

MONTGOMERY COUNTY PUBLIC SCHOOLS

Biology Curriculum Pacing Guide

| 1 st 9 Weeks | SOL Objectives | Vocabulary |
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| <p>90 Minute Class: 7 Days</p> <p>45 Minute Class: 14 Days</p> | <p>BIO.1 <i>The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which:</i></p> <ul style="list-style-type: none"> a) LI: observations of living organisms are recorded in the lab and in the field; SC: I can make and record observations of living organisms in the lab and in the field. b) LI: hypotheses are formulated based on direct observations and information from scientific literature; SC: Formulate hypothesis based on direct observations and information from scientific literature; c) LI: variables are defined and investigations are designed to test hypotheses; SC: Define and design investigations to test a hypothesis. d) LI: graphing and arithmetic calculations are used as tools in data analysis; SC: I can graph and perform arithmetic calculations to analyze my data. e) LI: conclusions are formed based on recorded quantitative and qualitative data; SC: I can form conclusions based on quantitative and qualitative data. f) LI: sources of error inherent in experimental design are identified and discussed; SC: I can identify sources of error inherent g) LI: validity of data is determined; SC: I can generate valid data. h) LI: chemicals and equipment are used in a safe manner; SC: I can properly use chemicals and equipment. i) LI: appropriate technology including computers, graphing calculators, and probeware, is used for gathering and analyzing data, communicating results, modeling concepts, and simulating experimental conditions; SC: I can use appropriate technology including computers, graphing calculators, and probeware, is used for gathering and analyzing data, communicating results, modeling concepts, and simulating experimental conditions. j) LI: research utilizes scientific literature; SC: I can research scientific literature. k) LI: differentiation is made between a scientific hypothesis, theory, and law; SC: Differentiate between a scientific hypothesis, theory, and law. l) LI: alternative scientific explanations and models are recognized and analyzed; and SC: I can identify alternative scientific explanations and models are recognized and analyzed. m) LI: current applications of biological concepts are used. SC: I can apply current biological concepts. | <p>Observations, hypotheses, variables, investigations, data analysis, conclusions, quantitative and qualitative data, experimental design, validity, modeling, simulation, experimental conditions, scientific hypothesis, theory, and law</p> |

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| <p>90 Minute Class: 8 Days</p> <p>45 Minute Class: 16 Days</p> | <p>BIO.8 <i>The student will investigate and understand dynamic equilibria within populations, communities, and ecosystems. Key concepts include:</i></p> <p>a) LI: interactions within and among populations including carrying capacities, limiting factors, and growth curves; SC: I can recognize interactions within and among populations including carrying capacities, limiting factors, and growth curves.</p> <p>b) LI: nutrient cycling with energy flow through ecosystems; SC: I can recognize nutrient cycling with energy flow through ecosystems.</p> <p>c) LI: succession patterns in ecosystems; SC: I can recognize succession patterns in ecosystems.</p> <p>d) LI: the effects of natural events and human activities on ecosystems; and SC: I can describe the effects of natural events and human activities on ecosystems.</p> <p>e) LI: analysis of the flora, fauna, and microorganisms of Virginia ecosystems. SC: I can generate analysis of the flora, fauna, and microorganisms of Virginia ecosystems.</p> | |
| <p>90 Minute Class: 7 Days</p> <p>45 Minute Class: 14 Days</p> | <p>BIO.2 <i>The student will investigate and understand the chemical and biochemical principles essential for life. Key concepts include:</i></p> <p>a) LI: water chemistry and its impact on life processes; SC: I can explain water chemistry and its impact on life processes.</p> <p>b) LI: the structure and function of macromolecules; SC: I can describe the structure and function of macromolecules and the nature of enzymes.</p> <p>c) LI: the nature of enzymes; and SC: I can explain water chemistry and its impact on life processes.</p> | <p>Acids, bases, hydrogen bond, macromolecules, monomer, enzymes, ionic bonds, covalent bonds, polarity, polymer, substrate</p> |
| <p>2nd 9 Weeks</p> | <p>SOL Objectives</p> | <p>Vocabulary</p> |
| <p>90 Minute Class: 11 Days</p> <p>45 Minute Class: 22 Days</p> | <p>BIO.3 <i>The student will investigate and understand relationships between cell structure and function. Key concepts include:</i></p> <p>a) LI: evidence supporting the cell theory; SC: I can provide evidence that supports the cell theory.</p> <p>b) LI: characteristics of prokaryotic and eukaryotic cells; SC: I can distinguish the differences between prokaryotic & eukaryotic cells.</p> <p>c) LI: similarities between the activities of the organelles in a single cell and a whole organism; SC: I can compare & contrast the activities of a single cell & a whole organism.</p> <p>d) LI: the cell membrane model; and SC: I can describe the cell membrane model & how it affects cells.</p> <p>e) LI: the impact of surface area to volume ratio on cell division, material transport, and other life processes. SC: I can distinguish differences in the process associated with movement across the cell membrane. I can compare the differences between a cell's internal & external solute</p> | <p>Cell theory, prokaryote, eukaryote, organelles, photosynthesis, aerobic respiration, diffusion, osmosis, anaerobic respiration, cellular respiration, fermentation</p> |

