BCCS

High School **GENERAL BIOLOGY** Curriculum Map

(Revised 2008-09)

Month	**Content** What topic(s) is being covered and what is the important vocabulary? What do students need to know?		**Skills** What do students have to be able to do connected to the Content?	**Essential Questions** What are fundamental, enduring questions that will guide study and instruction?	**Standards/ Benchmarks** What benchmarks are met through this topic?	**Instruction** What activities are used to develop the skills and knowledge?	**Resources** What materials, texts, videos, internet, software, or human resources support instruction?	**Assessment** What evidence (products and/or performances) is collected to establish that the Content and Skills have been learned?
Unit 1 – Biological Principles – The Science of Life	Themes of Biology Characteristics of living things. Scientific Method Microscopy	Biology Metabolism Reproduction Homeostasis Heredity Organization Interdependence Evoltuion	All living things have five characteristics properties of life: metabolism, reproduction, heredity, homeostasis, and organization. (Mr. H2O) The scientific method is used by scientist to ask and answer scientific questions. Microscopes are one of the tools scientist used to conduct investigations.	What is science? Why is science important? What are strategies used to perform good science experiments? How is science different from other forms of knowledge? How has science changed over time? What is necessary to determine that something is alive?	**L2.p1A** **L2.p1B** **L2.p1C** **L2.p2A** **L2.p2B**		HMB 1, 2-3 Light Microscopes Dissecting Microscope Microscope slides Reading Essentials	Dog and Turnip Activity (Scientific Method) HMB: End of section/end of chapter questions. HMB CD – Section review worksheets. Microscope lab Chapter 1 Test Unit Exam
Unit 2 - Chemistry and Biochemistry	Composition of matter Energy Solutions Biochemistry Water Carbon Compounds Macromolecules Molecules of life.	ATP Carbohydrate Catalyst Chemical bond Covalent bonds DNA Dehydration Element Enzyme Hemoglobin High energy bonds Hormone Hydrolysis Lipid Molecular energy Nucleic acid Protein Protein structure Polymers RNA) Substrate	Living systems are made up of four major types of organic molecules: carbohydrates, lipids, proteins and nucleic acids. Organisms are made up of different arrangements of these molecules, giving all life a biochemical framework. Selected cells in multi-cellular organisms are specialized to carry out particular life functions.	What are the biochemical processes at the cellular level that sustain life? How does the structure of an atom relate to its interaction with other atoms? How is water important to life? What is the role of Carbon Compounds in organisms?	**B2.2A** **B2.2B** **B2.2C** **B2.2D** **B2.2E** **B2.2f** **B2.4f** **B2.5A**		HMB 2-3 Reading Essentials Water Lab materials	HMB: End of section/end of chapter questions. HMB CD – Section review worksheets. Microscope lab Chapter 1 Test Chapter 2 pop quiz Science in the News Properties of Water Lab RE- Atoms and Interactions RE- Water and Diffusion RE – Life Substances Vocabulary Ch 1, 2, 3 Graphic Organizers/ thinking maps. Unit Exam

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Unit 3 – Cells Structure and Function	Cell theory Prokaryotic/eukaryotic cells Parts of eukaryotic cell Multicellular Organization Plant/animal cells Homeostasis Passive and active transport Cell membrane Selective Permeability Cell function Cell organelle Cellular differentiation Cellular waste disposal	Active transport Bacteria Biological evolution Cell function Cell membrane Cell nucleus Cell organelle Cell wall Cellular differentiation Chloroplast Chromosome Cytoplasm Diffusion DNA (deoxyribonucleic acid) Eukaryote Golgi apparatus Mitochondrion Nucleus Nucleated cell Organelle Osmosis Photosynthesizing organism Prokaryote Protein Ribosome Storage of genetic information Transport of cell materials Vacuole Virus	Cells are the basic units of life. Compare/contrast plant and animal cells. Discovery of the cell Cell Theory Cell diversity The cell membrane is responsible for maintaining homeostasis Cells combine to form more complex structures Passive Transport Active transport Different structures in different organisms accomplish the same or similar function. Systems work together physiologically to support the needs of the entire organism and the cells of which it is composed.	List the three major tenants of the cell theory. Compare and contrast structures in plant and animal cells. **What are cells made of?** **How are they specialized for their function?** **How do cells maintain homeostasis?** If the process of osmosis and enzyme action were not available, what might be some effects on living cells? How does selective permeability maintain homeostasis within the cell? What factors effect the diffusion of water through a membrane by osmosis? How do active and passive transport compare? How would you expect the number of mitochondria in a cell to be related to the amount of active transport it carries out? How are the structures of cell parts related to their function?	B2.4g B2.4h B2.4i B2.5g B2.5h B2.5i B2.4B B2.4C B2.5B		HMB: 4-5 Computer/web access Web Quest materials Power point notes HMB Chapter 4,5 Reading Essentials Poster project materials	Cells Alive Web Quest Cell structure analogy poster project Crossword/word jumble Cell Volume/surface area Lab RE- Cell Discoveries Science in the New Venn Diagram/graphic organizer Cell Theory Worksheet Cell City Analogy Osmosis Lab Chapter 4 test Chapter 5 Test Cell Structure Unit Exam

