

**Grade:** LHS  
**Course:** Introduction to Life Science  
**Year:** 2018



### Mission Statement

In partnership with our families and community, Lakewood City Schools will develop responsible citizens, who are critical and creative thinkers, committed to life-long learning, invested in a diverse society, and prepared for technological and global opportunities.

#### Thinking Skills - The student demonstrates:

1. Critical Thinking Skills include the ability to analyze, criticize, advocate ideas, reason inductively and deductively, and to reach factual and judgemental conclusions.
2. Creative Problem Solving by identifying and analyzing a problem, thinking divergently and evaluating the implementation of possible solutions.
3. Research skills by compiling, evaluating and presenting data.
4. Communication Skills

Suggested Pacing	Content Standards	Learning and Performance Expectations	Assessment of Learning	Learning Resources
1st Quarter	<p><b>B.C: CELLS</b></p> <ul style="list-style-type: none"> <li>● B.C.1: Cell structure and function               <ul style="list-style-type: none"> <li>o Structure, function and interrelatedness of cell organelles</li> </ul> </li> </ul>	<p><b>Nature of Life</b></p> <ul style="list-style-type: none"> <li>● List and describe/explain the steps in the Scientific Method</li> <li>● Create a proper scientific graph from provided data; read/interpret information from a graph</li> <li>● Define and describe the following terms: biology, spontaneous generation, homeostasis, metabolism, cell, ethics</li> <li>● Compare and contrast sexual vs. asexual reproduction</li> <li>● Compare stimulus vs. response, and give examples of each</li> <li>● List and describe the characteristics of living things</li> </ul> <p><b>Chemistry of Life</b></p> <ul style="list-style-type: none"> <li>● Identify the six basic elements that make up all organic compounds</li> <li>● Distinguish between dehydration synthesis and hydrolysis (polymerization).</li> </ul>	<p>Both formative and summative assessments are used. Varies from teacher to teacher, but includes:</p> <ul style="list-style-type: none"> <li>● Lab write-ups/reports</li> <li>● Tests/Quizzes</li> <li>● Research Projects</li> <li>● Midterm exam</li> </ul>	<p>Biology by Stephen Nowicki, Houghton Mifflin Harcourt, Copyright 2017.</p> <p>HHMI interactives  <a href="http://www.hhmi.org/biointeractive">http://www.hhmi.org/biointeractive</a></p>

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		<ul style="list-style-type: none"> <li>● Recognize carbon's ability to form many different compounds.</li> <li>● Identify the 4 groups of organic compounds found in living things</li> <li>● Identify each of the monomers for each of the 4 organic compounds.</li> <li>● Compare and contrast DNA and RNA</li> <li>● Explain how enzymes work and why they are important in living organisms.</li> <li>● Discuss the effects of environmental conditions (temperature, pH and concentration) on the structure and function of biological molecules.</li> </ul>		
2nd Quarter	<p><b>B.C: CELLS</b></p> <ul style="list-style-type: none"> <li>● B.C.1: Cell structure and function           <ul style="list-style-type: none"> <li>○ Eukaryotic cells and prokaryotic cells</li> </ul> </li> <li>● B.C.2: Cellular processes           <ul style="list-style-type: none"> <li>○ Characteristics of life regulated by cellular processes</li> <li>○ Photosynthesis, chemosynthesis, cellular respiration, biosynthesis of macromolecules</li> </ul> </li> </ul>	<p><b>Cell Structure and Function</b></p> <ul style="list-style-type: none"> <li>● Evaluate the cell as a system that conducts a variety of functions associated with life.</li> <li>● Discuss the role of a cell in a larger system, such as a multicellular organism or ecosystem.</li> <li>● Distinguish between Eukaryotes and Prokaryotes</li> <li>● Classify organisms based on observation of similarities and differences</li> <li>● Explain how form follows function in relation to cell organelles</li> <li>● Describe the role of organelles in the life processes of the cell</li> <li>● Describe the role of cell membrane (selective permeability)</li> <li>● Differentiate between diffusion and osmosis</li> <li>● Compare and contrast active and</li> </ul>	<p>Both formative and summative assessments are used. Varies from teacher to teacher, but includes:</p> <ul style="list-style-type: none"> <li>● Lab write-ups/reports</li> <li>● Tests/Quizzes</li> <li>● Research Projects</li> <li>● Midterm exam</li> </ul>	<p>Biology by Stephen Nowicki, Houghton Mifflin Harcourt, Copyright 2017.</p> <p>HHMI interactives  <a href="http://www.hhmi.org/biointeractive">http://www.hhmi.org/biointeractive</a></p>

