Biology

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
L	Life Science		
L.1	Matter tends to be cycled within an ecosystem, while energy is transformed and eventually exits an ecosystem		
L.1.a	Analyze how energy flows through trophic levels	Population Ecology	Disturbance of a Community
L.1.b	Evaluate the potential ecological impacts of a plant-based or meat-based diet		
L.1.c	Analyze and interpret data from experiments on ecosystems where matter such as fertilizer has been added or withdrawn such as through drought		
L.1.d	Develop, communicate, and justify an evidence-based scientific explanation showing how ecosystems follow the laws of conservation of matter and energy	Population Ecology	Disturbance of a Community
L.1.e	Define and distinguish between matter and energy, and how they are cycled or lost through life processes	Population Ecology	Disturbance of a Community
L.1.f	Describe how carbon, nitrogen, phosphorus, and water cycles work	Population Ecology	The Hydrologic (Water) Cycle The Phosphorus Cycle The Nitrogen Cycle The Carbon Cycle
L.1.g	Use computer simulations to analyze how energy flows through trophic levels	Population Ecology	Disturbance of a Community
L.2	The size and persistence of populations depend on their interactions with each other and on the abiotic factors in an ecosystem		

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L.2.a	Analyze and interpret data about the impact of removing keystone species from an ecosystem or introducing non-native species into an ecosystem	Population Ecology	Disturbance of a Community
L.2.b	Describe or evaluate communities in terms of primary and secondary succession as they progress over time	Population Ecology	Community Density and Stability
L.2.c	Evaluate data and assumptions regarding different scenarios for future human population growth and their projected consequences		
L.2.d	Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate ecosystem interactions	Population Ecology	Community And Ecosystem Dynamics
L.3	Cellular metabolic activities are carried out by biomolecules produced by organisms		
L.3.a	Identify biomolecules and their precursors/building blocks	The Nature of Science	Carbon Compounds
L.3.b	Develop, communicate, and justify an evidence-based explanation that biomolecules follow the same rules of chemistry as any other molecule	The Nature of Science	Carbon Compounds

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L.3.c	Develop, communicate, and justify an evidence-based explanation regarding the optimal conditions required for enzyme activity	Photosynthesis	Enzymes: Organic Catalysts
L.3.d	Infer the consequences to organisms of suboptimal enzyme function - such as altered blood pH or high fever - using direct and indirect evidence	Photosynthesis	Enzymes: Organic Catalysts
L.3.e	Analyze and interpret data on the body's utilization of carbohydrates, lipids, and proteins	The Nature of Science	Carbon Compounds
L.4	The energy for life primarily derives from the interrelated processes of photosynthesis and cellular respiration. Photosynthesis transforms the sun's light energy into the chemical energy of molecular bonds. Cellular respiration allows cells to utilize chemical energy when these bonds are broken.		
L.4.a	Develop, communicate, and justify an evidence-based scientific explanation the optimal environment for photosynthetic activity	Photosynthesis	Photosynthesis: Food Production
L.4.b	Discuss the interdependence of autotrophic and heterotrophic life forms such as depicting the flow of a carbon atom from the atmosphere, to a leaf, through the food chain, and back to the atmosphere	Photosynthesis	Where Does Energy Come From? Cellular Respiration
L.4.c	Explain how carbon compounds are gradually oxidized to provide energy in the form of adenosine triphosphate (ATP), which drives many chemical reactions in the cell	Photosynthesis	Where Does Energy Come From?

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L.5	Cells use passive and active transport of substances across membranes to maintain relatively stable intracellular environments		
L.5.a	Analyze and interpret data to determine the energy requirements and/or rates of substance transport across cell membranes	Cell Structure	The Cell Membrane: Structure and Function
L.5.b	Compare organisms that live in freshwater and marine environments, and identify the challenges of osmotic regulation for these organisms	Cell Structure	Water and Solute Movement
L.5.c	Diagram the cell membrane schematically, and highlight receptor proteins as targets of hormones, neurotransmitters, or drugs that serve as active links between intra and extracellular environments		
L.5.d	Use tools to gather, view, analyze, and interpret data produced during scientific investigations that involve passive and active transport		
L.5.e	Use computer simulations and models to analyze cell transport mechanisms	Cell Structure	Cells and Diffusion Active and Passive Transport: Tolls Versus Free Rides
L.6	Cells, tissues, organs, and organ systems maintain relatively stable internal environments, even in the face of changing external environments		
L.6.a	Discuss how two or more body systems interact to promote health for the whole organism	Animal Organization	Animal Organ Systems and Homeostasis

