

Life Science Overview

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Life Science		
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).		
	K-2	3-4
1. CLASSIFICATION	<p>S:LS1:2:1.1 Differentiate between living and nonliving things; and categorize objects in each group using the significant observable characteristics they share, such as color, shape and size.</p> <p>S:LS1:2:1.2 Recognize plants and animals as living things and describe how they are alike and different.</p>	<p>S:LS1:4:1.1 Recognize and identify the various ways in which living things can be grouped.</p> <div style="border: 1px solid black; padding: 5px;"> <p>S:LS1:4:1.2 Sort/classify different living things using similar and different characteristics; and describe why organisms belong to each group or cite evidence about how they are alike or not alike. [LS1(K-4)INQ+POC-1]</p> </div>
2. LIVING THINGS AND ORGANIZATION	<p>S:LS1:2:2.1 Recognize that plants and animals have features that help them survive in different environments.</p>	<p>S:LS1:4:2.1 Recognize that living organisms have certain structures and systems that perform specific functions, facilitating survival, growth and reproduction.</p> <p>S:LS1:4:2.2 Identify and describe the function of the plant structures responsible for food production, water transport, support, reproduction, growth and protection.</p> <div style="border: 1px solid black; padding: 5px;"> <p>S:LS1:4:2.3 Identify and explain how the physical structures of an organism (plants or animals) allow it to survive in its habitat/environment (e.g., roots for water; nose to smell fire). [LS1(K-4)FAF-4]</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS1:4:2.4 Identify the basic needs of plants and animals in order to stay alive (i.e., water, air, food, space). [LS1(K-4)SAE-2]</p> </div>

Life Science		
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).		
	K-2	3-4
3. REPRODUCTION	<p>S:LS1:2:3.1 Recognize that parents and offspring of many species closely resemble one another; and describe the similarities in appearance of given plant and animal families.</p> <p>S:LS1:2:3.2 Recognize that living things have a life cycle, during which they are born, grow, and die.</p>	<p>S:LS1:4:3.1 Distinguish between plant and animal characteristics that are inherited, such as eye color in humans and the shape of leaves in plants, and those that are affected by their environment, such as grass turning brown due to lack of water.</p> <p>S:LS1:4:3.2 Recognize that living organisms have life cycles, which include birth, growth and development, reproduction, and death; and explain how these life cycles vary for different organisms.</p> <p>S:LS1:4:3.3 Describe the reproductive process of plants, explaining some plants grow from seed, while others grow from the parts of other plants.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS1:4-3.4 Predict, sequence, or compare the life stages of organisms (plants and animals): e.g., put images of life stages of an organism in order, predict the next stage in sequence, and compare two organisms. [LS1(K-4)POC-3]</p> </div>

Life Science		
LS2– Energy flows and matter recycles through an ecosystem.		
	K-2	3-4
1. ENVIRONMENT	<p>S:LS2:2:1.1 Recognize that living things can be found almost anyplace in the world; and that specific types of environments are required to support the many different species of plant and animal life.</p> <p>S:LS2:2:1.2 Recognize that animals, including humans, interact with their surroundings using their senses; and that different senses provide different kinds of information.</p> <p>S:LS2:2:1.3 Recognize that some plants and animals go through changes in appearance when the seasons change.</p>	<p>S:LS2:4:1.1 Describe how the nature of an organism’s environment, such as the availability of a food source, the quantity and variety of other species present, and the physical characteristics of the environment affect the organism’s patterns of behavior.</p> <p>S:LS2:4:1.2 Describe the interaction of living organisms with nonliving things.</p>
2. FLOW OF ENERGY	<p>S:LS2:2:2.1 Identify the resources plants and animals need for growth and energy, and describe how their habitat provides these basic needs.</p>	<p>S:LS2:4:2.1 Recognize that the transfer of energy through food is necessary for all living organisms and describe the organization of food webs.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:4:2.2 Recognize that energy is needed for all organisms to stay alive and grow or identify where a plant or animal gets its energy. [LS2(K-4)SAE-5]</p> </div>
3. RECYCLING OF MATERIALS	<p><i>Districts may choose to work on End of Grade 8 expectations in the 5-8 grade span.</i></p>	<p>S:LS2:4:3.1 Recognize that plants and animals interact with one another in various ways besides providing food, such as seed dispersal or pollination.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:4:3.2 Describe ways plants and animals depend on each other (e.g., shelter, nesting, food). [LS2(K-4)SAE-6]</p> </div>

