

**Colorado Standards High School
Science Contents Standards Mapping**

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LIFE SCIENCE	Boardworks High School Biology Presentation
Explain and illustrate with examples how living systems interact with the biotic and abiotic environment	
1. Matter tends to be cycled within an ecosystem, while energy is transformed and eventually exits an	
a. Analyze how energy flows through trophic levels	Energy Transfer in Food Chains Energy Loss in Food Chains Food Chains
b. Evaluate the potential ecological impacts of a plant-based or meatbased diet	Energy Loss in Food Chains
c. <i>Analyze and interpret data from experiments on ecosystems where matter such as fertilizer has been added or withdrawn such as through drought</i>	-
d. Develop, communicate, and justify an evidence-based scientific explanation showing how ecosystems follow the laws of conservation of matter and energy	Carbon Cycle Energy Transfer in Food Chains Nitrogen Cycle Recycling Nutrients Water Cycle
e. Define and distinguish between matter and energy, and how they are cycled or lost through life processes	Carbon Cycle Energy Transfer in Food Chains Nitrogen Cycle Recycling Nutrients Water Cycle
f. Describe how carbon, nitrogen, phosphorus, and water cycles work	Carbon Cycle Nitrogen Cycle Water Cycle
g. <i>Use computer simulations to analyze how energy flows through trophic levels</i>	-
2. The size and persistence of populations depend on their interactions with each other and on the abiotic factors in an ecosystem	
a. <i>Analyze and interpret data about the impact of removing keystone species from an ecosystem or introducing non-native species into an ecosystem</i>	-
b. Describe or evaluate communities in terms of primary and secondary succession as they progress over time	Ecosystem and Succession
c. Evaluate data and assumptions regarding different scenarios for future human population growth and their projected consequences	Human Populations Human Impact on the Environment

d. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate ecosystem interactions	–
Analyze the relationship between structure and function in living systems at a variety of organizational levels, and recognize living systems' dependence on natural selection	
3. Cellular metabolic activities are carried out by biomolecules produced by organisms	
e. Identify biomolecules and their precursors/building blocks	Monosaccharides Proteins Nucleic Acids Polysaccharides Lipids
f. Develop, communicate, and justify an evidence-based explanation that biomolecules follow the same rules of chemistry as any other molecule	Monosaccharides Proteins Nucleic Acids Polysaccharides Lipids
g. Develop, communicate, and justify an evidence-based explanation regarding the optimal conditions required for enzyme activity	Enzymes Enzyme Shape
h. Infer the consequences to organisms of suboptimal enzyme function – such as altered blood pH or high fever – using direct and indirect evidence	Enzymes
i. Analyze and interpret data on the body's utilization of carbohydrates, lipids, and proteins	–
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.	
a. Develop, communicate, and justify an evidence-based scientific explanation the optimal environment for photosynthetic activity	Photosynthesis 1 Photosynthesis 2
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	Carbon Cycle
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	Aerobic Respiration Cell Theory
5. Cells use passive and active transport of substances across membranes to maintain relatively stable intracellular environments	
a. Analyze and interpret data to determine the energy requirements and/or rates of substance transport across cell membranes	–
b. Compare organisms that live in freshwater and marine environments, and identify the challenges of osmotic regulation for these organisms	–

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	The Fluid Mosaic Model
d. Use tools to gather, view, analyze, and interpret data produced during scientific investigations that involve passive and active transport	Active Transport Diffusion Osmosis
e. Use computer simulations and models to analyze cell transport mechanisms	Active Transport Diffusion Osmosis
6. Cells, tissues, organs, and organ systems maintain relatively stable internal environments, even in the face of changing external environments	
a. Discuss how two or more body systems interact to promote health for the whole organism	Glucoregulation Homeostasis Thermoregulation
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	Homeostasis
c. Distinguish between causation and correlation in epidemiological data, such as examining scientifically valid evidence regarding disrupted homeostasis in particular diseases	HIV and AIDS
d. Use computer simulations and models of homeostatic mechanisms	Glucoregulation Homeostasis Thermoregulation
Analyze how various organisms grow, develop, and differentiate during their lifetimes based on an interplay between genetics and their environment	
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	
a. Analyze and interpret data that genes are expressed portions of DNA.	DNA Genes and Alleles
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 organisms	Controlling Protein Synthesis DNA Replication 1 DNA Replication 2 Genetic Mutations Transcription and Translation
c. Recognize that proteins carry out most cell activities and mediate the effect of genes on physical and behavioral traits in an organism	Controlling Protein Synthesis
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	Meiosis The Stages of Meiosis

e. Explain using examples how genetic mutations can benefit, harm, or have neutral effects on an organism	DNA Replication 2 Genetic Mutations
8. Multicellularity makes possible a division of labor at the cellular level through the expression of select genes, but not the entire genome.	
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	Cell Differentiation Cells to Organisms Controlling Protein Synthesis
b. Analyze and interpret data that show most eukaryotic deoxyribonucleic acid (DNA) does not actively code for proteins within cells	Controlling Protein Synthesis Understanding Genomes
<i>c. Develop, communicate, and justify an evidence-based scientific explanation for how a whole organism can be cloned from a differentiated – or adult – cell</i>	–
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	Genetic Mutations Smoking
Explain how biological evolution accounts for the unity and diversity of living organisms	
9. Evolution occurs as the heritable characteristics of populations change across generations and can lead populations to become better adapted to their environment	
a. Develop, communicate, and justify an evidence-based scientific explanation for how Earth's diverse life forms today evolved from common ancestors	The Process of Evolution Fossil Record Darwin
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	Fossil Record
<i>c. Analyze and interpret data suggesting that over geologic time, discrete bursts of rapid genetic changes and gradual changes have resulted in speciation</i>	–
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	The Process of Evolution Genetic Variation
<i>e. Generate a model – an evolutionary tree – showing how a group of organisms is most likely diverged from common ancestry</i>	–