<table>
<thead>
<tr>
<th>Unit</th>
<th>Indicators</th>
<th>Major Topics/Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>H.B.2A.1</td>
<td>Construct explanations of how the structures of carbohydrates, lipids, proteins, and nucleic acids (including DNA and RNA) are related to their functions in organisms. Plan and conduct investigations to determine how various environmental factors (including temperature and pH) affect enzyme activity and the rate of biochemical reactions.</td>
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<tr>
<td></td>
<td>H.B.2A.2</td>
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<td></td>
<td>*H.B.1A.3</td>
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<td>*H.B.1A.6</td>
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<tr>
<td>Cell Structure, Function, and Differentiation</td>
<td>H.B.2B.1</td>
<td>Develop and use models to explain how specialized structures within cells (including the nucleus, chromosomes, cytoskeleton, endoplasmic reticulum, ribosomes, and Golgi complex) interact to produce, modify, and transport proteins. Models should compare and contrast how prokaryotic cells meet the same life needs as eukaryotic cells without similar structures.</td>
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<td></td>
<td>H.B.2B.2</td>
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<td>H.B.2D.1</td>
<td>Collect and interpret descriptive data on cell structure to compare and contrast different types of cells (including prokaryotic versus eukaryotic, and animal versus plant versus fungal).</td>
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<td>H.B.2D.4</td>
<td>Obtain information to contrast the structure of viruses with that of cells and to explain, in general, why viruses must use living cells to reproduce.</td>
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<td>*H.B.1A.2</td>
<td>Construct models to explain how the processes of cell division and cell differentiation produce and maintain complex multicellular organisms.</td>
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<td>*H.B.1A.3</td>
<td>Construct scientific arguments to support the pros and cons of biotechnological applications of stem cells using examples from both plants and animals.</td>
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<td>*H.B.1A.4</td>
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<td>*H.B.1A.7</td>
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<td>*H.B.1A.8</td>
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<tr>
<td>Cellular Transport and Homeostasis</td>
<td>H.B.2C.1</td>
<td>Develop and use models to exemplify how the cell membrane serves to maintain homeostasis of the cell through both active and passive transport processes. Ask scientific questions to define the problems that organisms face in maintaining homeostasis within different environments (including water of varying solute concentrations).</td>
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<tr>
<td></td>
<td>H.B.2C.2</td>
<td>Analyze and interpret data to explain the movement of molecules (including water) across a membrane.</td>
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<tr>
<td>Photosynthesis and Cellular Respiration</td>
<td>H.B.3A.1</td>
<td>Develop and use models to explain how chemical reactions among ATP, ADP, and inorganic phosphate act to transfer chemical energy within cells. Develop and revise models to describe how photosynthesis transforms light energy into stored chemical energy.</td>
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<td>H.B.3A.5</td>
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<tr>
<td><strong>Cell Division, Growth, and Reproduction</strong></td>
<td>H.B.4A.1, H.B.4A.2, H.B.2D.2, H.B.2D.3, *H.B.1A.2, *H.B.1A.7</td>
<td>Develop and use models at different scales to explain the relationship between DNA, genes, and chromosomes in coding the instructions for characteristic traits transferred from parent to offspring. Develop and use models to explain how genetic information (DNA) is copied for transmission to subsequent generations of cells (mitosis). Develop and use models to exemplify the changes that occur in a cell during the cell cycle (including changes in cell size, chromosomes, cell membrane/cell wall, and the number of cells produced), and predict, based on the models, what might happen to a cell that does not progress through the cycle correctly. Construct explanations for how the cell cycle is monitored by check point systems, and communicate possible consequences of the continued cycling of abnormal cells.</td>
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<td><strong>1st Cumulative Benchmark</strong> (covering all content to this point)</td>
<td>H.B.4B.1, H.B.4D.1, *H.B.1A.2</td>
<td>Develop and use models to describe how the structure of DNA determines the structure of resulting proteins or RNA molecules that carry out the essential functions of life. Develop and use models to explain how mutations in DNA that occur during replication (1) can affect the proteins that are produced or the traits that result and (2) may or may not be inherited.</td>
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<td><strong>From DNA to RNA to Proteins</strong></td>
<td>H.B.4C.1, H.B.4C.2, H.B.4C.3, H.B.4B.2, *H.B.1A.2</td>
