Biology Curriculum Map

Timeframe	Unit/Topic	Eligible Content Anchors	Assessments	Suggested Resources	Eligible Content
Marking Periods 1 & 2	Biological principles, biochemistry • Study of life • Unifying Themes • Biology tools & technology • atoms, ions & molecules • properties of water & carbon • bonding & chemical reactions • enzymes	BIO.A.1.1.1 BIO.A.1.2.1 BIO.A.1.2.2 BIO.B.2.4.1 BIO.A.2.1.1 BIO.A.2.2.1 BIO.A.2.2.2 BIO.A.2.2.3 BIO.A.2.3.2	Labs Formative Assessments Quizzes Summative Assessments Projects	Holt-McDougal Biology My.hrw.com --virtual labs --interactive reviews --formative assessments scilinks.org biointeractive.org learn.genetics.utah.edu potential lab activities: --molecular modeling --acids, bases & pH --enzyme activity virtual lab	Organisms are made up of simpler units called cells. Organisms need light and/or chemicals to make cellular protoplasm. Organisms obtain and use energy through photosynthesis or cellular respiration to carry out their life processes. Organisms release waste chemicals produced by cells. Organisms seek to maintain homeostasis at all biological levels of organization. Organisms grow, develop and eventually die. Organisms can reproduce their own kind using DNA. Organisms adapt to changes in their environments. Biological levels of organization from smallest to largest include: atoms, molecules, organelles, cells, tissues, organs, organ systems, multicellular organisms, populations, and communities. The pattern of form following function is reflected at all biological levels of organization. Cells function as microscopic chemical factories synthesizing and degrading biological molecules necessary for life.

	Cell structure, function, transport • cell theory • organelles' structure & function • cell membrane structure & function • active & passive transport processes	BIO.B.3.3.1 BIO.A.4.1.1 BIO.A.4.1.3 BIO.A.4.1.2		Potential lab activities: --comparing plant and animal cells --diffusion and osmosis in a model cell	Liquid water forms hydrogen bonds, is a solvent, and forms hydronium ions allowing a wide range of biochemical reactions to occur. Biological molecules produced by a cell can be used by the cell or transported outside for use by other cells. Cells are composed mostly of: C, H, N, O, P, and S. Carbon rings and chains form the backbone of all biological molecules. Many biological molecules are polymers made from monomers that contain carbon chemically bound with other elements. Carbohydrates, lipids, proteins, and nucleic acids are the chemical foundations for life. Molecular structure is related to function. Cells grow when they can take in more nutrients through their plasma membranes than they can metabolize in their interior. Cells may divide when their metabolism exceeds nutrient absorption. All cells go through a cell cycle. Prokaryotic cells divide via binary fission. Eukaryotic cells first divide their nucleus and then divide their cytoplasm to make new cells Cell differentiation occurs many times during development of a multicellular organisms giving rise to a diversity of cell types.

					Cells are the basic unit of structure and function for all living things. Cells occur in two basic forms: Prokaryotes (Bacteria and Archaea) and Eukaryotes (all other cells). A cell's interior is separated or compartmentalized from the environment by a phospholipid bilayer plasma membrane. The cytoplasm contains a collection of connected, internal membranous sacs that divide the cytoplasm into functional and structural compartments or organelles. Chemical reactions and processes necessary for life are carried out in cytoplasm or organelles within a eukaryotic cell's protoplasm. Structure is related to function at the cellular and organelle levels of biological organization. Cells come only from the division of a pre-existing cell. Homeostasis dynamically returns biological changes (body temperature, osmolarity, blood pressure, pH, blood glucose, etc.) to balance by modifying chemical reactions, adjusting energy transformations, and responding to environmental changes. Molecules, ions and water move in and out of the cell through a variety of mechanisms. Passive transport depends on the diffusion of substances with a concentration gradient moving across a membrane from an area of higher concentration to an area of lesser concentration without energy.

					Both passive and facilitated diffusion move materials along a concentration gradient without energy. Osmosis is the diffusion of water from an area of lower solute concentration (more aqueous solution) across a membrane to an area higher solute concentration (less aqueous solution). Active transport moves atoms, ions and small molecule mostly against a concentration gradient and requires an expenditure of energy. Active transport of larger substances and subcellular structures occurs through endocytosis and exocytosis.

