

Middle School - Life Science Curriculum Framework

Grade	Big Idea	Essential Questions	Concepts	Competencies	Vocabulary	2002 Standards	SAS Standards	Assessment Anchor Eligible Content
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	All living things have a common set characteristic needs and functions that separate them from nonliving things such as: gas exchange, energy usage, water usage, response, reproduction, elimination of waste, growth, and made of one or more cells.	Use evidence of characteristics of life to differentiate between living and nonliving things.	Dead Dormant Living Nonliving	3.3.7B	3.1.6.A 3.1.7.A	
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	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).	Conduct investigations to provide evidence that living things are made of cells and cells can be differentiated.	Eukaryote Multicellular Prokaryote Unicellular	3.3.7A 3.3.7B	3.1.6.A 3.1.7.A 3.1.8.A	S.8.B.1.1.1 S.8.B.1.1.2 S.8.B.1.1.3
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	Within cells, special structures are responsible for particular functions.	Create and use models to describe the basic structures and functions of cells within a system framework.	Cell membrane Cell wall Chloroplast Cytoplasm Mitochondria Nucleus Organelles	3.3.7A 3.3.7B	3.1.6.A 3.1.7.A 3.1.8.A	S.8.B.1.1.1 S.8.B.1.1.2
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	In multicellular organisms, there is a systems framework of organization from cells to tissues, to organs to organ systems. These systems are specialized for particular body functions of an organism.	Provide evidence to support the concept of an organism is composed of interacting subsystems composed of a group of cells.	Cells Molecules Organ systems Organelles Organs Tissues	3.3.7.A 3.3.7.B	3.1.6.A 3.1.7.A 3.1.8.A	S.8.B.1.1.1 S.8.B.1.1.2 S.8.B.1.1.3 S.8.B.1.1.4
6-8	All organisms are made of cells and can be characterized by common	How do organisms live, grow, respond to their environment, and reproduce?	All living things have adaptations that help them survive and reproduce in their	Use argument based evidence to support the notion that living things are able to survive and reproduce	Adaptations: structural, behavioral	3.3.7.D	3.1.6.A 3.1.7.A 3.1.8.A	S.8.B.2.1.1 S.8.B.2.1.2

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	aspects of their structure and functioning.		environment.	based on structural or behavioral adaptations.				
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	Living organisms reproduce in a variety of ways that may involve sexual or asexual reproduction. Reproduction usually follows a cycle.	Describe and distinguish between various types of reproductive methods of cells and organisms.	Asexual reproduction Cell division Life cycles Sexual reproduction	3.3.7.B	3.1.6.A 3.1.7.A 3.1.8.A	
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	Genetic factors as well as local conditions affect the growth of organisms.	Provide a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	Environmental factors Genetic factors Scientific explanation	3.3.7.D	3.1.6.A 3.1.7.A 3.1.8.A	S.8.B.3.2.1 S.8.B.3.2.3
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	Some organisms 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.	Create a scientific, evidence-based explanation of the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Carbon dioxide Glucose Oxygen Photosynthesis Products Water Reactants	3.3.7.B 4.1.7.C	3.1.6.A 3.1.7.A 3.1.8.A	S.8.C.1.1.3 S.8.C.2.1.1 S.8.C.2.1.3 S.8.C.2.2.1
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	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.	Create 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	Aerobic respiration Anaerobic respiration Cellular respiration Fermentation	3.3.7B 4.1.7.C	3.1.6.A 3.1.7.A 3.1.8.A	S.8.C.1.1.3 S.8.C.2.1.1 S.8.C.2.1.3 S.8.C.2.2.1
6-8	All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	How do organisms live, grow, respond to their environment, and reproduce?	Organisms have sense receptor that responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to a brain or processing center. These signals are processed and result in immediate behaviors or memories.	Gather information that sensory receptors respond to stimuli by sending messages to the brain or processing center for immediate behavior or storage as memories.	Brain Nerves Neurons Response Signal Stimuli	Not mentioned in 2002 standards		S.8.B.2.1.1
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one	How are the characteristics of one generation passed to the next? How can individuals of the same	Organisms have characteristic behaviors and structures that increase their odds of reproduction.	Utilize empirical evidence to support an argument that organism have characteristic behaviors and structures that increase their odds of	Adaptations: structural, behavioral	3.3.7.D	3.1.8.C	S.8.B.2.1.1 S.8.B.2.1.2