Life Science		
LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).		
	K-2	3-4
1. CHANGE	S:LS3:2:1.1 Recognize that some living things, which lived on Earth long ago, are now extinct, such as dinosaurs, mammoths, giant tree ferns, and horsetail trees.	<p>S:LS3:4:1.1 Provide examples of how environmental changes can cause different effects on different organisms.</p> <p>S:LS3:4:1.2 Provide examples of how an organism’s inherited characteristics can adapt and change over time in response to changes in the environment.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS3:4:1.3 Using information (data or scenario), explain how changes in the environment can cause organisms to respond (e.g., survive there and reproduce, move away, die). [LS3(K-4)SAE-7]</p> </div>
2. EVIDENCE OF EVOLUTION	S:LS3:2:2.1 Recognize that some plants and animals, which are alive today, are similar to living things which have become extinct, such as elephants and mammoths.	S:LS3:4:2.1 Compare information about fossils to living organisms and other fossils to determine any similarities and differences.
3. NATURAL SELECTION	<p>S:LS3:2:3.1 Recognize and describe the similarities and differences in both behavior and appearance of plants and animals.</p> <p>S:LS3:2:3.2 Recognize that there are different species of living things in various places around the world.</p>	<p>S:LS3:4:3.1 Recognize that individuals of the same species differ in their characteristics; and explain that sometimes these differences give individuals an advantage in survival and reproduction.</p> <p>S:LS3:4:3.2 Recognize that for any particular environment, some kinds of animals and plants survive well, some less well, and some cannot survive at all.</p>

Life Science		
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.		
	K-2	3-4
1. BEHAVIOR	<p>S:LS4:2:1.1 Recognize and describe how living things respond when exposed to helpful and harmful situations.</p> <p>S:LS4:2:1.2 Recognize that humans learn from each other in many different ways, such as listening and speaking, watching and imitating.</p> <p>S:LS4:2:1.3 Recognize that humans can gather different kinds of information about an object by adjusting their proximity to it.</p> <p>S:LS4:2:1.4 Recognize that some of the things humans can do, such as playing games, reading, and writing, must be learned.</p>	<p>S:LS4:4:1.1 Recognize that an individual organism’s behavior is affected by internal cues, such as hunger and thirst; and describe how an organism uses its senses to understand and respond to these cues.</p> <p>S:LS4:4:1.2 Recognize that an individual organism’s behavior is influenced by external cues, such as seasonal change; and describe how an organism might react, such as migrating or hibernating.</p> <p>S:LS4:4:1.3 Recognize behaviors that may be unsafe or unhealthy for themselves and others.</p>
2. DISEASE	<p>S:LS4:2:2.1 Recognize that proper nutrition, exercise and rest are all important factors in maintaining good health.</p> <p>S:LS4:2:2.2 Recognize that humans can spread germs that cause disease.</p> <p>S:LS4:2:2.3 Identify and describe the basic personal hygiene habits for maintaining good health, such as washing one’s hands with soap and water and brushing one’s teeth.</p> <p>S:LS4:2:2.4 Recognize symptoms, such as fever, rashes, coughing and congestion for common illnesses.</p>	<p>S:LS4:4:2.1 Explain how the amount of rest and the types of food, exercise and recreation humans choose can influence and affect their well-being.</p> <p>S:LS4:4:2.2 Recognize that vitamins and minerals are needed in small amounts and are essential to maintain proper health.</p> <p>S:LS4:4:2.3 Explain how proper food preparation and appropriate food handling practices can maintain the safety and quality of food.</p>

Life Science		
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.		
	K-2	3-4
3. HUMAN IDENTITY	<p>S:LS4:2:3.1 Recognize similarities and individual differences among people, and that children closely resemble their parents.</p> <p>S:LS4:2:3.2 Identify the sense organs, including eyes, ears, nose mouth, and skin; and describe how each can warn an individual about danger.</p> <p>S:LS4:2:3.3 Recognize that two parents, both a father and mother, are required for human reproduction.</p> <p>S:LS4:2:3.4 Recognize and describe the human life cycle from birth to old age.</p> <p>S:LS4:2:3.5 Recognize that humans need food, water, air, waste removal and a particular range of temperatures in their environment, just as other animals do.</p>	<div style="border: 2px solid black; padding: 5px; margin-bottom: 10px;"> <p>S:LS4:4:3.1 Identify what the physical structures of humans do (e.g., sense organs– eyes, ears, skin, etc.) or compare physical structures of humans to similar structures of animals. [LS4(K-4)FAF-8]</p> </div> <div style="border: 2px solid black; padding: 5px; margin-bottom: 10px;"> <p>S:LS4:4:3.2 Distinguish between characteristics of humans that are inherited from parents (i.e., hair color, height, skin color, eye color) and others that are learned (e.g., riding a bike, singing a song, playing a game, reading). [LS4(K-4)POC-9]</p> </div> <p>S:LS4:4:3.3 Recognize the nutritional value of different foods and distinguish between healthy and unhealthy food choices using data gathered from food labels and dietary guidelines, such as the food pyramid.</p>