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		<p>passive transport</p> <ul style="list-style-type: none"> <li>• Differentiate between isotonic, hypertonic and hypotonic solutions</li> <li>• Compare and contrast exocytosis and endocytosis</li> <li>• Explain how enzymes work and why they are important in living organisms.</li> <li>• Discuss the effects of environmental conditions (temperature, pH and concentration) on the structure and function of biological molecules.</li> </ul> <p><b>Photosynthesis and Respiration</b></p> <ul style="list-style-type: none"> <li>• Define ATP and describe its role in the cell.</li> <li>• Compare and contrast ATP and ADP.</li> <li>• Explain how photosynthesis and cellular respiration are complementary processes.</li> <li>• Examine the reactants and products of each process</li> <li>• Differentiate between aerobic processes and anaerobic processes.</li> </ul> <p><b>Cell growth and division</b></p> <ul style="list-style-type: none"> <li>• Identify the steps in cell division (mitosis) and differentiation</li> <li>• Describe the exceptions to the normal cellular process (i.e. cancer)</li> </ul>		
3rd Quarter	<p><b>B.H: HEREDITY</b></p> <ul style="list-style-type: none"> <li>• B.H.1: Cellular genetics</li> <li>• B.H.2: Structure and function of DNA in cells</li> </ul>	<p><b>Mendelian genetics, Punnett squares, Meiosis</b></p> <ul style="list-style-type: none"> <li>• Distinguish between genotype and phenotype</li> <li>• Explain the three principles of genetics</li> </ul>	Both formative and summative assessments are used. Varies from teacher to teacher, but includes:	Biology by Stephen Nowicki, Houghton Mifflin Harcourt, Copyright 2017.

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	<ul style="list-style-type: none"> <li>● B.H.3: Genetic mechanisms and inheritance</li> <li>● B.H.4: Mutations</li> <li>● B.H.5: Modern genetics</li> </ul> <p><b>B.E: EVOLUTION</b></p> <ul style="list-style-type: none"> <li>● B.E.1: Mechanisms           <ul style="list-style-type: none"> <li>○ Natural selection</li> <li>○ Mutation</li> <li>○ Genetic drift</li> <li>○ Gene flow (immigration, emigration)</li> <li>○ Sexual selection</li> </ul> </li> </ul>	<p>that Mendel obtained through his experiments</p> <ul style="list-style-type: none"> <li>● Explain the differences between mitosis and meiosis</li> <li>● Apply Punnett squares to make predictions.</li> <li>● Explain modern genetics in terms of Mendel's laws of inheritance and our current knowledge of DNA and chromosome structure and function</li> <li>● Relate the recombination of genes in sexual reproduction to variance in traits of the offspring and evolution</li> <li>● Summarize the role of co-dominance, incomplete dominance, sex-linked traits, polygenetic traits (epistasis), multiple alleles</li> <li>● Illustrate and interpret goodness of fit test (Chi-square), monohybrid and dihybrid crosses</li> </ul> <p><b>RNA and DNA</b></p> <ul style="list-style-type: none"> <li>● Relate the biological information contained in a genome with the structure of deoxyribonucleic acid (DNA) and genes.</li> <li>● Describe the process of DNA replication relate the sequence of DNA bases in a chromosome to the sequence of amino acids in a protein.</li> <li>● Describe the steps in protein synthesis (transcription, translation)</li> <li>● Describe the effects of inserting, deleting or substituting segments of DNA molecules on genes.</li> </ul>	<ul style="list-style-type: none"> <li>● Lab write-ups/reports</li> <li>● Tests/Quizzes</li> <li>● Research Projects</li> </ul>	<p>HHMI interactives  <a href="http://www.hhmi.org/biointeractive">http://www.hhmi.org/biointeractive</a></p>
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		<ul style="list-style-type: none"> <li>● Explain the effects of altering DNA on the offspring and its success in its environment</li> <li>● Describe the relationship between DNA sequence, amino acid sequence and final protein structure and function</li> </ul> <p><b>Genetic Engineering</b></p> <ul style="list-style-type: none"> <li>● Describe how technological advances have led to the current knowledge of heredity such as the model for DNA</li> </ul> <p><b>The Human Genome</b></p> <ul style="list-style-type: none"> <li>● Identify the four types of chromosomal mutations</li> <li>● Identify the two kinds of frameshift mutations</li> <li>● Sequence the events of nondisjunction in Meiosis</li> <li>● Describe how the events of nondisjunction lead to genetic disorders</li> <li>● Describe how chromosomes determine sex</li> <li>● Explain why sex linked disorders occur in one sex more often than in the other</li> <li>● Analyze a pedigree to determine the mode of inheritance</li> <li>● Use a pedigree to trace a trait through many generations of a family</li> </ul> <p><b>Darwin and Adaptation</b></p> <ul style="list-style-type: none"> <li>● Describe how natural variation is used in artificial selection</li> <li>● Explain how natural selection is related to species' fitness</li> </ul>		
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		<ul style="list-style-type: none"> <li>● Identify evidence Darwin used to present his case for evolution</li> <li>● Describe Darwin's theory of evolution by natural selection</li> <li>● Compare and contrast analogous and homologous structures</li> <li>● Compare and contrast artificial and natural selection</li> <li>● Analyze experimental data and infer that the environment affects survival</li> <li>● Given certain environmental criteria, design a model organism with evolutionary adaptations that will allow that organism to survive and reproduce</li> <li>● Compare and contrast the concept of natural selection and evolution according to Hutton, Malthus, Lamarck, Darwin, Lyell, and Wallace</li> </ul>		
4th Quarter	<p><b>B.E: EVOLUTION</b></p> <ul style="list-style-type: none"> <li>● B.E.2: Speciation <ul style="list-style-type: none"> <li>o Biological classification expanded to molecular evidence</li> <li>o Variation of organisms within a species due to population genetics and gene frequency</li> </ul> </li> </ul> <p><b>B.DI: DIVERSITY AND INTERDEPENDENCE OF LIFE</b></p> <ul style="list-style-type: none"> <li>● B.DI.1: Biodiversity <ul style="list-style-type: none"> <li>o Genetic diversity</li> <li>o Species diversity</li> </ul> </li> <li>● B.DI.2: Ecosystems</li> </ul>	<p><b>Evolution of Populations</b></p> <ul style="list-style-type: none"> <li>● Summarize the effects of the different types of natural selection on gene pools.</li> <li>● Relate changes in genetic equilibrium to mechanisms of speciation.</li> <li>● Explain the concept of gene pool</li> <li>● Identify the main sources of inheritable variation in a population</li> <li>● Explain how natural selection affects single gene and polygenic traits</li> <li>● Describe genetic drift</li> <li>● List the five conditions needed to maintain genetic equilibrium</li> <li>● Identify the conditions necessary for a new species to evolve</li> </ul>	<p>Both formative and summative assessments are used. Varies from teacher to teacher, but includes:</p> <ul style="list-style-type: none"> <li>● Lab write-ups/reports</li> <li>● Tests/Quizzes</li> <li>● Research Projects</li> <li>● Final Exam</li> </ul>	<p>Biology by Stephen Nowicki, Houghton Mifflin Harcourt, Copyright 2017.</p> <p>HHMI interactives  <a href="http://www.hhmi.org/biointeractive">http://www.hhmi.org/biointeractive</a></p>