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	Cellular energetics • chemical energy & ATP • photosynthesis • cellular respiration • fermentation Cell reproduction • Cell cycle • mitosis & cytokinesis • regulating the cell cycle • asexual reproduction		Potential lab activities --plant pigment chromatography --virtual lab: carbon transfer through snails and elodea --cellular respiration quicklab --alium root tip mitosis	Forms of energy are required to maintain life. The energy flow of biochemical reactions is governed by the physical laws of thermodynamics. Most biochemical reactions require an input of energy. Photosynthesis is the process that transforms light energy into potential chemical energy. Cellular respiration is the process by which potential chemical energy in the bonds of glucose is transformed into potential chemical energy in the bonds of ATP. ATP molecules store usable chemical energy to drive life processes through coupled reactions. Glycolysis is the foundation of both aerobic and anaerobic respiration. Glycolysis, through anaerobic respiration, is the main energy source in many prokaryotes. Cells grow when they can take in more nutrients through their plasma membranes than they can metabolize in their interior. Cells may divide when their metabolism exceeds nutrient absorption. All cells go through a cell cycle. Prokaryotic cells divide via binary fission.

	• cancer • multicellular life			Eukaryotic cells first divide their nucleus and then divide their cytoplasm to make new cells Cell differentiation occurs many times during development of a multicellular organisms giving rise to a diversity of cell types. A multicellular organization enables life functions such as movement, digestion, internal circulation of nutrients, excretion of waste and reproduction to be subdivided among specialized groups of cells. The simplest level of multicellular organization is a tissue. Different types of cells and tissues combine to form distinct structures known as organs which perform specific functions. Organs work together as a system to perform common functions. Organ systems function to meet an organism's needs. Cells that have differentiated to perform specialized functions rely on the collective function of other specialized cells within a multicellular organism to maintain their living condition.

	DNA & Heredity • chromosomes & meiosis • traits, genes & alleles • genetics & probability • genetic variation • genotypes & phenotypes • complex patterns of inheritance • gene linkage & mapping • human genetics & pedigrees • DNA structure & replication • Transcription & translation • Gene expression & regulation • mutations	BIO.B.1.1.2 BIO.B.1.2.2 BIO.B.2.1.1 BIO.B.1.1.1 BIO.B.1.2.1 BIO.B.2.1.2 BIO.B.2.3.1 BIO.B.3.1.3 BIO.B.2.4.1	Potential lab activities: --plant cell mitosis --corn genetics --simulated blood typing --karyotyping	Sexually reproducing organisms produce gametes which transport hereditary information from one generation of organisms into another generation. Meiosis involves a two-step nuclear division reducing the number of chromosomes in half – producing gametes. One or more pairs of genes on one or more chromosomes code for the expression of inherited traits. Two or more versions of a gene (alleles) contribute to the expression of inherited traits. During the process of meiosis genetic recombinations may occur contributing to genetic variability within a population. Patterns of inheritance reflecting how genes interact and express themselves (including dominant, recessive, codominance, incomplete dominance, sex-linked, sex-influenced, multiple alleles) can be predicted, observed and described. The Punnett square is a tool that can be used to predict the probability of an offspring's genotype and phenotype. The basic molecular and the associated genetic code structure of DNA are universal, revolutionizing our understanding of disease, heredity and evolution.

	• manipulating DNA • DNA fingerprinting • Genetic engineering • Genomics & bioinformatics • Genetic engineering		Potential lab activities: --gel electrophoresis --genomic database (NCBI BLAST) --DNA, protein synthesis modeling --cloning virtual investigation	DNA contains the complete set of instructions, the genetic code, for building and running an organism. RNA is necessary for protein synthesis from DNA. Many synthesized polypeptides require additional processing to acquire their active, three-dimensional structures. Which genes are expressed at a given time is determined by the integration of internal and environmental signals received by a cell. Enzymes are special proteins designed to catalyze most biochemical reactions that otherwise would not occur.