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| | <p>concentrations & how that affects material transport across the cell membrane.</p> <p>BIO.2 <i>The student will investigate and understand the chemical and biochemical principles essential for life. Key concepts include:</i></p> <p>d) LI: The capture, storage, transformation, and flow of energy through the processes of photosynthesis and respiration. SC: I can describe the role of ATP in the storage and release of chemical energy in the cell. SC: I can recognize the equations for photosynthesis & respiration. SC: I can identify the reactants & products of photosynthesis and respiration.</p> | |
| <p>90 Minute Class: 11 Days</p> <p>45 Minute Class: 22 Days</p> | <p>BIO.5 <i>The student will investigate and understand common mechanisms of inheritance and protein synthesis: Key concepts include:</i></p> <p>a) LI: cell growth and division; SC: I can distinguish between cell cycle and mitosis; the phases & what happens in each phase and determine how cells mature.</p> <p>b) LI: gamete formation; SC: I can distinguish the differences between mitosis & meiosis and determine under which conditions each process will occur.</p> <p>c) LI: cell specialization; SC: I can recognize the differences between cells and their functions.</p> | <p>Haploid, Zygote, Diploid, Tetrad, Spermatogenesis, Fertilization, Crossing Over, Gamete, Conjugation, Meiosis, Oogenesis, Homologous, mitosis, independent assortment</p> |
| 3rd 9 Weeks | SOL Objectives | Vocabulary |
| <p>90 Minute Class: 11 Days</p> <p>45 Minute Class: 22 Days</p> | <p>BIO.5 <i>The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include:</i></p> <p>d) LI: prediction of inheritance of traits based on the Mendelian laws of heredity; SC: I will be able to predict the inheritance of traits using a punnett square for a monohybrid & dihybrid cross.</p> <p>e) LI: historical development of the structural model of DNA; SC: I will be able to create a timeline highlighting five discoveries about DNA.</p> <p>f) LI: genetic variation; SC: I will be able to give an example of genetic variation within a population.</p> <p>g) LI: the structure, function, and replication of nucleic acids;</p> <p>h) LI: events involved in the construction of proteins; SC for both g and h: I will be able to build a model of DNA replication. I will be able to name the steps of transcription and translation.</p> <p>j) LI: exploration of the impact of DNA technologies. SC: I will be able to discuss positive and negative impacts of various types of DNA technology.</p> | <p>Allele, variation, genes, dominant, recessive, Mendelian Inheritance, cloning, transcription, translation, DNA, RNA, replication, electrophoresis, restriction enzymes</p> |