Life Science		
LS5– The growth of scientific knowledge in Life Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.		
	K-2	3-4
1. DESIGN TECHNOLOGY	S:LS5:2:1.1 Recognize that new products can be made out of natural materials, such as paper from trees and cloth from various plants and animals.	S:LS5:4:1.1 Recognize that man uses various mechanical devices to record and describe living organisms.
2. TOOLS	S:LS5:2:2.1 Recognize that some tools, such as magnifiers, balances and thermometers, have special uses and can help gather information and extend the senses.	S:LS5:4:2.1 Demonstrate the use of appropriate tools and simple equipment, such as thermometers, magnifiers and microscopes to gather data and extend the senses. S:LS5:4:2.2 Identify and describe the purpose of tools used by health care professionals, such as X-rays and stethoscopes.
3. SOCIAL ISSUES (LOCAL AND GLOBAL) MEDICAL TECHNOLOGY BIOTECHNOLOGY	S:LS5:2:3.1 Recognize that technology is used in medicine to prevent and cure diseases through vaccinations and medications. S:LS5:2:3.2 Provide examples from personal experience that illustrate how medicine helps humans recover from illness.	S:LS5:4:3.1 Recognize that medical technology provides information about a body’s condition, such as determining blood pressure, and recognizing the need to repair, replace and support the affected body parts. S:LS5:4:3.2 Recognize that biotechnology refers to the different ways humans modify the living environment to meet their needs, including growing food, genetic engineering and using living organisms such as yeast to prepare foods.
4. CAREER TECHNICAL EDUCATION CONNECTIONS	S:LS5:2:4.1 Recognize that some jobs/careers require knowledge and use of life science content and/or skills.	S:LS5:4:4.1 Identify some jobs/careers that require knowledge and use of life science content and/or skills.

Life Science		
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).		
	5-6	7-8
1. CLASSIFICATION	<p>S:LS1:6:1.1 Identify ways in which living things can be grouped and organized, such as taxonomic groups of plants, animals and fungi.</p> <p>S:LS1:6:1.2 Categorize organisms into kingdoms that are currently recognized, according to shared characteristics.</p>	<p>S:LS1:8:1.1 Recognize that similarities among organisms are found in anatomical features and patterns of development; and explain how these can be used to infer the degree of relatedness among organisms.</p> <div style="border: 1px solid black; padding: 5px;"> <p>S:LS1:8:1.2 Describe or compare how different organisms have mechanisms that work in a coordinated way to obtain energy, grow, move, respond, provide defense, enable reproduction, or maintain internal balance (e.g., cells, tissues, organs and systems). [LS1(5-8)SAE+FAF-2]</p> </div>
2. LIVING THINGS AND ORGANIZATION	<p>S:LS1:6:2.1 Recognize that all living things are composed of cells, and explain that while many organisms are single celled, such as yeast, others, including humans, are multicellular.</p> <p>S:LS1:6:2.2 Explain that the way in which cells function is similar in all organisms.</p> <p>S:LS1:6:2.3 Recognize that cells use energy obtain from food, to conduct the functions necessary to sustain life, such as cell growth.</p> <p>S:LS1:6:2.4 Recognize and describe the hierarchical organization of living systems, including cells, tissues, organs, organ systems, whole organisms, and ecosystems.</p> <p>S:LS1:6:2.5 Explain that multicellular organisms have specialized cells, tissues, organs and organ systems that perform certain necessary functions, including digestion, respiration, reproduction, circulation, excretion, movement, control and coordination and protection from disease.</p> <p>S:LS1:6:2.6 Recognize that the human cells found in tissues and organs are similar to those of other animals, but somewhat different from cells found in plants.</p>	<p>S:LS1:8:2.1 Identify the functions of the human body's systems, including digestion, respiration, reproduction, circulation, excretion, movement, control and coordination and protection from disease; and describe how they interact with one another.</p> <p>S:LS1:8:2.2 Define a population and describe the factors that can affect it.</p> <p>S:LS1:8:2.3 Explain why it is beneficial for an organism to be able to regulate its internal environment while living in a constantly changing external environment.</p> <div style="border: 1px solid black; padding: 5px;"> <p>S:LS1:8:2.4 Explain relationships between or among the structure and function of the cells, tissues, organs, and organ systems in an organism. [LS1(5-8)FAF-4]</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p>S:LS1:8:2.5 Using data and observations about the biodiversity of an ecosystem, make predictions or draw conclusions about how the diversity contributes to the stability of the ecosystem. [LS1(5-8)INQ+SAE-1]</p> </div>

Life Science		
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).		
	5-6	7-8
3. REPRODUCTION	<p>S:LS1:6:3.1 Explain that cells repeatedly divide to make more cells for growth and repair.</p> <p>S:LS1:6:3.2 Explain that the same genetic information is copied in each cell of a new organism.</p> <p>S:LS1:6:3.3 Explain that all living things reproduce in order to continue their species.</p>	<p>S:LS1:8:3.1 Differentiate between asexual and sexual reproduction, and explain that in some kinds of organisms, all the genes come from one parent, while in organisms requiring two sexes to reproduce, typically half the genes come from each parent.</p> <p>S:LS1:8:3.2 Explain that a species of sexually reproducing organisms is comprised of all the organisms that can mate to produce fertile offspring.</p> <p>S:LS1:8:3.3 Explain that in sexual reproduction, a single specialized cell from a female merges with a specialized cell from a male in a process called fertilization.</p> <p>S:LS1:8:3.4 Explain that the fertilized egg cell, carrying genetic information from each parent, multiplies to form the complete organism.</p> <p>S:LS1:8:3.5 Explain how the basic tissues of an embryo form.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS1:8:3.6 Compare and contrast sexual reproduction with asexual reproduction. [LS1(5-8)POC-3]</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS1:8:3.7 Using data provided, select evidence that supports the concept that genetic information is passed on from both parents to offspring. [LS4(5-8)INQ+POC-11]</p> </div>

