



ADW GRADE 6-8 LIFE SCIENCE STANDARDS & INSTRUCTION GUIDE

LS.1 Structure and Function of Organisms	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.1-1	Investigate and observe cells in living organisms and collect evidence to support the claim that all living things are made of cells.	<ul style="list-style-type: none"> • All living things grow, develop, reproduce, use energy, respond to stimuli, are made of organic molecules, and are composed of one or more cell. • The cell is the smallest unit that can be said to be alive. • An organism may consist of one single cell or many different numbers and types of cells. • Cells come only from existing cells • Cells were discovered and continue to be studied through the development of technologies such as light and electron microscopes. 	<ul style="list-style-type: none"> • cell • multicellular • unicellular • Cell Theory • stimulus • response • protein • lipid • carbohydrate • nucleic acid • eukaryote • prokaryote • Robert Hooke • Antonie van Leeuwenhoek • Schleiden, Schwann, and Virchow 	<ul style="list-style-type: none"> • http://www.cpalms.org/Public/PreviewResourceLesson/Preview/156428 • http://www.cpalms.org/Public/PreviewResourceLesson/Preview/128776



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SC.6-8.LS.1-2	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	<ul style="list-style-type: none">• All cells are enclosed in a selectively permeable plasma membrane across which nutrients and waste materials must pass.• Cells function as whole systems, with special structures and organelles that are responsible for particular functions.• Plant cells have a cell wall and chloroplasts, while animal cells do not.• The four primary types of organic molecules in cells are proteins, lipids, carbohydrates, and nucleic acids.• Water is an important inorganic molecule in cells and is required to carry out many cellular functions.• DNA plays an important role in the cell, directing the synthesis of proteins.• Mitochondria carry out cellular respiration, providing energy for the cell.	<ul style="list-style-type: none">• cell wall• cell membrane• cytoplasm• nucleus• chloroplast• DNA• mitochondria• ribosomes• organelle• selectively permeable• diffusion• osmosis• equilibrium• gradient	<ul style="list-style-type: none">• https://biomanbio.com/HTML5GamesandLabs/Cellgames/cellexplorerpagehtml5.html



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SC.6-8.LS.1-3	Construct explanations for how cells in multicellular organisms repeatedly divide to make more cells for growth and repair.	<ul style="list-style-type: none">• Cells repeatedly divide to make more cells for growth and repair.• New somatic (body) cells are formed through a process called the cell cycle.• The cell cycle consists of interphase, mitosis, and cytokinesis• Chromosome number is conserved in the new daughter cells.• When cells divide uncontrollably, this is called cancer, a disease that is difficult to cure.	<ul style="list-style-type: none">• cell cycle• interphase• mitosis• cytokinesis• chromosomes• centrioles• cytoplasm• nucleus• spindle fibers	<ul style="list-style-type: none">• https://newsela.com/student-home/explore



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SC.6-8.LS.1-4	Research and describe the relationships between various cell types, tissues, and organs in human body systems.	<ul style="list-style-type: none"> • 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. • Different body tissues and organs are made up of different kinds of cells. • Human body systems include the circulatory, excretory, digestive, respiratory, muscular, and nervous systems. • Bacteria in and on our bodies play an important role in immunity, digestion, etc. • The body systems function together (eg. red blood cells carry oxygen for cellular respiration; the digestive system breaks down food into components such as proteins, lipids, and carbohydrates that cells need to produce energy.) • Regular exercise and good nutrition are important to maintaining healthy organ systems. 	<ul style="list-style-type: none"> • cell • tissue • organ • organ system • organism • microbiome 	<ul style="list-style-type: none"> • http://edheads.org/?page=VirtualKneeInfo • https://kidshealth.org/en/kids/eyes.html



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SC.6-8.LS.1-5	Develop a model to describe how food molecules are produced during photosynthesis and rearranged through chemical reactions to release energy during cellular respiration.	<ul style="list-style-type: none">Plants and some photosynthetic protists and bacteria use the energy from light to produce sugars.Photosynthesis requires water, carbon dioxide, and light (electromagnetic) energy to take place and produces glucose, as well as the byproduct, oxygen.Cellular respiration in both plants and animals involve chemical reactions with oxygen that release stored (chemical) energy from sugars.Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules that support growth or to release energy.Organisms use energy from food for bodily processes such as growth, body repair, motion, homeostasis (eg. maintaining body warmth), etc.	<ul style="list-style-type: none">photosynthesisautotrophheterotrophhomeostasiscellular respirationfermentationglucoseoxygencarbon dioxidechlorophyll	<ul style="list-style-type: none">http://www.harcourtschool.com/activity/science_up_close/512/deploy/interface.html