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Unit 4 – Cell Energetic	Photosynthesis Breakdown of food molecules Transforming matter and/or energy Calvin Cycle Aerobic Respiration Anaerobic Processes	Aerobic Anaerobic ATP Cellular respiration Energy conversion Chloroplast Enzyme Mitochondrion Molecular energy Photosynthesis Potential energy Product Reactant	Organisms need energy to do cell work. Photosynthesis converts the sun's energy into the chemical potential energy of food. Cell respiration converts the chemical potential energy stored in food to the chemical potential energy stored in ATP. ATP supplies the energy to do cell work.	How are cellular respiration and photosynthesis complementary processes? What happens to sunlight that strikes a leaf but is not trapped by photosynthesis? What might happen to Earth's atmosphere if photosynthesis suddenly stopped? Why would yeast cells carry our aerobic respiration rather than fermentation when oxygen is present? **How do living things accomplish life functions?** What is the relationship between the sun and living organisms?	B2.4e B2.5D B2.5e B2.5f B3.1B B3.1C B3.1f B3.1A		HMB: 6—7 Reading Essentials Yeast US Video- PSN	Vocabulary 6, 7 Photosynthesis Lab Photosynthesis Worksheet Stomata Lab Graphic Organizers Yeast Lab Cell Energetic Test

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Unit 5 - Cell Division and Chromosome Mutations	DNA structure Chromosomal Structure Mitosis Meiosis Mutations Sexual reproduction	Cancer Carcinogenic Chromosome Chromosome pair Crossing over Deletion DNA Replication Diploid Duplication of Genes Haploid Genetic Variation Jumping genes Karyotype Meiosis Mitosis Mutation New gene combinations Progeny Recombination of genetic Material Sex cell Sex chromosomes	The process of mitosis produces new cells needed for growth of an organism and these cells differentiate into specific cells with specialized functions. Mitosis ensures genetic continuity. Mutations in genes that control mitosis may cause uncontrolled cell division which leads to cancer. Meiosis produces sex cells for sexual reproduction that passes on genes to the next generation. Genetic mutations may be passed on from parent to offspring through these cells.	How does a cell's surface area – to – volume ratio limit its size? Why is it necessary for a cell's chromosomes to be distributed to its daughter cells in such a precise manner? How does cell division in adult animals help maintain homeostasis? How can the disruption of the cell cycle result in cancer? \ What are the different modes of inheritance and examples of each? What role does the environment play on gene expression (transcription and translation)? What are the similarities and differences in chromosomal structure, gene expression, and regulation of gene expression in prokaryotes and eukaryotes? **How and why do cells divide?** **How can knowledge of DNA help us understand the way that organisms are related to each other and how organisms change over time?** **How does DNA technology impact individuals and society today**	B2.1C B2.1d B3.5d B4.2A B4.3A B4.3B B4.3C B4.3d B4.3e B4.3f B4.4b		HMB 8 Microscopes Karyotypes US:DNA analysis and crime investigations	Meiosis/mitosis webquest DNA Illustration Compare/contrast meiosis and mitosis Ch8 Vocabulary Karyotyping activity Science in the News Web Research – Cancer DNA base pair practice DNA to amino acids

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Unit 6 – <u>Classification, Comparative structures and functions</u>	History of Classification Kingdoms Comparative -gas exchange -circulatory system -Reproduction -Symmetry	Animal bodies Invertebrate Vertebrate Fertilization Development Sponges Chidarians Ctenophores Flatworms Roundworms Mollusks Annelids Arthropods Insects Fishes Amphibians Reptiles Birds Mammals	Compare and contrast different organisms. Identify the defining characteristics of various phyla of the animal kingdom. Classify organisms based on kingdom characteristics.	How are living things grouped? Living things are classified by shared characteristics on the cellular and organism level. In classifying organisms, biologists consider details of internal and external structures. Biological classification systems are arranged from general (kingdom) to specific species). How do the functions of systems within organisms allow them to survive?	B2.4B		HMB Preserved specimens Dissection – -frogs -rats -crayfish	Vocabulary End of chapter questions Practical Lab exam Lab participation Use and create a dichotomous key. Cladogram practice. Cross word puzzles