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	<ul style="list-style-type: none"> <li>o Equilibrium and disequilibrium</li> <li>o Carrying capacity</li> <li>● B.DI.3: Loss of Diversity</li> <li>o Climate change</li> <li>o Anthropocene effects</li> <li>o Extinction</li> <li>o Invasive species</li> </ul>	<ul style="list-style-type: none"> <li>● Calculate genotype ratios in a model population and compare them with Mendelian ratios</li> <li>● Summarize the effects of the different types of natural selection on gene pools and how these influence diversity within a population.</li> <li>● Explain the significance of gene pools in understanding evolution.</li> <li>● Tell how genetic drift, gene flow (immigration and emigration), mutations, and natural selection contribute to changes in the gene pool by altering genetic frequencies of genes.</li> <li>● Identify the 2 types of genetic drift.</li> <li>● Identify the five conditions (Hardy-Weinberg) that must be met to maintain genetic equilibrium.</li> </ul> <p><b>Classification</b></p> <ul style="list-style-type: none"> <li>● Understand that evolution explains the natural origins for the diversity of life.</li> <li>● Explain the effects of physical/chemical constraints on all biological relationships and systems.</li> <li>● Understand that ecosystems tend to have cyclic fluctuations around a state of rough equilibrium. (biogeochemical cycles)</li> <li>● Understand that ecosystems always change as geological or biological conditions vary. (succession)</li> <li>● Analyze experimental data and infer that the environment affects survival.</li> </ul>		
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		<ul style="list-style-type: none"> <li>● The cycling of matter and flow of energy occurs at all levels of biological organization, from molecules to ecosystems. (food web, food chain, etc.)</li> <li>● Apply algebraic knowledge to explain concepts of carrying capacity.</li> <li>● Construct a model to exemplify biomagnification in an ecosystem such as mercury in Lake Erie.</li> <li>● Examine wildlife and the factors that have impacted the carrying capacity.</li> <li>● Describe symbiotic relationships and predator prey relationship.</li> <li>● Compare and contrast exponential vs. logistical growth; types for different organisms</li> <li>● Define monoculture; describe advantages and disadvantages</li> <li>● Differentiate between threatened, endangered, and extinct species.</li> <li>● Define/describe threats to ecosystems, including: invasive species, habitat fragmentation, edge effect, acid rain, depletion of the ozone layer</li> <li>● Compare and contrast bacteria and viruses.</li> <li>● Explain the lytic cycle for a virus.</li> <li>● Describe the major categories of the Kingdom Protista.</li> <li>● Understand the differences between prokaryotes and eukaryotes.</li> <li>● Understand and explain the diversity of life.</li> </ul>		
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