

# BUD CARLSON ALTERNATIVE SCHOOL

## GENERAL BIOLOGY COURSE

This Biology course is designed to continue student investigations of the life sciences that began in grades K-8 while providing students the experiences and necessary skills to have a richer knowledge base in biological science. This course is designed as a survey course of Biology while being foundational for in depth courses in advanced biology courses or special topic courses. This course includes the major concepts of the organization of life, energy transformations through organisms and ecosystems, growth and heredity to ensure species survival, the maintenance of biological balance, and basic body systems. Learning in these areas is through direct instruction, student research, cooperative projects, experiments, and demonstration.

Major Concepts:

### Organization of Life

Cell structure and function  
Evolutionary history  
History of life  
Classification of kingdoms  
Ecosystem structure  
Viruses

### Energy transformations through organisms and ecosystems

Chemistry of life  
Function of organic molecules  
Photosynthesis  
Cellular respiration  
Energy flow  
Food chains and webs

### Growth and Heredity to ensure species survival

Asexual and sexual reproduction  
Cell growth  
Mendelian genetics  
DNA and RNA processes  
Chromosomes and mutations  
Natural selection  
Genetic engineering  
DNA Technology  
Biological resistance  
Bioethics

Maintenance of biological balance

- Cellular transport
- Homeostasis
- Natural selection
- Plant adaptations
- Animal adaptations and behavior
- Succession
- Population genetics

Basic Body Systems

- Nutrition
- Digestion
- Circulation
- Blood
- Respiration and excretion
- Support and movement
- Nervous and chemical control
- Senses
- Drugs and behavior

**GENERAL BIOLOGY**

<b>General Biology Competencies</b>	<b>LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, &amp; species).</b>
<b>Knowledge/ Skills</b>	<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:LS1:11:2.1 Identify the structures of different types of cell parts/organelles and explain the functions they perform.</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:LS1:11:2.8 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).</p>

	<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).</p>
<p><b>Science Process Skills</b></p>	<ol style="list-style-type: none"> <li>1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems.</li> <li>2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results.</li> <li>3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns.</li> <li>4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems.</li> <li>5. Students will understand that technology is used to identify and address issues of daily life on a local and global scale.</li> <li>6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.</li> <li>7. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.</li> </ol>
<p><b>Performance Assessment</b></p>	<p>Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.</p>

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<b>General Biology Competencies</b>	<b>LS2– Energy flows and matter recycles through an ecosystem.</b>
<b>Knowledge/ Skills</b>	<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:LS2:11:1.5 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.</p> <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.</p> <p>S:LS2:11:2.1 Use examples from local ecosystems to describe the relationships among organisms at the different trophic levels.</p> <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).</p>
<b>Science Process Skills</b>	<ol style="list-style-type: none"> <li>1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems.</li> <li>2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results.</li> <li>3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns.</li> <li>4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems.</li> <li>5. Students will understand that technology is used to identify and address issues of daily life on a local and global scale.</li> <li>6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.</li> </ol>

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<b>Performance Assessment</b>	<p>Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.</p>

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<b>General Biology Competencies</b>	<p><b>LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).</b></p>
<b>Knowledge/ Skills</b>	<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:LS3:11:2.1 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:LS3:11:2.3 Explain the contributions of Darwin, Malthus, Wallace and Russell to the advancement of life science.</p> <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).</p>

	<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).</p> <p>S:LS3:11:3.1 Explain the concept of natural selection.</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>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).</p>
<p><b>Science Process Skills</b></p>	<ol style="list-style-type: none"> <li>1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems.</li> <li>2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results.</li> <li>3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns.</li> <li>4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems.</li> <li>5. Students will understand that technology is used to identify and address issues of daily life on a local and global scale.</li> <li>6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.</li> <li>7. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.</li> </ol>
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<p><b>General Biology Competencies</b></p>	<p><b>LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.</b></p>
<p><b>Knowledge/ Skills</b></p>	<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>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:LS4:11:2.6 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).</p> <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> <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</p>
<p><b>Science Process Skills</b></p>	<ol style="list-style-type: none"> <li>1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems.</li> <li>2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results.</li> <li>3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns.</li> <li>4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems.</li> </ol>

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<b>General Biology Competencies</b>	<p><b>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.</b></p>
<b>Knowledge/ Skills</b>	<p>S:LS5:11:1.1 Describe ways in which technology has increased our understanding of the life sciences.</p> <p>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.</p> <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:LS5:11:4.1 Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to the life sciences.</p>
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