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Unit 7 – Human Body Systems, Health and Homeostasis	Skeletal, muscular and integumentary systems Circulatory and Respiratory Systems Immune System Digestive and Excretory system Nervous System Reproductive system Human health and disease	Digestion Cell division Cell function Organelle Cellular communication Cellular differentiation Cellular energy conversion Cellular regulation Cellular response Cellular waste disposal Differentiation Embryo formation Env. influence Enzyme Gene combinations Gene expression Homeostasis Metamorphosis Neuron Neurotransmitter Recombination of genes Sexual reproduction Substrate Transplantation Behavioral response Disease agents Equilibrium Homeostasis Hormone Neuron PH Physiological change Regulatory response	Cell differentiation occurs early in embryonic development and gives rise to all tissue types by a series of complex environmental and biochemical interactions. Human systems work together to maintain the short and long term health of the organism The complexity and organization within an organism result from the organisms need to obtain, transform, transport, release and eliminate the matter and energy required to sustain life. Living systems require continuous input of energy to maintain life. Organisms have behavioral responses to internal and external stimuli.	How do the systems of the human body function together to support life? What is disease and what are the possible origins of disease? What characterizes an infectious disease? How does the body defend itself? What is immunity? Why is homeostasis an important concept with regards to the human body? What is the anatomy and physiology of a neuron? What is the role of the brain in the human body? How does the body react to various external stimuli? (smell, touch, taste) What is the role of the circulatory system? What is the function of the human heart? What is the role of the respiratory system? How does digestion occur? How does the body rid itself of waste? What is the role of the reproductive system in the human body? How do medical professionals assess the human body's imbalances?	B2.1e B2.3d B2.3g B4.3g B2.3A B2.3B B2.3C B2.3e B2.3f B2.6a		HMB 46-53 US: Human Body AIDS research information HMB CD Resources Fetal pigs Dissection tools.	Systems project System project presentation. Skeletal, muscle, skin quiz Circulatory/Resp Quiz Immune Quiz Digestive Quiz Nervous Quiz Reproductive Quiz Unit Test Fetal Pig dissection Lab Test – Fetal pig

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Unit 8 – Matter and Energy in Ecosystems, Population Ecology and Human Impacts on Ecosystems	Introduction to Ecology Organism ecology Population ecology Population growth Human population dynamics Community interactions Properties of communities Succession Energy transfer Biomes/ecosystems Human and the environment Biodiversity	Abiotic components Biological molecule Breakdown of food molecules Carbon Carbon cycle Carbon dioxide Cellular energy Cellular respiration Chemical bond Chemical organization Consumer Energy requirements of living systems Flow of energy Flow of matter Nitrogen cycle Photosynthesizing Organism Producer Product Reactant Recombination of chemical elements Release of energy Transforming matter and/or energy Trophic level Carrying capacity Ecosystem stability Equilibrium of ecosystems Exponential growth Global warming Greenhouse effect Population dynamics Reproductive capacity Succession	--Organisms and their environments are interconnected. Changes in one part of the system will affect other parts of the system. --Matter needed to sustain life is continually recycled among and between organisms and the environment. --Energy from the sun flows irreversibly through ecosystems and is conserved as organisms use and transform it. --Humans can alter the living and non-living factors within an ecosystem, thereby creating changes to the overall system. --The energy of life is primarily derived from the sun. --The distribution and abundance of organisms within an ecosystem is limied by the availability of energy and matter. --Living organisms have the capacity to produce populations of infinite size, but environments and resources are limited. Populations relate to each other within their ecosystem. --Ecosystems usually establish equilibrium between their biotic inhabitants and abiotic factors. These relationships typically are stable for long periods of time. --Ecosystems are characterized by both stability and change, on which human populations can have an impact.	How does change in an ecosystem affect the entire ecosystem? What are the consequences of the destruction of the rainforests and wetlands? What affect do humans have on the ecosystem? What factors influence and determine biome types? How do matter and energy link organisms to each other and their environments? Why is sunlight essential to life on Earth? How do humans have an impact on the diversity and stability of ecosystems? How do different organisms interact in symbiotic relationships?	B2.1A B2.1B B2.5C B3.1A B3.1B B3.1C B3.1D B3.1e B3.2A B3.2B B3.2C B3.3A B3.3b B3.4A B3.4C B3.4d B3.4e B3.5A B3.5B B3.5C B3.5e B3.5f B2.2g		HMB 19-23 Project Wild DVD: March of the Penguins. Owl Pellets Dissection materials.	PW – How many bears? PW – “Oh Deer” PW – Good Buddies March of the Penguins Video Guide Succession Worksheet Science in the News Biome Webquest Unit Review sheet Unit Exam

