the make-up of a population. Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.	

PA Core Content Standards/Anchors (or National Standards): 3.1.6-8.D - Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. 3.1.6-8.O - Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. 3.1.6-8.P - Apply scientific ideas to construct an explanation for anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. 3.1.6-8.Q - Analyze displays of pictorial data to compare patterns of similarities in anatomical structures across multiple species to identify relationships not evident in the fully formed anatomy. 3.1.6-8.R - Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. 3.1.6-8.S - Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. 3.1.6-8.T - Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	**Interdisciplinary Standards (if applicable):**

Essential Questions:	**Understandings (CCCs - Cross-cutting Concepts [themes]):**
How do organisms grow and develop? What evidence supports that different species are related? How does genetic variation among organisms affect survival and reproduction? How does the environment influence populations of organisms over multiple generations?	Students will know that… **Patterns** Graphs, charts, and images can be used to identify patterns in data. **Patterns** Patterns can be used to identify cause and effect relationships. **Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
Knowledge (DCIs - Disciplinary Core Ideas [what they will know]): The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring. Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	**Do/Skills (SEPs - Science and Engineering Practices [what they do]):** Students will be able to… **Engaging in Argument from Evidence** Use a written argument supported by evidence to support or refute an explanation or a model for a phenomenon. **Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings. **Analyzing and Interpreting Data** Analyze displays of data to identify linear and nonlinear relationships. (Ex: relatives vs. descendents) **Constructing Explanations and Designing Solutions** Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. **Obtaining, Evaluating, and Communicating Information** Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. **Using Mathematics and Computational Thinking** Use mathematical representations to support scientific conclusions and design solutions.

In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.	
Vocabulary: 1. adaptation 2. camouflage 3. mimicry 4. natural selection 5. mutation 6. evolution 7. microevolution 8. macroevolution 9. common ancestor 10. related 11. descended 12. fossil 13. fossil record 14. absolute dating 15. relative dating 16. anatomy 17. vestigial structure 18. embryo 19. homologous structure **Taxonomy:** 1. taxonomy	**Core Resources:** Unit notes slideshows, unit notes, lab equipment and supplies

2. scientific name 3. species 4. taxonomic key 5. anterior 6. posterior 7. dorsal 8. ventral	
Common Assessment(s): Unit quizzes, lab activities	**Supplemental Resources:** Gizmos, Gimkit, Quizlet, Quizizz, Edpuzzle, Science World, NewsELA

Grade, Subject/Course: 8th Grade Life Science	
Unit: Ecology	**__X___ Essential _____ Important _____ Compact**
Big Idea: Ecosystems are complex systems that include both living (biotic) and non-living (abiotic) components that interact with each other. The cycling of matter and the flow of energy within ecosystems occur through interactions among different organisms and between organisms and the physical environment. As the environment and populations of species change, there are resulting changes in ecosystems. Humans depend on biodiversity, the variety of species and ecosystems, for resources. Human actions can impact the diversity of species.	

Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary)	
PA Core Content Standards/Anchors (or National Standards): 3.1.6-8.I - Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. 3.1.6-8.J - Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. 3.1.6-8.K - Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. 3.1.6-8.L - Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. 3.1.6-8.U - Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	**Interdisciplinary Standards (if applicable):**
Essential Questions: How do organisms interact with the living and nonliving environments to obtain matter and energy? How do matter and energy move through an ecosystem? How does a change in environment impact ecosystems? How do humans affect biodiversity, and how does it affect humans?	**Understandings (CCCs - Cross-cutting Concepts [themes]):** Students will know that… **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Patterns** Patterns can be used to identify cause and effect relationships. **Energy and Matter** The transfer of energy can be tracked as energy flows through a natural system. **Stability and Change** Small changes in one part of a system might cause large changes in another part.

Knowledge (DCIs - Disciplinary Core Ideas [what they will know]): Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Growth of organisms and population increases are limited by access to resources. Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	**Do/Skills (SEPs - Science and Engineering Practices [what they do]):** Students will be able to… **Analyzing and Interpreting Data** Analyze and interpret data to provide evidence for phenomena. **Constructing Explanations and Designing Solutions** Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. **Developing and Using Models** Develop a model to describe phenomena. **Engaging in Argument from Evidence** Construct a written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Changes in biodiversity can influence humans/ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on - for example, water purification and recycling.	
Vocabulary: 1. ecology 2. population 3. community 4. ecosystem 5. biome 6. biosphere 7. biotic 8. abiotic 9. biodiversity 10. niche 11. autotroph 12. heterotroph 13. trophic level 14. food web 15. biomass 16. energy pyramid 17. carrying capacity 18. limiting factor 19. keystone species 20. invasive species 21. symbiosis 22. mutualism 23. commensalism 24. parasitism	**Core Resources:** Unit notes slideshows, unit notes, lab equipment and supplies

Common Assessment(s):	**Supplemental Resources:**
Unit quizzes, lab activities	Gizmos, Gimkit, Quizlet, Quizizz, Edpuzzle, Science World, NewsELA