Life Science		
LS2– Energy flows and matter recycles through an ecosystem.		
	5-6	7-8
1. ENVIRONMENT	<p>S:LS2:6:1.1 Identify and describe the factors that influence the number and kinds of organisms an ecosystem can support, including the resources that are available, the differences in temperature, the composition of the soil, any disease, the threat of predators, and competition from other organisms.</p> <p>S:LS2:6:1.2 Explain that most microorganisms do not cause disease and that many are beneficial to the environment.</p>	<p>S:LS2:8:1.1 Explain how changes in environmental conditions can affect the survival of individual organisms and an entire species.</p> <p>S:LS2:8:1.2 Explain that in all environments, organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter, and that in any particular environment the growth and survival of organisms depend on the physical conditions.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:8:1.3 Using data and observations, predict outcomes when abiotic/biotic factors are changed in an ecosystem. [LS2(5-8)INQ+SAE-5]</p> </div>
2. FLOW OF ENERGY	<p>S:LS2:6:2.1 Describe how energy is transferred in an ecosystem through food webs; and explain the roles and relationships between producers, consumers and decomposers.</p> <p>S:LS2:6:2.2 Recognize that one of the most general distinctions among organisms is between plants, which use sunlight to make their own food, and animals, which consume energy-rich foods.</p> <p>S:LS2:6:2.3 Describe the process of photosynthesis and explain that plants can use the food they make immediately or store it for later use.</p> <p>S:LS2:6:2.4 Recognize that energy, in the form of heat, is usually a byproduct when one form of energy is converted to another, such as when living organisms transform stored energy to motion.</p>	<p>S:LS2:8:2.1 Explain how food provides energy and materials for growth and repair of body parts.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:8:2.2 Given a scenario, trace the flow of energy through an ecosystem, beginning with the sun, through organisms in the food web, and into the environment (includes photosynthesis and respiration). [LS2(5-8)SAE-6]</p> </div>

Life Science		
LS2– Energy flows and matter recycles through an ecosystem.		
	5-6	7-8
<p>3. RECYCLING OF MATERIALS</p>	<p>S:LS2:6:3.1 Define a population as all individuals of a species that exist together at a given place and time; and explain that all populations living together in a community, along with the physical factors with which they interact, compose an ecosystem.</p> <p>S:LS2:6:3.2 Using food webs, identify and describe the ways in which organisms interact and depend on one another in an ecosystem.</p> <p>S:LS2:6:3.3 Explain how insects and various other organisms depend on dead plant and animal matter for food; and describe how this process contributes to the system.</p>	<p>S:LS2:8:3.1 Identify autotrophs as producers who may use photosynthesis, and describe this as the basis of the food web.</p> <p>S:LS2:8:3.2 Explain the process of respiration and differentiate between it and photosynthesis.</p> <p>S:LS2:8:3.3 Know that all organisms, including humans, are part of, and depend on, two main interconnected global food webs: one which includes microscopic ocean plants, and the other which includes land plants.</p> <p>S:LS2:8:3.4 Describe how matter is recycled within ecosystems and explain that the total amount of matter remains the same, though its form and location change.</p> <p>S:LS2:8:3.5 Identify carbon, hydrogen, oxygen, nitrogen and phosphorus as common elements of living matter.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:8:3.6 Given an ecosystem, trace how matter cycles among and between organisms and the physical environment (includes water, oxygen, food web, decomposition and recycling, but not carbon cycle nor nitrogen cycle). [LS2(5-8)SAE-7]</p> </div>

Life Science		
LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).		
	5-6	7-8
1. CHANGE	<p>S:LS3:6:1.1 Provide examples of how all organisms, including humans, impact their environment; and explain how some changes can be detrimental to other organisms.</p> <p>S:LS3:6:1.2 Explain how changes in environmental conditions can affect the survival of individual organisms and the entire species.</p>	<p>S:LS3:8:1.1 Describe the type of impact certain environmental changes, including deforestation, invasive species, increased erosion, and pollution containing toxic substances, could have on local environments.</p>
2. EVIDENCE OF EVOLUTION	<p>S:LS3:6:2.1 Describe the fundamental concepts related to biological evolution, such as biological adaptations and the diversity of species.</p>	<p>S:LS3:8:2.1 Describe how the fossil record provides geologic evidence verifying the existence of now extinct life forms, and explains how this evidence provides documented proof of their appearance, diversification and extinction.</p> <p>S:LS3:8:2.2 Explain the concept of extinction and describes its importance in biological evolution.</p> <div style="border: 2px solid black; padding: 5px;"> <p>S:LS3:8:2.3 Use a model, classification system, or dichotomous key to illustrate, compare, or interpret possible relationships among groups of organisms (e.g., internal and external structures, anatomical features). [LS3(5-8)MAS+FAF-8]</p> </div>