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<u>Unit 9: DNA/RNA and Protein Synthesis</u>	Structure of DNA Complementary base pairing DNA replication Structure of RNA Transcription Amino Acid formation Protein assembly	amino acid sequence anatomical characteristic biochemical characteristic biological adaptation cell nucleus chromosome complementary sequence degree of kinship DNA DNA molecule DNA sequence DNA subunit double helix enzyme evidence for unity among organisms gene genetic diversity genetic mutation genetic variation inherited trait messenger RNA molecular synthesis new gene combinations nucleated cell phylogenetics protein protein structure protein synthesis recombination of genetic material ribosome storage of genetic information transcription translation transfer RNA	The central dogma of biology states that DNA codes for proteins that are responsible for the production of inherited traits. The processes by which proteins are made from DNA are transcription and translation. DNA must replicate itself faithfully in order to pass all genetic information on to descendent cells, including sex cells	Determine amino acid sequence starting with a DNA sequence. How is DNA replicated? How id RNA produced? What is the relationship between mRNA and tRNA? How do codons and anticodons interact? What are the similarities and difference between DNA and RNA?	B4.1B B4.2B B4.2C B4.2D B4.2E B4.2f B4.2g B4.4c		HMB 10 DVD: GATTACA	DNA base pair practice DNA to amino acids Science in the News Gene Expression – Lac Operon. Crossword puzzle

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Unit 10: Mendelian and Molecular Genetics (includes Biotechnology)	Work of Gregor Mendel Mendel's experiments Genotype/ Phenotype Monohybrid crosses Dihybrid crosses Gene control and expression Cell differentiation Cencer Sex determination Human Inheritance	allele chromosome chromosome pair co-dominant traits DNA replication dominant trait gene encoding gene expression genetic diversity gene location genetic mutation genetic variation genotype heterozygous homologous chromosome human genetics independent assortment law of Segregation meiosis Mendelian genetics new gene combinations phenotype phylogenetics polygenic traits protein protein synthesis Punnett Square recessive traits recombination of genetic material sex cell sex chromosomes sex-linked traits shared characteristics storage of genetic information	DNA in genes codes for the production of proteins. Mutations in the DNA code can lead to dysfunctional proteins - genetic disorders. Cells differ in the genes they express-all genes are not used in all cells.	What is the difference between a purebred and hybrid individuals? Who was Gregor Mendel? What did he study? Why was this important for the field of genetics? What is a gene? What is the difference between a dominant and recessive gene? What is meant by genotype and phenotype? Discuss what is meant by homozygous dominant, homozygous recessive, and heterozygous? What are monohybrid and dihybrid crosses? What is incomplete dominance and codominance?	B4.1A B4.1c B4.1d B4.1e B4.2h B4.4a B2.1e B4.3g		HMB 9, 11, 12, 13 DVD: Jurassic Park	Science in the news GATTACA Ethics paper Human genetics project Crossword Genetics basics worksheet Punnet square practice Monohybrid cross practice Dihybrid crosses Sex linked traits Design a creature Unit exam

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Unit 11 Evolution	Biogenesis Spontaneous Generation Formation of the Earth Early life on earth Modern Evolution Darwin's work Patterns of Evolution Evidence of Evolution Variation in Populations Mutation Migration/gene flow Formation of Species Genetic Equilibrium.	behavioral structures biodiversity biological evolution chance inherited variants comparative anatomy degree of kinship differential survival DNA DNA molecule embryonic stages of development evidence for the unity among organisms gene pool genetic drift genetic diversity genetic mutation genetic variation homologous structures molecular structures morphological structures natural selection origin of life phylogenetics recombination of genetic material speciation	Evolution provides a scientific explanation for the history of life on Earth. Evolution is the consequence of natural selection. The millions of different species of plants, animals, and microorganisms that live on earth today are related by descent from common ancestors.	What are the major points of Darwin's Theory of Natural Selection? What evidence is used to explain biological evolution? How are natural selection and species adaptations related? What are examples of environmental changes that can cause the formation or extinction of species? What is evolution? Why is evolution a unifying theme in biology? What is the history of the development of the theory of evolution.(Darwin, Scopes Monkey Trial)? Can you explain the processes of mutation and natural selection, and how they may work together to bring about change to a species?	B2.4A\ B3.4B B5.1A B5.1B B5.1c B5.1d B5.1e B5.1f B5.1g B5.2a B5.2b B5.2c B5.3A B5.3B B5.3C B5.3d B5.3e B5.3f		HMB 14, 15, 16 Bill Nye Video "What Darwin Never Saw" Beak of the Finch	Evolution web quest Evolution Vocab Experimental design – biogenesis Science in the News Evidence for Evolution group project Chapter 14 review Bean Lab Dot Lab Take home quiz Unit Exam