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	generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	species and even siblings have different characteristics?		reproduction.				
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	Organisms and populations of organisms are dependent on their environmental interactions, both biotic and abiotic factors.	Analyze data to provide evidence for the impact of resource availability on organisms and populations in an ecosystem.	Abiotic Biotic Consumer Ecosystem Energy pyramid Food chain Food web Niche Predator Prey Producer Symbiosis	4.3.7.C 4.6.7.A 3.2.7.B	3.1.6.A2 4.1.7.A 3.1.7.A	S8.B.3.1.1 S8.B.3.1.3
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	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.	Analyze data to provide evidence for the impact of resource availability on organisms and populations in an ecosystem.	Capacity Carrying Dynamics Limiting factor Population	4.6.7.A 3.2.7.B 3.3.7.D	3.1.6.A2	S8.B.3.1.1 S8.B.3.1.2 S8.B.3.2.1 S8.B.3.2.2
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	Growth of organisms and population increases are limited by access to resources.	Analyze data to provide evidence for the impact of resource availability on organisms and populations in an ecosystem.	Carrying capacity Community Competition Limiting factors Population	4.6.7.C 3.1.7.E	3.1.8.A 3.4.8.A 3.4.8.B 4.2.8.C 4.4.8.A 4.5.8.A 4.5.8.C 4.5.8.D	S8.B.3.2.1 S8.B.3.2.2 S8.B.3.2.3
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through	How and why do organisms interact with their environment and what are the effects of these interactions?	Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial	Develop an explanation that describes patterns of interactions among organisms across multiple ecosystems.	Commensalism Mutualism Parasitism Predator Prey	4.6.7.A	3.1.8.A 3.3.8.A 3.4.8.B 4.3.8.A 4.4.8.A	S8.B.3.3.1 S8.A.1.2.4 S8.B.3.1.1 S8.B.3.1.2 S8.B.3.1.3

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	interdependent relationships with other organisms and the physical environment.		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.		Resource availability Symbiosis		4.5.8.A 4.5.8.C 4.5.8.D	
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	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.	Design and/or construct a model to describe the cycling of matter and flow of energy and within the biotic and abiotic parts of an ecosystem.	Autotroph Carnivore Competition Consumer Decomposer Energy pyramid Food chain Food web Herbivore Heterotroph Omnivore Photosynthesis Predation Primary Producer Secondary Tertiary	4.6.7.A 3.1.7.A 3.1.7.B	3.1.7.A2	S.8.B. 3.1.3 S.8.B.3.1.1
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments.	Design and/or construct a model to describe the cycling of matter and flow of energy and within the biotic and abiotic parts of an ecosystem.	Autotroph Carnivore Competition Consumer Decomposer Energy pyramid Food chain Food web Herbivore Heterotroph Omnivore Photosynthesis Predation	4.6.7.A 3.1.7.A 3.1.7.B	3.1.7.A2	S.8.B. 3.1.3 S.8.B.3.1.1