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L.6.b	Analyze and interpret data on homeostatic mechanisms using direct and indirect evidence to develop and support claims about the effectiveness of feedback loops to maintain homeostasis	Animal Organization	Animal Organ Systems and Homeostasis
L.6.c	Distinguish between causation and correlation in epidemiological data, such as examining scientifically valid evidence regarding disrupted homeostasis in particular diseases	Animal Organization	The Integumentary System: Protection and Senses
L.6.d	Use computer simulations and models of homeostatic mechanisms	Animal Organization	Animal Organ Systems and Homeostasis
L.7	Physical and behavioral characteristics of an organism are influenced to varying degrees by heritable genes, many of which encode instructions for the production of proteins		
L.7.a	Analyze and interpret data that genes are expressed portions of DNA.	Cell Structure	The DNA Molecule
L.7.b	Analyze and interpret data on the processes of DNA replication, transcription, translation, and gene regulation, and show how these processes are the same in all organism	Cell Structure Genetics	The DNA Molecule The Structure of DNA DNA Replication: Copying the Code How Proteins Are Made From Genes to Proteins: RNA, Transcription, and Translation
L.7.c	Recognize that proteins carry out most cell activities and mediate the effect of genes on physical and behavioral traits in an organism	The Nature of Science Cell Structure Genetics	Proteins The DNA Molecule The Structure of DNA DNA Replication: Copying the Code How Proteins Are Made From Genes to Proteins: RNA, Transcription, and Translation

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L.7.d	Evaluate data showing that offspring are not clones of their parents or siblings due to the meiotic processes of independent assortment of chromosomes, crossing over, and mutations	Cell Structure	Meiosis and Sexual Reproduction
L.7.e	Explain using examples how genetic mutations can benefit, harm, or have neutral effects on an organism		
L.8	Multicellularity makes possible a division of labor at the cellular level through the expression of select genes, but not the entire genome.		
L.8.a	Develop, communicate, and justify an evidence-based scientific explanation of how cells form specialized tissues due to the expression of some genes and not others		
L.8.b	Analyze and interpret data that show most eukaryotic deoxyribonucleic acid (DNA) does not actively code for proteins within cells	Cell Structure Genetics	The DNA Molecule The Structure of DNA DNA Replication: Copying the Code How Proteins Are Made From Genes to Proteins: RNA, Transcription, and Translation
L.8.c	Develop, communicate, and justify an evidence-based scientific explanation for how a whole organism can be cloned from a differentiated - or adult - cell		

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L.8.d	Analyze and interpret data on medical problems using direct and indirect evidence in developing and supporting claims that genetic mutations and cancer are brought about by exposure to environmental toxins, radiation, or smoking		
L.9	Evolution occurs as the heritable characteristics of populations change across generations and can lead populations to become better adapted to their environment		
L.9.a	Develop, communicate, and justify an evidence-based scientific explanation for how Earth's diverse life forms today evolved from common ancestors	Evolution	Evidence for Evolution Biogeography: Separation and Divergence Embryology
L.9.b	Analyze and interpret multiple lines of evidence supporting the idea that all species are related by common ancestry such as molecular studies, comparative anatomy, biogeography, fossil record and embryology	Evolution	Evidence for Evolution Biogeography: Separation and Divergence Embryology
L.9.c	Analyze and interpret data suggesting that over geologic time, discrete bursts of rapid genetic changes and gradual changes have resulted in speciation	History of Life on Earth	The Precambrian: The Proterozoic Eon The Paleozoic: The Time of Ancient Life
L.9.d	Analyze and interpret data on how evolution can be driven by three key components of natural selection - heritability, genetic variation, and differential survival and reproduction	Evolution	Evidence for Evolution Biogeography: Separation and Divergence Embryology Mutation Rate Natural Selection
L.9.e	Generate a model - an evolutionary tree - showing how a group of organisms is most likely diverged from common ancestry	Evolution	Evidence for Evolution