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SC.6-8.LS.1-6	Investigate how viruses and bacteria affect the human body.	<ul style="list-style-type: none"> • Bacteria are one celled organisms found almost everywhere and can be helpful, harmful, or have no effect. • Viruses do not have a cellular structure, but have some of the same chemicals that make up living organisms. • Pathogens (viruses, bacteria, fungi, and parasites) may infect the human body and interfere with normal body functions. • Infection by pathogens cause the body to build up immunity against subsequent infection by the same organisms. • Technologies having to do with food production, sanitation, and disease prevention have dramatically changed how people live and work and have resulted in changes in factors that affect the growth of human population. • Vaccines induce the body to build immunity to a disease without actually causing the disease itself. 	<ul style="list-style-type: none"> • pathogens • disease • viruses • bacteria • Louis Pasteur • Germ Theory • Edward Jenner • vaccines • herd immunity • epidemic 	<ul style="list-style-type: none"> • https://www.stem.org.uk/resources/collection/3500/pathogens

LS.2 Inheritance and Variation of Traits	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
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SC.6-8.LS.2-1	Obtain, evaluate, and communicate information describing the relationship between genes, chromosomes, and inherited characteristics.	<ul style="list-style-type: none">• Chromosomes are primarily composed of chromatin, a combination of DNA and protein.• Hereditary information is carried in discrete units on chromosomes called genes.• Genes consist of a specific nucleotide sequence in DNA.• 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.• Mutations may result in harmful, beneficial, or neutral effects to the structure and function of the organism.	<ul style="list-style-type: none">• chromatin• chromosomes• chromatids• genes• alleles• deoxyribonucleic acid (DNA)• mutation• protein synthesis• messenger RNA• transfer RNA• transcription• translation	<ul style="list-style-type: none">• https://www.ck12.org/biology/Chromosomes/
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LS.2 Inheritance and Variation of Traits	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.2-2	Construct explanations for how genetic information is transmitted from parent to offspring through reproduction.	<ul style="list-style-type: none"> • Reproduction is a characteristic of all living things and allows a species to survive. • Inherited traits are coded by DNA that organisms inherit from their parents • The distribution of genetic material during sexual reproduction occurs during meiosis and fertilization. • Organisms produced through sexual reproduction typically have half of the genes from each parent. • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. • Acquired traits are developed over the course of an organism's life and are not coded by DNA. • In asexual reproduction all of the genes come from a single parent, resulting in organisms that are identical to the parent organism. • Many plants can reproduce both asexually (eg. garlic cloves, strawberry runners, dune grasses) and sexually (by fertilization, seed formation, etc.). 	<ul style="list-style-type: none"> • sexual reproduction • asexual reproduction • genetic variation • cloning • meiosis • gametes • fertilization • zygote • acquired traits • sperm • ova • haploid • diploid 	<ul style="list-style-type: none"> • https://www.explorelarning.com/index.cfm?method=cResource.dspView&ResourceID=449



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LS.2 Inheritance and Variation of Traits	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC6-8.LS.2-3	Create and analyze Punnett squares to calculate the probability of specific traits being passed from parents to offspring using different patterns of inheritance.	<ul style="list-style-type: none">• Gregor Mendel conducted experiments to follow the inheritance of traits by pea plants.• He found that some traits are dominant and some are recessive.• Reginald Punnett applied the rules of probability to the study of genetics.• More complex patterns of inheritance are possible, including codominance, and incomplete dominance.	<ul style="list-style-type: none">• trait• dominant• recessive• homozygous/purebred• heterozygous/hybrid• allele• gene• genotype• phenotype• Punnett Square• Gregor Mendel• Reginald Punnett	<ul style="list-style-type: none">• http://comelearnmore.com/websites-by-topic/genetics-games/



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LS.2 Inheritance and Variation of Traits	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.2-4	Explore and predict the evolutionary relationships between species looking at the anatomical differences among modern organisms and between modern and fossil organisms.	<ul style="list-style-type: none"> Evidence supporting evolution comes from fossil records, comparison of homologous structures and embryology, technologies such as carbon dating, and advances in molecular biology. 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. The fossil record 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. Phylogenetic trees depict hypotheses about the evolutionary history of species. 	<ul style="list-style-type: none"> adaptation phylogeny fossil record natural selection evolution phylogenetic tree Charles Darwin 	<ul style="list-style-type: none"> https://betterlesson.com/browse/common_core_standard/2235/ngss-ms-ls4-2-apply-scientific-ideas-to-construct-an-explanation-for-the-anatomical-similarities-and-differences-among-modern-or