<td>Develop and use models of sex cell formation (meiosis) to explain why the DNA of the daughter cells is different from the DNA of the parent cell. Analyze data on the variation of traits among individual organisms within a population to explain</td>
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<td><strong>Genetics and Biotechnology</strong></td>
<td>H.B.4C.1, H.B.4C.2, H.B.4C.3, H.B.4B.2, *H.B.1A.2</td>
<td>Develop and use models of sex cell formation (meiosis) to explain why the DNA of the daughter cells is different from the DNA of the parent cell. Analyze data on the variation of traits among individual organisms within a population to explain</td>
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<td>*H.B.1A.4</td>
<td>patterns in the data in the context of transmission of genetic information.</td>
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<td>*H.B.1A.7</td>
<td>Construct explanations for how meiosis followed by fertilization ensures genetic variation among offspring within the same family and genetic diversity within populations of sexually reproducing organisms.</td>
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<td>*H.B.1A.8</td>
<td>Obtain, evaluate, and communicate information on how biotechnology (including gel electrophoresis, plasmid-based transformation and DNA fingerprinting) may be used in the fields of medicine, agriculture, and forensic science.</td>
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<td>Biological Evolution</td>
<td>B-5.1</td>
<td>Summarize the process of natural selection.</td>
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<td>B-5.2</td>
<td>Explain how genetic processes result in the continuity of life-forms over time.</td>
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<td>B-5.3</td>
<td>Explain how diversity within a species increases the chances of survival.</td>
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<td>B-5.4</td>
<td>Explain how genetic variability and environmental factors lead to biological evolution.</td>
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<td>B-5.5</td>
<td>Exemplify scientific evidence in the fields of anatomy, embryology, biochemistry, and paleontology that underlies the theory of biological evolution.</td>
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<td>B-5.6</td>
<td>Summarize ways that scientists use data from a variety of sources to investigate and critically analyze aspects of evolutionary theory.</td>
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<td>B-5.7</td>
<td>Use a phylogenetic tree to identify the evolutionary relationships among different groups of organisms.</td>
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<tr>
<td>Ecology</td>
<td>H.B.6A.1</td>
<td>Analyze and interpret data that depict changes in the abiotic and biotic components of an ecosystem over time or space (such as percent change, average change, correlation, and proportionality), and propose hypotheses about possible relationships between the changes in the abiotic components and the biotic components of the environment.</td>
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<td>H.B.6A.2</td>
<td>Use mathematical and computational thinking to support claims that limiting factors affect the number of individuals that an ecosystem can support.</td>
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<td>H.B.6B.1</td>
<td>Develop and use models of the carbon cycle, which include the interactions between photosynthesis, cellular respiration, and other processes that release carbon dioxide, to evaluate the effects of increasing atmospheric carbon dioxide on natural and agricultural ecosystems.</td>
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<td>H.B.6B.2</td>
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<td>H.B.6C.1</td>
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<td>H.B.6D.1</td>
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Analyze and interpret quantitative data to construct an explanation for the effects of greenhouse gases (such as carbon dioxide and methane) on the carbon cycle and global climate. Construct scientific arguments to support claims that the changes in the biotic and abiotic components of various ecosystems over time affect the ability of an ecosystem to maintain homeostasis.
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<td>Design solutions to reduce the impact of human activity on the biodiversity of an ecosystem</td>
<td>[Final Comprehensive Benchmark (covering all content)]</td>
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*Please note that the indicators of Standard H.B.1 address science and engineering practices that are not intended for teaching, learning, or assessment in isolation. As stated by the SC Academic Standards Support document, this standard describes “how students should learn and demonstrate knowledge of the content outlined in other standards.” For this reason, the pacing guide identifies key indicators that should be incorporated into instruction for each unit. The list provided for each unit, however, is not exhaustive. Any and all of the science and engineering practices outlined by Standard H.B.1 could be incorporated into instructional methods or assessment items in each unit of study.*