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					Primary Producer Secondary Tertiary			
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	Design and/or construct a model to describe the cycling of matter and flow of energy and within the biotic and abiotic parts of an ecosystem.	Autotroph Carnivore Competition Consumer Decomposer Energy pyramid Food chain Food web Herbivore Heterotroph Omnivore Photosynthesis Predation Primary Producer Secondary Tertiary	4.6.7.A 3.1.7.A 3.1.7.B	3.1.7.A2	S.8.B. 3.1.3 S.8.B.3.1.1
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	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.	Construct an argument supported by evidence that changes to the physical or biological parts of an ecosystem impact populations.	Conservation of matter Consumer Decomposer Flow of energy Producer	4.6.7.C 3.2.7.B	3.1.7.A.2	S8.B.3.1.1 S8.B.3.2.2 S8.B.3.2.3 S8.B.3.3.1 S8.B.3.2.1 S8.A.1.3.3 S8.A.1.3.4
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	Biodiversity describes the variety of species found in Earth's terrestrial and aquatic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.	Design or evaluate solutions for maintaining biodiversity and / or ecosystems services.	Biodiversity Food web Freshwater Oceanic Resiliency Species Terrestrial	4.3.7.C	3.1.7.A2	S8.B.3.1.1 S8.B.3.2.2
6-8	Organisms grow, reproduce, and	How and why do organisms interact with their	Changes in biodiversity can influence humans' resources,	Design or evaluate solutions for maintaining biodiversity and / or	Carbon cycle Decomposition	4.6.7.A 3.2.7.C	3.1.7.A2	S8.B.3.1.1 S8.B.3.3.3

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	perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	environment and what are the effects of these interactions?	such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling of matter	ecosystems services.	Nitrogen cycle Water cycle			S8.B.3.3.4 S8.B.3.3.2
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	Design or evaluate solutions for maintaining biodiversity and / or ecosystems services.	Ecosystem	4.6.7.C 3.2.7.C	3.1.8.A 3.4.8.A 4.2.8.C	S8.B.3.2.1 S8.B.3.2.3
6-8	Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.	How and why do organisms interact with their environment and what are the effects of these interactions?	Biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems.		Biodiversity Oceanic Terrestrial	4.3.7 C 3.1.7.B	3.1.8.A 3.4.8.A 4.2.8.C 3.1.8.C1	S8.B.3.2.2
6-8	Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.	How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?	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, change, and extinction, of many life forms throughout the history of life on Earth.	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	Evolution Evolutionary descent Evolutionary history Fossil Fossil record Homologous structures Radioactive dating	3.1.7.C 3.1.10.D 3.2.7.C 3.2.7.A	3.1.8.A 3.4.8.A 4.2.8.C 3.1.8.C	S8.B.2.1.5 S8.B.2.1.1
6-8	Biological evolution explains both the unity and diversity of species and provides a unifying	How can there be so many similarities among organisms yet so many different kinds of plants, animals, and	Anatomical similarities and differences among various organisms living today and between them and organisms	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between	Anatomical Anatomical fossil record Evolutionary	4.7.7.A 3.2.7.A 3.3.7.D 3.2.10.A	3.1.8.C 3.4.8.E	S8.B.2.1.2 S8.B.2.1.5 S8.B.2.1.1

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	principle for the history and diversity of life on Earth.	microorganisms?	in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.	modern and fossil organisms to infer evolutionary relationships.	descent Evolutionary history Fossil Fossil record Homologous structures Natural selection	3.2.7.C		
6-8	Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.	How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?	Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.	-Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy	Embryological relationships	3.3.7.D, 3.3.10.D 3.2.7.A 3.2.10.A 3.3.7.C	3.1.8.C 3.4.8.E	S8.B.2.1.5
6-8	Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.	How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?	Adaptations allow organisms to survive in their environment. Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	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.	Genetic variation Natural selection Predominance Suppression	3.3.7.D, 3.3.10.D 3.1.7.C 3.1.10.C 3.7.7.A	3.1.8.C 3.4.8.E	S8.B.2.1.5 S8B.3.2.3 S8B.2.1.1 S8B.2.1.2 S8B.2.1.3
6-8	Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.	How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?	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 on to offspring.	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms	Biotechnology Selective breeding	3.3.7.D, 3.3.10.D 3.1.7.C 3.1.10.C 3.1.7.E 3.3.7.C 3.3.10.C	3.1.8.C 3.4.8.E	S8.B.2.1.4 S8.B.2.1.3
6-8	Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.	How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?	Adaptation by natural selection acting over generations is a process by which species change over time in response to changes in environmental conditions. Traits that support survival and reproduction in the new environment become more	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. If organisms cannot adapt to new environmental conditions, extinction can happen.	Adaptation Evolve Natural selection Variation	3.3.7.D, 3.3.10.D 3.2.7.A 3.2.10.A 4.7.7.B 3.1.7.B 3.1.10.B 3.1.7.D 3.1.7.E	3.1.8.A 3.1.8.C 3.4.8.B 3.4.8.E 4.4.8.A 4.5.8.A 4.5.8.C 4.5.8.D	S8.B.2.1.5 S8.B.2.1.1 S8B.3.2.3 S8B.3.2.2