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LS.2 Inheritance and Variation of Traits	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.2-5	Gather and synthesize information about how humans alter organisms genetically through a variety of methods.	<ul style="list-style-type: none">• Technology allows humans to influence the transfer of genetic information.• Selective breeding for particular traits is used to create new varieties of cultivated plants (e.g. corn, apples) and domesticated animals (e.g. dogs, horses).• Genetic engineering of microorganisms can be used to produce medicines or to facilitate the transfer of genes from one species to another.• There are ethical issues surrounding the application of selective breeding technologies to human reproduction.	<ul style="list-style-type: none">• selective breeding• cloning• hybridization• genetic engineering	<ul style="list-style-type: none">• https://www.legendsoflearning.com/learning-objectives/artificial-selection-via-selective-breeding/



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LS.3 Interactions, Energy, and Dynamics of Ecosystems	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.3-1	Develop and use models to describe the cycling of matter and the flow of energy among living and nonliving parts of an ecosystem.	<ul style="list-style-type: none">• The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.• Diagrams such as energy pyramids and food chains demonstrate that the energy in animal's food used for bodily processes was once energy from the sun.• 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.• Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments.	<ul style="list-style-type: none">• matter• energy• autotroph• heterotroph• decomposers• homeostasis• photosynthesis• energy pyramid• food web• food chain• trophic level	<ul style="list-style-type: none">• https://www.commonse.org/education/lesson-plans/energy-flow-within-living-and-nonliving-parts-of-an-ecosystem



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LS.3 Interactions, Energy, and Dynamics of Ecosystems	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.3-2	Examine traits of individuals within a species that may give them an advantage or disadvantage to survive and reproduce in stable or changing environments.	<ul style="list-style-type: none">• Adaptations in different organisms help the organism to survive and reproduce.• Organisms might have to adapt if the environment changes.• Natural selection can lead to an increase in the frequency of some traits and the decrease in the frequency of other traits.• 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.	<ul style="list-style-type: none">• adaptations• traits• natural selection• evolution	<ul style="list-style-type: none">• https://phet.colorado.edu/en/simulation/natural-selection



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LS.3 Interactions, Energy, and Dynamics of Ecosystems	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.3-3	Analyze and interpret data from observations to compare characteristics of organisms used to classify organisms into domains and kingdoms.	<ul style="list-style-type: none"> • Scientists currently use three domains (Archaea, Bacteria, and Eukarya,) to classify organisms. • The domain Eukarya is further divided into four kingdoms-animals, plants, fungi, and protists. • Some characteristics used to classify organisms are whether they are unicellular or multicellular, how they obtain energy, chromosome number, and external features. • The Protist Kingdom is one of the most diverse groups and includes organisms that have characteristics similar to plants, animals, or fungi. These microorganisms live in moist environments and vary in how they obtain energy and move. • The Fungi Kingdom consists of organisms that do not make their own food (heterotrophs) but obtain their nutrition through external absorption. • Scientists use scientific names (binomial nomenclature) to avoid confusion and to show relationships between organisms. • Taxonomy is a dynamic science in which our understanding of genetic and evolutionary relationships between species is often changing. 	<ul style="list-style-type: none"> • taxonomy • Carolus Linnaeus • binomial nomenclature • scientific name • Genus species • domain • kingdom • protist • fungi • autotroph • heterotroph • unicellular • multicellular • eukaryote • prokaryote • dichotomous key 	<ul style="list-style-type: none"> • https://educators.brainpop.com/lesson-plan/animals-lesson-plan-diversity-life/?bp-topic=protists



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LS.3 Interactions, Energy, and Dynamics of Ecosystems	Standard	Core Concepts	Scientific Terms and Scientists	EdTech Resources
SC.6-8.LS.3-4	Develop and use models to explain how organisms interact in a competitive or mutually beneficial relationship for food, shelter, or space.	<ul style="list-style-type: none"> Organisms within a habitat form relationships with other species. These interactions can be classified according to the effect on the populations concerned. (eg. predator/prey; consumer/producer) Symbiosis is a close association between organisms that can be classified as parasitism, mutualism, or commensalism. 	<ul style="list-style-type: none"> predator prey parasite host symbiosis- (parasitism, mutualism, commensalism) 	<ul style="list-style-type: none"> https://www.nationalgeographic.org/activity/ecological-relationships/
SC.6-8.LS.3-5	Analyze and interpret data to predict how changes in the number of organisms of one species or the introduction of a new species in an environment impact the balance of an ecosystem.	<ul style="list-style-type: none"> All environments have biotic and abiotic components. Changes in the balance between biotic and abiotic components can help or harm native plants and animals. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources. Non-native species may become invasive species by dominating the habitat, causing environmental damage. There are many invasive species in our area (emerald ash borer, golden bamboo, northern snakehead, etc.). 	<ul style="list-style-type: none"> abiotic biotic environment populations community ecosystem biodiversity native species non-native species invasive species 	<ul style="list-style-type: none"> http://cashmanuncueo.net/biomes/biomebuil.swf