

Grade: LHS
Course: Advanced Biology
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.C: CELLS</p> <ul style="list-style-type: none"> ● B.C.1: Cell structure and function <ul style="list-style-type: none"> o Structure, function and interrelatedness of cell organelles o Eukaryotic cells and prokaryotic cells ● B.C.2: Cellular processes <ul style="list-style-type: none"> o Characteristics of life regulated by cellular processes o Photosynthesis, chemosynthesis, cellular respiration, biosynthesis of macromolecules 	<p>Chemistry of Life</p> <ul style="list-style-type: none"> ● Identify the six basic elements that make up all organic compounds ● Distinguish between dehydration synthesis and hydrolysis (polymerization). ● Recognize carbon's ability to form many different compounds. ● Describe the structures, functions, properties, and types of carbohydrates, lipids, proteins and nucleic acids. ● Describe the special properties of water that make it vital to living system. Explain how these properties are related to hydrogen bonding. ● Examine buffers and how they function ● Describe the special properties of water that make it vital to living system. Explain how these properties are related to hydrogen bonding. <p>Cell Structure and Function</p> <ul style="list-style-type: none"> ● Evaluate the cell as a system that 	<p>Both formative and summative assessments are used. Varies from teacher to teacher, but includes:</p> <ul style="list-style-type: none"> ● Lab write-ups/reports ● Tests/Quizzes ● Research Projects 	<p>Campbell Biology: Concepts and Connections by Martha Taylor et al, Pearson, Copyright 2018.</p> <p>HHMI interactives http://www.hhmi.org/biointeractive</p>

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		<p>conducts a variety of functions associated with life.</p> <ul style="list-style-type: none">● Discuss the role of a cell in a larger system, such as a multicellular organism or ecosystem.● Distinguish between the structures of prokaryotic and eukaryotic cells● Explain how form follows function in relation to cell organelles● Describe the role of cell membrane (selective permeability)● Differentiate between diffusion and osmosis● Compare and contrast active and passive transport● Differentiate between isotonic, hypertonic and hypotonic solutions● Compare and contrast exocytosis and endocytosis● Explain how enzymes work and why they are important in living organisms.● Discuss the effects of environmental conditions (temperature, pH and concentration) on the structure and function of biological molecules. <p>Photosynthesis and Respiration</p> <ul style="list-style-type: none">● Define ATP and describe its role in the cell.● Compare and contrast ATP and ADP.● List the cellular regions where glycolysis, the citric acid cycle, and oxidative phosphorylation occur. Note whether substrate-level phosphorylation or		
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		<p>chemiosmosis occur at each of these sites.</p> <ul style="list-style-type: none"> ● Explain how photosynthesis and cellular respiration are complementary processes. ● Compare the reactants, products and energy yield of alcohol and lactic acid fermentation. ● Define autotrophs, producers, and photoautotrophs. ● Compare the reactants and products of the light reactions and the calvin cycle. <p>Explain how photosynthesis relates to these reactions.</p> <ul style="list-style-type: none"> ● Compare the mechanisms that C3, C4, and CAM plants use to obtain and use carbon dioxide. 		
2nd quarter	<p>B.H: HEREDITY</p> <ul style="list-style-type: none"> ● B.H.1: Cellular genetics ● B.H.2: Structure and function of DNA in cells ● B.H.3: Genetic mechanisms and inheritance ● B.H.4: Mutations ● B.H.5: Modern genetics 	<p>Mendelian genetics, Punnett squares, Meiosis</p> <ul style="list-style-type: none"> ● Distinguish between genotype and phenotype ● Explain the three principles of genetics that Mendel obtained through his experiments ● Explain the differences between mitosis and meiosis ● Apply Punnett squares to make predictions. ● Explain modern genetics in terms of Mendel's laws of inheritance and our current knowledge of DNA and chromosome structure and function ● Relate the recombination of genes in sexual reproduction to variance in 	<p>Both formative and summative assessments are used. Varies from teacher to teacher, but includes:</p> <ul style="list-style-type: none"> ● Lab write-ups/reports ● Tests/Quizzes ● Research Projects ● Midterm exam 	<p>Campbell Biology: Concepts and Connections by Martha Taylor et al, Pearson, Copyright 2018.</p> <p>HHMI interactives http://www.hhmi.org/biointeractive</p>

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		<p>traits of the offspring and evolution</p> <ul style="list-style-type: none"> • Summarize the role of co-dominance, incomplete dominance, sex-linked traits, polygenetic traits (epistasis), multiple alleles, genes that affect more than one trait (pleiotropy) and linkage groups • Illustrate and interpret goodness of fit test (Chi-square), monohybrid and dihybrid crosses <p>RNA and DNA</p> <ul style="list-style-type: none"> • Relate the biological information contained in a genome with the structure of deoxyribonucleic acid (DNA) and genes. • Describe the process of DNA replication relate the sequence of DNA bases in a chromosome to the sequence of amino acids in a protein. • Describe the steps in protein synthesis (transcription, translation) • Describe the effects of inserting, deleting or substituting segments of DNA molecules on genes. • Explain the effects of altering DNA on the offspring and its success in its environment • Describe the relationship between DNA sequence, amino acid sequence and final protein structure and function <p>Genetic Engineering</p> <ul style="list-style-type: none"> • Describe how technological advances have led to the current knowledge of 		
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		<p>heredity such as the model for DNA</p> <ul style="list-style-type: none"> • Discuss modern genetic techniques such as cloning and the resulting ethical considerations • Explain how DNA evidence can be used to solve crimes. <p>The Human Genome</p> <ul style="list-style-type: none"> • Identify the four types of chromosomal mutations • Identify the two kinds of frameshift mutations • Sequence the events of nondisjunction in Meiosis • Describe how the events of nondisjunction lead to genetic disorders • Describe how chromosomes determine sex • Explain why sex linked disorders occur in one sex more often than in the other • Analyze a pedigree to determine the mode of inheritance • Use a pedigree to trace a trait through many generations of a family 		
3rd quarter	<p>B.E: EVOLUTION</p> <ul style="list-style-type: none"> • B.E.1: Mechanisms <ul style="list-style-type: none"> o Natural selection o Mutation o Genetic drift o Gene flow (immigration, emigration) 	<p>Darwin and Adaptation</p> <ul style="list-style-type: none"> • Describe how natural variation is used in artificial selection • Explain how natural selection is related to species' fitness • Identify evidence Darwin used to present his case for evolution • Describe Darwin's theory of evolution by 	<p>Both formative and summative assessments are used. Varies from teacher to teacher, but includes:</p> <ul style="list-style-type: none"> • Lab write-ups/reports • Tests/Quizzes 	<p>Campbell Biology: Concepts and Connections by Martha Taylor et al, Pearson, Copyright 2018.</p> <p>HHMI interactives</p>