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Marking Periods 3 & 4	Evolution & Classification • Development of evolution theory • Natural selection • Evidences of evolution • Natural selection in populations • Hardy-Weinberg equilibrium • Speciation • Patterns of evolution • Fossil record • Origin of life • Linnean classification • Phylogenetics • Molecular clocks	BIO.B.3.1.1 BIO.B.3.1.2 BIO.B.3.1.3 BIO.B.3.2.1 BIO.B.3.3.1	Potential lab activities: --variation within species --virtual lab comparing hominoid skulls	Mutations alter a gene's genetic information, resulting in a change in the protein that is made, or how or when a cell makes that protein. Most mutations are evolutionary neutral. Evolution occurs when the gene frequency of alleles in a population shifts to confer survial and reproductive success. The differential reproductive success of populations of organisms with advantageous traits is known as natural selection. Speciation occurs when one population is isolated from another population. The isolation can be geological, reproductive, or filling different ecological niches to reduce competition. With isolation comes changing environmental factors exerting selective pressure on mutations and adaptations. Common anatomical and/or genetic structures and behaviors demonstrate that species have evolved from common ancestors. The fossil record documents patterns of mass and background extinctions and the appearance of new species. There are similarities and differences between fossils and living organisms. Selective breeding and biotechnology contribute to the deliberate changing of the genetic makeup of a population.

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	Ecology • biotic & abiotic factors • energy in ecosystems • food chains & webs • biogeochemical cycles • pyramid models • habitat & niche • community interactions • population density, growth & distribution • succession • biomes & ecosystem • human impacts on environment • threats to biodiversity	BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.3 BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.4 BIO.B.4.2.5	Potential lab activities: --virtual lab estimating population size	All forms of life on Earth are connected in a Biosphere. Specific biotic and abiotic factors characterize biomes and their component ecosystems. Organisms and their environment are interdependent. Sunlight is the initial energy source for most life on Earth. Energy is converted from one form to another as it moves through a food chains and food webs. Matter flows through an ecosystem using a variety of natural cycles. Limiting factors can cause population fluctuations or extinction in a given ecosystem. Biotic and abiotic components within a habitat change, or differ, based on their location and topography.

				Natural and human events can affect aquatic, terrestrial, and wetland environments in a variety of ways. Organisms within an ecosystem interact with other biotic components, abiotic components and within populations. Abiotic components are critically important for maintaining an ecosystem's homeostasis. Limiting factors affect the carrying capacity of an ecosystem. A variety of cycles exist within an ecosystem and each helps maintain balance within the ecosystem. Every living organism is uniquely suited to fulfill a role within its ecosystem. Biological diversity directly impacts the stability of an ecosystem. Species must be able to adapt to changes within their ecosystem in order to survive. The degree of specialization of a species can cause it to become threatened, endangered, or extinct.

	Microorganisms • virus structure & function	BIO.A.1.2.2 BIO.A.4.2.1	Potential lab activities:	Animal species can be classified as generalists or specialists in their eating habits. Habitat destruction can lead to species loss or termination. The intervention of humans has influenced the survival of species through management practices. Human endeavors and changes in natural cycles have caused species to become threatened, endangered, or extinct. Environmental laws and regulations have been implemented in an attempt to protect species diversity. Technological advancements increase efficiency in production and environmental impacts of agriculture. Integrated pest management (IPM) carries both benefits and risks when associated with agriculture. Human activity affects ecosystems for better or worse. Human and societal supply and demand impact the environment in a variety of ways.

	• viral diversity • viral pathogens • bacteria structure & function • bacterial diversity • bacterial pathogens • protist structure & function • protist diversity • protist pathogens • fungi structure & function • fungi diversity • fungal pathogens Plants • plant origins & classification • plant cells & tissues	BIO.A.1.2.2 BIO.A.4.2.1	--comparing bacteria & protists --fungi diversity & classification --virtual lab testing antibacterial agents Potential lab activities: --flower structure & function	

	• roots, stems, leaves • plant reproduction • life cycles • seed dispersal & germination		--plant cells, tissues, organs & systems	

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