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| <p>90 Minute Class: 11 Days</p> <p>45 Minute Class: 22 Days</p> | <p>BIO.4 <i>The student will investigate and understand life functions of Archaea, Bacteria and Eukarya. Key concepts include:</i></p> <p>a) LI: comparison of their metabolic activities; SC: I will be able to compare describe how organisms obtain or generate energy including archaeobacteria, eubacteria, and eukaryotes.</p> <p>b) LI: maintenance of homeostasis; SC: I will be able to provide three examples of homeostasis and state its importance.</p> <p>c) LI: how the structures and functions vary among and within the Eukarya kingdoms of protists, fungi, plants, and animals, including humans; SC: I will be able to distinguish between the eukaryotic kingdoms with regard to structure, locomotion, reproductions, and response to the environment.</p> <p>e) LI: how viruses compare with organisms. SC: I will be able to distinguish a virus from organisms with regard to genetic material and reproduction.</p> <p>f) LI: evidence supporting the germ theory of infectious disease. SC: I will be able to describe the experiments of Pasteur and Koch and state how the conclusion of their experiments relates to germ theory.</p> | <p>Archaeobacteria, Eubacteria, Methanogen, Halophile, Thermophile, Bacilli- , Cocci- , Spirilla- , Strepto- , Staphylo- , Autotroph, Phototroph, Chemotroph, Heterotroph, Photoheterotroph, aerobes, binary fission, Conjugation, Endospores, homeostasis, virus</p> |
| <p>4th 9 Weeks</p> | <p>SOL Objectives</p> | <p>Vocabulary</p> |
| <p>90 Minute Class: 10 Days</p> <p>45 Minute Class: 20 Days</p> | <p>BIO.7 <i>The student will investigate and understand how populations change through time. Key concepts include:</i></p> <p>a) LI: evidence found in fossil records; SC: I can describe how the fossil record supports how populations change through time.</p> <p>b) LI: how genetic variation, reproductive strategies, and environmental pressures impact the survival of populations; SC: I can analyze how genetic variation, reproductive strategies and environmental pressures impact the survival of populations.</p> <p>c) LI: how natural selection leads to adaptations; SC: I can explain how natural selections leads to adaptations.</p> <p>d) LI: emergence of new species; and SC: I can analyze & interpret how selection pressures lead to the emergence of new species.</p> <p>e) LI: scientific evidence and explanations for biological evolution. SC: I can evaluate how scientific evidence & explanations for biological evolution.</p> | <p>Evolution, Natural Selection, Mutation, Adaption, Genetic Drift, Sexual Selection, Geographic Isolation, Behavioral Isolation, Reproductive Isolation, Divergence, Speciation, Stasis, Gradualism, Punctuated Equilibrium, Homologous Structure, Analogous Structure, Vestigial Structure, Fossils, Phylogenic Tree, Macroevolution, Morphology</p> |

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| <p>90 Minute Class: 10 Days</p> <p>45 Minute Class: 20 Days</p> | <p>BIO.6 <i>The student will investigate and understand bases for modern classification systems.</i> Key concepts include:</p> <p>a) LI: structural similarities among organisms; SC: I can compare & contrast structural similarities & differences among organisms.</p> <p>b) LI: fossil record interpretation; SC: I can interpret how the fossil record implies classification of organisms.</p> <p>c) LI: comparison of developmental stages in different organisms; SC: I can compare the embryological species of organisms to determine relationship.</p> <p>d) LI: examination of biochemical similarities and differences among organisms; and SC: I can compare biochemicals in different organisms to determine relationship.</p> <p>e) LI: systems of classification that are adaptable to new scientific discoveries. SC: I can apply new scientific discoveries to the systems of classification.</p> | <p>Ancestral characteristic, Animalia, Chordata, Cladogram, Classification, Derived characteristics, Division, Hierarchical classification, Hominidae, Hominoidea, Homo, Identification, Linnaeus, Mammalia, Monophyletic, Nomenclature, Paraphyletic, Phenetic, classification, Phyletic classification, Phylogenetic classification, Phylum, Polyphyletic, Primates, sapiens, Systematics, Taxa, Taxonomy, Vertebrata, Dichotomous Key, Domain.</p> |
| <p>90 Minute Class: 4 Days</p> <p>45 Minute Class: 8 Days</p> | <p>SOL Review</p> | |