

Course Outline: Biology

<u>Time Frame</u>	<u>Course Content</u>
FIRST SEMESTER	

Study of Life	<ol style="list-style-type: none"> 1. What is Living? 2. Living or Non-living 3. Characteristics of Life Lab 4. The Nature of Science 5. Methods of Science 6. Formal Lab Write-Up 7. Lab Safety
The Cell	<ol style="list-style-type: none"> 1. Chemistry in Biology <ol style="list-style-type: none"> a. Atoms, Elements and Compounds b. Chemical Reactions c. Water and Solutions d. Organic Chemistry <p>HS.LS1.6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.</p> 2. Cellular Structure and Function <ol style="list-style-type: none"> a. Cell Discovery and Theory b. The Cell Membrane c. Structures and Organelles d. Cellular Transport 3. Cellular Energy <ol style="list-style-type: none"> a. How Organisms Obtain Energy <p>HS.LS1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</p> <p>HS.LS1.3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.</p> b. Photosynthesis <p>HS.LS1.5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.</p> c. Cellular Respiration <p>HS.LS1.7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.</p> 4. Cellular Reproduction <ol style="list-style-type: none"> a. Cellular Growth b. Mitosis and Cytokinesis

	<p>HS.LS1.4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.</p> <p>c. Cell Cycle Regulation</p>
<p>Genetics</p>	<p>1. Sexual Reproduction</p> <p>a. Meiosis</p> <p>b. Mendelian Genetics</p> <p>HS.LS3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>2. Complex Inheritance and Human Heredity</p> <p>a. Basic Patterns of Human Inheritance</p> <p>b. Chromosomes and Human Heredity</p> <p>HS.LS3.1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.</p> <p>HS.LS3.2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis,(2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.</p> <p>3. Molecular Genetics</p> <p>a. Introduction to DNA</p> <p>HS.LS1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells</p> <p>b. Replication of DNA</p> <p>c. DNA, RNA and Protein Synthesis</p> <p>d. Gene Regulation and Mutation</p>

Course Outline: Biology

<u>Time Frame</u>	<u>Course Content</u>
SECOND SEMESTER	

Evolution	<ol style="list-style-type: none"> 1. The History of Life <ol style="list-style-type: none"> a. Fossil Evidence b. The Origin of Life 2. Evolution <ol style="list-style-type: none"> a. Darwin’s Theory of Evolution by Natural Selection <p>HS.LS4.3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.</p> <p>HS.LS4.4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.</p> <p>HS.LS4.5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.</p> b. Evidence of Evolution <p>HS.LS4.1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p> <p>HS.LS4.2 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.</p>
Ecology	<ol style="list-style-type: none"> 1. Principles of Ecology <ol style="list-style-type: none"> a. Organisms and Their Relationships <p>HS.LS2.8 Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce.</p> b. Flow of Energy in an Ecosystem <p>HS.LS2.3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.</p> <p>HS.LS2.4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</p> c. Cycling of Matter <p>HS.LS2.3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.</p>

	<p>HS.LS2.4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</p> <p>HS.LS2.5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.</p> <ol style="list-style-type: none"> 2. Communities, Biomes, and Ecosystems <ol style="list-style-type: none"> a. Community Ecology b. Terrestrial Biomes c. Aquatic Biomes 3. Population Ecology <ol style="list-style-type: none"> a. Population Dynamics <p>HS.LS2.1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.</p> b. Human Population 4. Biodiversity and Conservation <ol style="list-style-type: none"> a. Biodiversity b. Threats to Biodiversity <p>HS.LS2.2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p> c. Conserving Biodiversity <p>HS.LS2.6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.</p> <p>HS.LS2.7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.</p> <p>HS.LS4.6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.</p>
<p>Classification and Taxonomy</p>	<ol style="list-style-type: none"> 1. Organizing Life’s Diversity <ol style="list-style-type: none"> a. The History of Classification b. Modern Classification c. Domains and Kingdoms