Life Science		
LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).		
	5-6	7-8
3. NATURAL SELECTION	<p>S:LS3:6:3.1 Recognize that there are genetic variations among individuals in groups of organisms and provide examples of how these variations affect the survival of an organism.</p> <p>S:LS3:6:3.2 Recognize that only organisms that are able to reproduce can pass on their genetic information to the next generation.</p>	<p>S:LS3:8:3.1 Recognize that hereditary information is contained in genes, which are located in the chromosomes of each cell; and explain that inherited traits can be determined by either one or many genes, and that a single gene can influence more than one trait, such as eye and hair color.</p> <p>S:LS3:8:3.2 Recognize that in any given environment the growth and survival of organisms depend on the physical conditions that exist; and explain that in all environments, organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter.</p> <p>S:LS3:8:3.3 Explain how individual organisms with certain traits are more likely than others to survive and have offspring.</p> <p>S:LS3:8:3.4 Recognize that humans are able to control some characteristics of plants and animals through selective breeding; and explain how this results in small differences between the parents and offspring, which can accumulate in successive generations so that decedents are very different from their ancestors.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS3:8:3.5 Cite examples supporting the concept that certain traits of organisms may provide a survival advantage in a specific environment and therefore, an increased likelihood to produce offspring. [LS3(5-8)POC-9]</p> </div>

Life Science		
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.		
	5-6	7-8
1. BEHAVIOR	<p>S:LS4:6:1.1 Recognize that learning requires more than just storage and retrieval of information and that prior knowledge needs to be tapped in order to make sense out of new experiences or information.</p> <p>S:LS4:6:1.2 Explain that people can learn about others from direct experience, from the media, and from listening to others talk about their life and work.</p> <p>S:LS4:6:1.3 Provide examples of how humans make judgments about new situations based on memories of past experiences.</p>	<p>S:LS4:8:1.1 Recognize that unlike human beings, behavior in insects and many other species is determined almost entirely by biological inheritance.</p> <p>S:LS4:8:1.2 Explain that organism’s behavioral response is a reaction to internal or and environmental stimuli, and that these responses may be determined by heredity or from past experience.</p> <p>S:LS4:8:1.3 Explain how all behavior is affected by both inheritance and experience.</p>
2. DISEASE	<p>S:LS4:6:2.1 Explain that the human body has ways to defend itself against disease-causing organisms and describe how defenders, including tears, saliva, the skin, some blood cells and stomach secretions support the defense process.</p> <p>S:LS4:6:2.2 Recognize that there are some diseases that human beings can only get once; and explain how many diseases can be prevented by vaccination.</p> <p>S:LS4:6:2.3 Explain how vaccines induce the body to build immunity to a disease without actually causing the disease itself.</p> <p>S:LS4:6:2.4 Recognize a healthy body cannot fight all germs that invade it; and explain how some germs interfere with the body’s defenses.</p>	<p>S:LS4:8:2.1 Recognize that disease in organisms can be caused by intrinsic failures of the system or infection from other organisms.</p> <p>S:LS4:8:2.2 Describe how viruses, bacteria, fungi, and parasites may affect the human body and provide examples of how they can interfere with normal body function.</p> <p>S:LS4:8:2.3 Describe the function of white blood cells and explain how they support the body’s defense system.</p> <div style="border: 2px solid black; padding: 5px;"> <p>S:LS4:8:2.4 Use data and observations to support the concept that environmental or biological factors affect human body systems (biotic and abiotic). [LS4(5-8)INQ-10]</p> </div>

Life Science		
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.		
	5-6	7-8
3. HUMAN IDENTITY	S:LS4:6:3.1 Recognize that the length and quality of human life are influenced by many factors, including sanitation, diet, medical care, gender, genes, environmental conditions, and personal health behaviors.	<p>S:LS4:8:3.1 Compare patterns of human development with those of other vertebrates.</p> <p>S:LS4:8:3.2 Recognize that an organism can be described in terms of a combination of traits; and differentiate between inherited traits and those that result from interactions with the environment.</p> <div style="border: 2px solid black; padding: 5px; margin-bottom: 10px;"> <p>S:LS4:8:3.3 Describe the major changes that occur over time in human development from single cell through embryonic development to new born (i.e., group of cells during the first trimester, organs form during the second, organs mature during the third). [LS4(5-8)POC-12]</p> </div> <div style="border: 2px solid black; padding: 5px;"> <p>S:LS4:8:3.4 Using data provided, select evidence that supports the concept that genetic information is passed on from both parents to offspring. [LS4(5-8)INQ+POC-11]</p> </div>

