

<b><u>VDOE Standard of Learning</u></b>	<b><u>Skill Mastery Objective</u></b>
<p><b>1. Students will demonstrate understanding of scientific reasoning, logic, and the nature of science through investigation.</b></p>	<ul style="list-style-type: none"> <li>• SWBAT conduct investigations in the classroom and in the field.</li> <li>• SWBAT critically examine investigations.</li> <li>• SWBAT observe and record qualitatively and quantitatively.</li> <li>• SWBAT hypothesize about and test cause and effect.</li> <li>• SWBAT identify independent and dependent variables, constants, and controls.</li> <li>• SWBAT write clear, replicable procedures.</li> <li>• SWBAT create, use, and discuss diagrams of data and its meaning.</li> <li>• SWBAT argue a case logically based upon data.</li> </ul>
<p><b>2. Students will investigate and understand the chemical and biochemical principles essential for life.</b></p>	<ul style="list-style-type: none"> <li>• SWBAT explain what makes water vital for life and why.</li> <li>• SWBAT identify the main components of living cells. (CHONPS)</li> <li>• SWBAT explain what makes the four categories of macromolecules important and why.</li> <li>• SWBAT describe and diagram how enzymes catalyze reactions.</li> <li>• SWBAT illustrate how and why light is a major energy source.</li> <li>• SWBAT correlate photosynthesis with respiration.</li> </ul>
<p><b>3. Students will investigate and understand how cells are structured and how they function.</b></p>	<ul style="list-style-type: none"> <li>• SWBAT outline the history of cell theory.</li> <li>• SWBAT compare and contrast prokaryotic and eukaryotic cells.</li> <li>• SWBAT compare and contrast single cell organelles and whole organisms.</li> <li>• SWBAT identify the form and function of essential cell structures.</li> <li>• SWBAT illustrate how selective permeability, diffusion, osmosis, active transport, and surface area impact solubility.</li> </ul>
<p><b>4. Students will investigate and understand life functions of bacteria and eukarya.</b></p>	<ul style="list-style-type: none"> <li>• SWBAT characterize metabolism for various life forms.</li> <li>• SWBAT theorize and illustrate organism response to environmental change.</li> <li>• SWBAT compare and contrast eukarya based on cells, movement, reproduction, and response to environmental change.</li> <li>• SWBAT illustrate the main factors that affect human health.</li> <li>• SWBAT illustrate the form and function of human body systems.</li> <li>• SWBAT compare and contrast viruses and cells.</li> <li>• SWBAT describe germ theory.</li> </ul>

<p><b>5. Students will investigate and understand how and why traits are inherited through proteins.</b></p>	<ul style="list-style-type: none"> <li>• SWBAT describe and diagram the stages of and processes within mitosis and meiosis.</li> <li>• SWBAT compare and contrast mitosis and meiosis, and why each occurs.</li> <li>• SWBAT demonstrate the importance of cell specialization in multicellular organisms.</li> <li>• SWBAT illustrate heredity, patterns of inheritance, and traits expressed by a genotype.</li> <li>• SWBAT use a Punnet square to show all possible gamete combinations and the likelihood of each combination occurring.</li> <li>• SWBAT evaluate a karyotype chart to determine gender and genetic health of an individual.</li> <li>• SWBAT rationalize genetic diversity and its advantage.</li> <li>• SWBAT illustrate lethal, harmful, and beneficial mutations.</li> <li>• SWBAT describe the form and function of DNA and its replication.</li> <li>• SWBAT outline the history of development of the DNA model.</li> <li>• SWBAT write a complimentary mRNA strand for a given DNA sequence.</li> <li>• SWBAT illustrate the process of protein synthesis, including transcription and translation.</li> <li>• SWBAT meaningfully debate various sides of arguments regarding genetic engineering.</li> </ul>
<p><b>6. Students will investigate and understand the bases of modern classification.</b></p>	<ul style="list-style-type: none"> <li>• SWBAT construct and use dichotomous keys to classify objects and organisms.</li> <li>• SWBAT describe relationships based on homologous structures.</li> <li>• SWBAT compare structural characteristics of an extinct organism evidenced by its fossil record with present and familiar organisms.</li> <li>• SWBAT describe similarities and relationships between diverse embryonic stages.</li> <li>• SWBAT compare biochemical evidence and describe relationships between them.</li> <li>• SWBAT interpret a cladogram or phylogenetic tree.</li> <li>• SWBAT apply classification systems to flora and fauna in the field.</li> </ul>
<p><b>7. Students will investigate and understand how populations change through time.</b></p>	<ul style="list-style-type: none"> <li>• SWBAT determine the relative age of a fossil, based on its position in the rock and radioactive decay.</li> <li>• SWBAT differentiate between relative and absolute fossil dating.</li> <li>• SWBAT illustrate the impact of reproductive strategies and adaptations on the survivability of an organism or population.</li> <li>• SWBAT illustrate how genetic variation and natural selection leads to gradual changes and new species.</li> <li>• SWBAT predict the impact of environmental change on a population.</li> <li>• SWBAT compare and contrast punctuated equilibrium to gradual change over time.</li> </ul>

**8. Students will investigate and understand dynamic equilibrium.**

- SWBAT graph and interpret a population's growth curve and carrying capacity.
- SWBAT predict changes in a population as the result of population interaction.
- SWBAT model key processes in water, carbon, and nitrogen cycles.
- SWBAT identify each producer, consumer, and decomposer in a food chain or web.
- SWBAT interpret how the flow of energy occurs between trophic levels in ecosystems.
- SWBAT identify and describe an ecosystem.
- SWBAT describe patterns of succession in water and land ecosystems in Virginia.
- SWBAT compare and contrast primary and secondary succession.
- SWBAT model a climax community.
- SWBAT apply ecological principles to local ecosystems in the field, where appropriate.
- SWBAT evaluate negative and positive impacts of humans on Virginia's ecosystems.

*Developed from the September 23, 2010 revision of the VDOE Biology SOL Curriculum Framework.  
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