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			common; those that do not, become less common.					
6-8	Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.	How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?	Explain how to use a dichotomous key to identify organisms.	Construct and utilize dichotomous keys to identify organisms	Dichotomous key Genus Species	3.3.7.A		S8.B.1.1.3
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	How are the characteristics of one generation passed to the next?	Animals engage in characteristic behaviors that increase the odds of reproduction.	Develop supporting statements based on scientific evidence and reasoning that explains how organismal behaviors and structures increase the probability of successful reproduction in living things.				S8.B.2.1.2
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	How can individuals of the same species and even siblings have different characteristics?	Organisms reproduce, either sexually or asexually, and transfer their genetic information through inheritance to their offspring.	Use a model that distinguishes how genetic information is conserved during asexual reproduction while sexual reproduction results in variation.	Asexual reproduction DNA Mutations Punnett squares Sexual reproduction	3.3.7.C, 3.3.10.C	3.1.8.C	S8.B.2.2.1
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	How are the characteristics of one generation passed to the next?	Genetic contribution from each parent through sexual reproduction results in variation in offspring, and asexual reproduction results in offspring with identical genetic information.	Construct a model that demonstrates how gene mutations occur	Alleles Chromosomes DNA Genes Genetic Heredity	3.3.7.D 3.3.7.C 3.1.7.B	3.1.8.C 3.1.7.B1	S8.B.2.2.2 S8.B.2.1.3
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via	How can individuals of the same species and even siblings have different characteristics?	Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes.	Research and report on how gene structural changes may be beneficial or harmful to the organism.	Egg cells Sperm cells		3.1.7.B1	S8.B.2.1.3

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	genes, and explains why offspring resemble, but are not identical to, their parents.		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.					
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	How can individuals of the same species and even siblings have different characteristics?	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.	Use a model that demonstrates how genetic mutations can result in changes in the associated protein.	Daughter cells Gametes	3.3.7.C, 3.1.7.B 3.1.10.B	3.1.7.C1 3.1.8.A 3.1.8.C 3.4.8.B 4.4.8.A 4.5.8.A 4.5.8.C 4.5.8.D 3.1.7.C2	S8.B.2.2.2 S8B. 3.2.3
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	How can individuals of the same species and even siblings have different characteristics?	Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.	Provide an explanation for the relationship among changes (mutations) to genes, changes to the formation of proteins, and the effect on the structure and function of the organism and thereby traits.		3.3.7.C, 3.3.10.C 3.2.7.A 3.2.10.A	3.1.8.C 3.4.8.E	S8.B.2.1.3
6-8	Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?	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.	Demonstrate using a model illustrating how offspring acquire genes from each parent during sexual reproduction.		3.3.7.C 3.1.7.B	3.1.8.C 3.4.8.E	S8.B.2.1.1 S8.B.2.2.2
6-8	Heredity refers to specific mechanisms by which	How are the characteristics of one generation passed to	Humans can select for specific traits, using technology for	Research and present a report that addresses the use of technologies	Selective breeding			S8.B.2.1.4

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	characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	the next? How can individuals of the same species and even siblings have different characteristics?	genetic modification, which leads to selective breeding.	allowing for the selection of specific genetic traits				
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