Life Science		
LS5– The growth of scientific knowledge in Life Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.		
	5-6	7-8
1. DESIGN TECHNOLOGY	S:LS5:6:1.1 Recognize that an agricultural system is designed to maximize the use of all the elements in the system, including using plants for food, oxygen, for the filtration of air and water, and for making compost.	S:LS5:8:1.1 Explain how technology has influenced the course of history, and provide examples such as those that relate to agriculture, sanitation and medicine. S:LS5:8:1.2 Provide examples of ways technology is used to protect the environment, such as using bacteria to clean water.
2. TOOLS	S:LS5:6:2.1 Demonstrate the appropriate use of tools, such as thermometers, probes, microscopes and computers to gather, analyze and interpret data in the life sciences.	S:LS5:8:2.1 Recognize and provide examples of how technology has enhanced the study of life sciences, as in the development of advanced diagnosing equipment improving medicine.
3. SOCIAL ISSUES (LOCAL AND GLOBAL) MEDICAL TECHNOLOGY BIOTECHNOLOGY	S:LS5:6:3.1 Provide examples of early health care technology that helped to extend the life expectancy of humans, such as the discovery of penicillin and sterilization of surgical instruments. S:LS5:6:3.2 Differentiate between vaccines, which help prevent diseases from developing and spreading, and medicines, which relieve symptoms or cure diseases. S:LS5:6:3.3 Recognize that the quality of personal health can be influenced by society and technology. S:LS5:6:3.4 Identify and describe some of the processes and systems used to grow food in New Hampshire, including irrigation, pest control and harvesting.	S:LS5:8:3.1 Explain the necessity of and purpose for the proper disposal of medical products. S:LS5:8:3.2 Give examples of how increased understanding of biology has led to improvements in biotechnology, such as scientific methods for increasing the yield or the pest-resistance of important food crops. S:LS5:8:3.3 Describes ways biotechnology helps humans, including improved health and medicine.
4. CAREER TECHNICAL EDUCATION CONNECTIONS	S:LS5:6:4.1 Understand that some form of science is used in most jobs/careers and that some jobs/careers specifically require knowledge of life science.	S:LS5:8:4.1 Understand that some scientific jobs/careers involve the application of life science content knowledge and experience in specific ways that meet the goals of the job.

Life Science		
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).		
	9-11	11-12 (Advanced)
1. CLASSIFICATION	<p>S:LS1:11:1.1 Describe how organisms are classified into a hierarchy of groups and subgroups, which are based on similarities that reflect their evolutionary relationships.</p> <p>S:LS1:11:1.2 Explain that organisms that possess similar DNA code are more closely related than those in which DNA varies greatly.</p> <p>S:LS1:11:1.3 Identify plants and animals according to binomial nomenclature.</p> <p>S:LS1:11:1.4 Differentiate between prokaryotic and eukaryotic cells according to general structure and degrees of complexity.</p>	<p>S:LS1:12:1.1 Differentiate between prokaryotic and eukaryotic cells at the biochemical level, using cell wall composition, DNA structure, and other biochemical pathways.</p>

Life Science		
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).		
	9-11	11-12 (Advanced)
2. LIVING THINGS AND ORGANIZATION	<p>S:LS1:11:2.1 Identify the structures of different types of cell parts/organelles and explain the functions they perform.</p> <p>S:LS1:11:2.2 Recognize how cell functions are regulated through changes in the activity of the functions performed by proteins, and through the selective expression of individual genes; and explain how this regulation allows cells to respond to their environment and to control and coordinate cell growth and division.</p> <p>S:LS1:11:2.3 Recognize how an organism’s organization and complexity accommodate its need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain it.</p> <p>S:LS1:11:2.4 Explain how the processes of photosynthesis and cellular respiration are interrelated and contribute to biogeochemical cycles.</p> <p>S:LS1:11:2.5 Describe the structures of proteins and their role in cell function.</p> <p>S:LS1:11:2.6 Describe the chemical reactions involved in cell functions using examples from the nervous, immune and endocrine systems in multicellular animals.</p> <p>S:LS1:11:2.7 Recognize that because all matter tends toward more disorganized states, living systems need a continuous input of energy to maintain their chemical and physical organizations.</p> <div style="border: 2px solid black; padding: 5px;"> <p>S:LS1:11:2.8 Use data and observation to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival (e.g., protein synthesis, DNA transport, nerve cells). [LS1(9-11)INQ+SAE+FAF-1]</p> </div>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses</i></p> <p>S:LS1:12:2.1 Compare the processes of mitosis and meiosis, including disruptions to the cycles, such as disease or cancer.</p> <p>S:LS1:12:2.2 Explain the process of cell differentiation, using stem cells as an example.</p>

Life Science		
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).		
	9-11	11-12 (Advanced)
3. REPRODUCTION	<p>S:LS1:11:3.1 Describe the chemical and structural properties of DNA and explain its role in identifying the characteristics of an organism.</p> <p>S:LS1:11:3.2 Recognize that new heritable characteristics can only result from new combinations of existing genes or from mutations of genes in an organism's sex cells; and explain why other changes in an organism cannot be passed on.</p> <p>S:LS1:11:3.3 Describe the alternation of generations, life cycles with haploid and diploid phases in living organisms, such as bacteria, plants and animals.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS1:11:3.4 Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations). [LS1(9-11)FAF+POC-2]</p> </div>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses</i></p> <p>S:LS1:12:3.1 Compare and contrast the alternation of generations' life cycles; and understand the variations of the haploid and diploid phases that produce diplontic, haplontic, and isomorphic alternation of generations in living organisms.</p>