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	<ul style="list-style-type: none"> o Sexual selection ● B.E.2: Speciation o Biological classification expanded to molecular evidence o Variation of organisms within a species due to population genetics and gene frequency 	<p>natural selection</p> <ul style="list-style-type: none"> ● Compare and contrast analogous and homologous structures ● Analyze experimental data and infer that the environment affects survival ● Compare and contrast the concept of natural selection and evolution according to Hutton, Malthus, Lamarck, Darwin, Lyell, and Wallace <p>Evolution of Populations</p> <ul style="list-style-type: none"> ● Summarize the effects of the different types of natural selection on gene pools. ● Relate changes in genetic equilibrium to mechanisms of speciation. ● Explain the concept of gene pool ● Identify the main sources of inheritable variation in a population ● Describe genetic drift ● List the five conditions needed to maintain genetic equilibrium ● Identify the conditions necessary for a new species to evolve ● Calculate genotype ratios in a model population and compare them with Mendelian ratios ● Summarize the effects of the different types of natural selection on gene pools and how these influence diversity within a population. ● Describe the 5 conditions required for the Hardy-Weinberg equilibrium. ● Identify the 2 types of genetic drift. ● Use the Hardy-Weinberg equation to 	<ul style="list-style-type: none"> ● Research Projects 	<p>http://www.hhmi.org/biointeractive</p>
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		identify how alleles move through an ecosystem.		
4th quarter	<p>B.DI: DIVERSITY AND INTERDEPENDENCE OF LIFE</p> <ul style="list-style-type: none"> ● B.DI.1: Biodiversity <ul style="list-style-type: none"> ○ Genetic diversity ○ Species diversity ● B.DI.2: Ecosystems <ul style="list-style-type: none"> ○ Equilibrium and disequilibrium ○ Carrying capacity ● B.DI.3: Loss of Diversity <ul style="list-style-type: none"> ○ Climate change ○ Anthropocene effects ○ Extinction ○ Invasive species 	<p>The History of Life</p> <ul style="list-style-type: none"> ● Explain the role of natural selection in convergent and divergent evolution. ● Describe Malthus’s theory of population growth ● Compare and contrast the conditions on the modern Earth with those on the Earth before life began. ● Summarize the four steps in scientists’ hypotheses about how the first cells were formed. ● Discuss the importance of nucleic acids to the first cells. ● Discuss the probable characteristics of the earliest cells. ● Describe scientists’ hypotheses about the development of photosynthesis, aerobic respiration, and eukaryotic cells. <p>Classification</p> <ul style="list-style-type: none"> ● Understand that evolution explains the natural origins for the diversity of life. ● Explain the effects of physical/chemical constraints on all biological relationships and systems. ● Understand that ecosystems tend to have cyclic fluctuations around a state of rough equilibrium. (biogeochemical cycles) ● Understand that ecosystems always change as geological or biological 	<p>Both formative and summative assessments are used. Varies from teacher to teacher, but includes:</p> <ul style="list-style-type: none"> ● Lab write-ups/reports ● Tests/Quizzes ● Research Projects ● Dissections ● Final exam 	<p>Campbell Biology: Concepts and Connections by Martha Taylor et al, Pearson, Copyright 2018.</p> <p>HHMI interactives http://www.hhmi.org/biointeractive</p>

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		<p>conditions vary. (succession)</p> <ul style="list-style-type: none"> ● Analyze experimental data and infer that the environment affects survival. ● The cycling of matter and flow of energy occurs at all levels of biological organization, from molecules to ecosystems. (food web, food chain, etc.) ● Apply algebraic knowledge to explain concepts of carrying capacity. ● Construct a model to exemplify biomagnification in an ecosystem such as mercury in Lake Erie. ● Examine wildlife and the factors that have impacted the carrying capacity. ● Describe symbiotic relationships and predator prey relationship. ● Compare and contrast exponential vs. logistical growth; types for different organisms ● Define monoculture; describe advantages and disadvantages ● Differentiate between threatened, endangered, and extinct species. ● Define/describe threats to ecosystems, including: invasive species, habitat fragmentation, edge effect, acid rain, depletion of the ozone layer ● Compare and contrast bacteria and viruses. ● Explain the lytic cycle for a virus. ● Describe the major categories of the Kingdom Protista. ● Understand the differences between prokaryotes and eukaryotes. 		
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		<ul style="list-style-type: none">● Understand and explain the diversity of life.		
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