Life Science		
LS2– Energy flows and matter recycles through an ecosystem.		
	9-11	11-12 (Advanced)
1. ENVIRONMENT	<p>S:LS2:11:1.1 Explain how the amount of life an environment can sustain is restricted by the availability of matter and energy, and the ability of the ecosystem to recycle materials.</p> <p>S:LS2:11:1.2 Describe how the interrelationships and interdependencies among organisms generate stable ecosystems that fluctuate around a state of rough equilibrium for hundreds or thousands of years.</p> <p>S:LS2:11:1.3 Identify the factors in an ecosystem that can affect its carrying capacity.</p> <p>S:LS2:11:1.4 Analyze and describe how environmental disturbances, such as climate changes, natural events, human activity and the introduction of invasive species, can affect the flow of energy or matter in an ecosystem.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:11:1.5 Using data from a specific ecosystem, explain relationships or make predictions about how environmental disturbance (human impact or natural events) affects the flow of energy or cycling of matter in an ecosystem. [LS2(9-11)INQ+SAE-3]</p> </div> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:11:1.6 Explain or evaluate potential bias in how evidence is interpreted in reports concerning a particular environmental factor that impacts the biology of humans. [LS2(9-11)NOS-5]</p> </div>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses</i></p>

Life Science		
LS2– Energy flows and matter recycles through an ecosystem.		
	9-11	11-12 (Advanced)
2. FLOW OF ENERGY AND RECYCLING OF MATERIALS	S:LS2:11:2.1 Use examples from local ecosystems to describe the relationships among organisms at the different trophic levels.	<i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i>
3. RECYCLING OF MATERIALS	<p>S:LS2:11:3.1 Explain that as matter and energy flow through different levels of organization in living systems and between living systems and the environment, elements, such as carbon and nitrogen, are recombined in different ways.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS2:11:3.2 Trace the cycling of matter (e.g., carbon cycle) and the flow of energy in a living system from its source through its transformation in cellular, biochemical processes (e.g., photosynthesis, cellular respiration, fermentation). [LS2(9-11)POC+SAE-4]</p> </div>	<i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses</i>

Life Science		
LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).		
	9-11	11-12 (Advanced)
1. CHANGE	<p>S:LS3:11:1.1 Identify ways humans can impact and alter the stability of ecosystems, such as habitat destruction, pollution, and consumption of resources; and describe the potentially irreversible effects these changes can cause.</p> <p>S:LS3:11:1.2 Identify ways of detecting, and limiting or reversing environmental damage.</p> <p>S:LS3:11:1.3 Analyze the aspects of environmental protection, such as ecosystem protection, habitat management, species conservation and environmental agencies and regulations; and evaluate and justify the need for public policy in guiding the use and management of the environment.</p>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i></p>

Life Science		
LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).		
	9-11	11-12 (Advanced)
2. EVIDENCE OF EVOLUTION	<p>S:LS3:11:2.1 Explain the currently accepted theory for the development of life on Earth, including the history of its origin and the evolutionary process.</p> <p>S:LS3:11:2.2 Recognize that the abilities and behaviors an organism has, and likelihood of its survival strongly depend on its heritable characteristics, which can be biochemical and anatomical.</p> <p>S:LS3:11:2.3 Explain the contributions of Darwin, Malthus, Wallace and Russell to the advancement of life science.</p> <p>S:LS3:11:2.4 Explain evolution in terms of how the Earth's present-day life forms evolved from earlier, distinctly different species as a consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS3:11:2.5 Explain how evidence from technological advances supports or refutes the genetic relationships among groups of organisms (e.g., DNA analysis, protein analysis). [LS3(9-11)NOS-6]</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS3:11:2.6 Given information about living or extinct organisms, cite evidence to explain the frequency of inherited characteristics of organisms in a population; or explain the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment (e.g., giraffe, wind pollination of flowers). [LS3(9-11)INQ+FAF+POC-8]</p> </div>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i></p>

Life Science		
LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).		
	9-11	11-12 (Advanced)
3. NATURAL SELECTION	<p>S:LS3:11:3.1 Explain the concept of natural selection.</p> <p>S:LS3:11:3.2 Explain the diversity and unity of past and present life forms on Earth using currently accepted theories.</p> <p>S:LS3:11:3.3 Recognize how a species' chance of survival increases with each variation of an organism within the species; and explain how, in the event of a major global change, the greater the diversity of species on Earth, the greater the chance for survival of life.</p> <p>S:LS3:11:3.4 Analyze present day data and research in areas, including antibiotic resistance in bacteria, changes in viral genomes, such as bird flu, and DNA sequencing; and relate it to the concepts of natural selection.</p> <p>S:LS3:11:3.5 Identify and describe ways genes may be changed and combined to create genetic variation within a species.</p> <p>S:LS3:11:3.6 Explain that gene mutations and new combinations may have a variety of effects on the organism, including positive and negative ones, or none at all.</p> <p>S:LS3:11:3.7 Explain the concepts of Mendelian genetics.</p> <p>S:LS3:11:3.8 Use pedigree charts and Punnet Squares to determine patterns of inheritance.</p> <p style="border: 2px solid black; padding: 5px;">S:LS3:11:3.9 Given a scenario, provide evidence that demonstrates how sexual reproduction results in a great variety of possible gene combinations and contributes to natural selection (e.g., Darwin's finches, isolation of a species, Tay Sach's disease). [LS3(9-11)INQ+POC-7]</p>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i></p> <p>S:LS3:12:3.1 Understand the types of mutations that cause changes in DNA and cause the appearance of new alleles, such as frameshift and point mutations, and the chromosomal mutations of insertion, deletion, translocation, and duplication.</p>

Life Science		
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.		
	9-11	11-12 (Advanced)
1. BEHAVIOR	<p>S:LS4:11:1.1 Recognize that the immune system, endocrine system, and nervous system can affect the homeostasis of an organism.</p> <p>S:LS4:11:1.2 Describe how the functions of all the human body systems are interrelated at a chemical level and how they maintain homeostasis.</p>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i></p>

Life Science		
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.		
	9-11	11-12 (Advanced)
2. DISEASE	<p>S:LS4:11:2.1 Explain that disease in organisms can be caused by intrinsic failures of the system or infection by other organisms, and describe as well as provide examples of how some diseases are caused by: the breakdown in cellular function, congenital conditions, genetic disorders, malnutrition, and emotional health, including stress.</p> <p>S:LS4:11:2.2 Explain that vaccines were developed to reduce or eliminate diseases; and provide examples of how these medical advances have proven to be successful.</p> <p>S:LS4:11:2.3 Describe and provide examples of how new medical techniques, efficient health care delivery systems, improved sanitation, and a more complete understanding of the nature of disease provides today’s humans a better chance of staying healthier than their forebears.</p> <p>S:LS4:11:2.4 Describe how some drugs mimic or block the molecules involved in transmitting nerve or hormone signals and explain how this disturbs the normal operations of the brain and body.</p> <p>S:LS4:11:2.5 Explain that gene mutation in a cell can result in uncontrolled division, which is called cancer; and describe how exposure of cells to certain chemicals and radiation increase mutation, and thus the chance for cancer.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS4:11:2.6 Use evidence to make and support conclusions about the ways that humans or other organisms are affected by environmental factors or heredity (e.g., pathogens, diseases, medical advances, pollution, mutations). [LS4(9-11)INQ+NOS-9]</p> </div>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i></p>

Life Science		
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.		
	9-11	11-12 (Advanced)
3. HUMAN IDENTITY	<p>S:LS4:11:3.1 Describe how the length and quality of human life are influenced by many factors, including sanitation, diet, medical care, gender, genes, and environmental conditions and personal health behaviors.</p> <p>S:LS4:11:3.2 Explain how the immune system functions to prevent and fight disease.</p> <div style="border: 2px solid black; padding: 5px; margin-top: 10px;"> <p>S:LS4:11:3.3 Explain how the immune system, endocrine system, or nervous system works and draw conclusions about how systems interact to maintain homeostasis in the human body. [LS4(9-11)SAE+FAF-10]</p> </div>	<p><i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i></p>

Life Science		
LS5– The growth of scientific knowledge in Life Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.		
	9-11	11-12 (Advanced)
1. DESIGN TECHNOLOGY	<p>S:LS5:11:1.1 Describe ways in which technology has increased our understanding of the life sciences.</p> <p>S:LS5:11:1.2 Understand that technology is designed with a particular function in mind, and principles of life science are useful in creating technology for the life sciences.</p>	S:LS5:12:1.1 Recognize the importance of technology as it relates to science, for purposes such as: access to information about living systems, medical diagnosis, sample collection and treatment, measurement, data collection, and storage, computation, and communication of information.
2. TOOLS	S:LS5:11:2.1 Describe the use and benefits of equipment such as light microscopes, transmission electron microscopes, scanning electron microscopes, spectrophotometers, probes, and robotics to the study of the life sciences.	<i>Schools should include expectations and competencies from Advanced Science Courses and Science-related Career and Technical Education Courses.</i>
3. SOCIAL ISSUES (LOCAL AND GLOBAL) MEDICAL TECHNOLOGY BIOTECHNOLOGY	<p>S:LS5:11:3.1 Describe ways technology can support and improve our understanding of environmental issues.</p> <p>S:LS5:11:3.2 Describe aspects of the medical system available to help people in New Hampshire, including: prevention programs, vaccines and pharmaceuticals, hospitals and rehabilitation facilities.</p> <p>S:LS5:11:3.3 Recognize that biotechnology is used in many areas, such as agriculture, pharmaceuticals, the environment, and genetic engineering; and understand that it requires extensive knowledge of the systems being changed.</p> <p>S:LS5:11:3.4 Explain how advances in agriculture made using biotechnology have directly affected the food production over the past 100 years; and that this change has profoundly affected societies all over the globe, making larger populations and urban centers a possibility.</p>	<p>S:LS5:12:3.1 Explain how genetic engineering is used to modify the DNA structure of an organism; and describe how this process is used to research and develop medically useful products, such as insulin.</p> <p>S:LS5:12:3.2 Summarize arguments on both sides of a medical research controversy, such as stem cell research, cloning, or zootransplantation.</p> <p>S:LS5:12:3.3 Analyze and evaluate a biotechnology system in New Hampshire that focuses on a specific goal, such as pharmaceutical development; and describe all elements of the system, identifying the costs and the benefits.</p>
4. CAREER TECHNICAL EDUCATION CONNECTIONS	S:LS5:11:4.1 Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to the life sciences.	S:LS5:12:4.1 Understand the various scientific fields that use scientific content and skills; and distinguish between professional and skilled science jobs/careers in the life sciences.