VAN BUREN SCHOOL DISTRICT
BIOLOGY CURRICULUM

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
7	1,2	The Nature of Science & Laboratory Equipment/ Safety	• Scientific method • SI units • quantitative and qualitative measurements, graphs • charts • bias • error analysis • Themes in biology • Pure vs applied science • Role of science • Ethics • Characteristics of life	Measurement Scientific Method Lab SI Measurement Lab Paper towel Lab Bubble Lab Graphing using Socratic Questioning Check Lab Plant Experiment	MC.2.B.11 Discuss *homeostasis* using *thermoregulation* as an example NS.10.B.1 Explain why science is limited to natural explanations of how the world works NS.10.B.2 Compare and contrast *hypotheses*, *theories*, and *laws* NS.10.B.3 Distinguish between a scientific *theory* and the term "*theory*" used in general conversation NS.10.B.4 Summarize the guidelines of science: ▪ *explanations* are based on observations, evidence, and testing ▪ *hypotheses* must be testable ▪ understandings and/or conclusions may change with additional empirical data ▪ scientific knowledge must have peer review and verification before acceptance NS.11.B.1 Develop and explain the appropriate procedure, controls, and variables (dependent and independent) in scientific experimentation NS.11.B.2 Research and apply appropriate safety precautions (refer to ADE Guidelines) when designing and/or conducting scientific investigations NS.11.B.3 Identify sources of bias that could affect experimental outcome NS.11.B.4 Gather and analyze data using appropriate summary statistics NS.11.B.5 Formulate valid conclusions without bias NS.11.B.6 Communicate experimental results using appropriate reports, figures, and tables NS.12.B.1 Recognize that theories are scientific explanations that require empirical data, verification, and peer review NS.12.B.2 Understand that scientific theories may be modified or expanded based on additional empirical data, verification, and peer review NS.14.B.1 Compare and contrast biological concepts in *pure science* and *applied science* NS.14.B.2 Discuss why scientists should work within ethical parameters NS.12.B.7 Research current events and topics in biology	Interpretation of Data and Other Information, Data Representation, Identification of Patterns, Trends, and Relationships of Data, Purpose of Experimental Procedures, Process of Scientific Investigation, Identification of Conclusions, Hypothesis, Models or Predictions.

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
1	-	MAP Test	Measure of Academic Progress			
4	6	Chemistry	• chemical bonding • Formulas • Equations • Types of matter • Properties of water • chemical reactions • biomolecules • enzymes • acids, bases and their properties	PH lab Make structural formulas *Test for Organic Molecules	MC.1.B.1 Describe the structure and function of the major organic molecules found in living systems: • *carbohydrates* • *proteins* • *enzymes* • *lipids* • *nucleic acids* MC.1.B.2 Describe the relationship between an enzyme and its substrate molecule(s) MC.1.B.3 Investigate the properties and importance of water and its significance for life: • surface tension • *adhesion* • *cohesion* • *polarity* • *pH* MC.1.B.4 Explain the role of energy in chemical reactions of living systems: • *activation energy* • *exergonic reactions* • *endergonic reactions*	
4	7	Cell Structure	• Organelles • cell theory • prokaryotic vs eukaryotic • microscopy • membranes • basic cell types	Cell Script, group cell, plant and animal cell lab. Microscope Use Lab *View Microscopic Cells	MC.2.B.2 Compare and contrast *prokaryotes* and eukaryotes MC.2.B.1 Construct a hierarchy of life from cells to *ecosystems* *eukaryotes* MC.2.B.3Describe the role of sub-cellular structures in the life of a cell: ▪ *organelles* ▪ *ribosomes* MC.2.B.4 Relate the function of the *plasma* (*cell) membrane* to its structure MC.2.B.5 Compare and contrast the structures of an animal cell to a plant cell MC.2.B.6 Compare and contrast the functions of *autotrophs* and *heterotrophs* NS.12.B.4 Relate the development of the *cell theory* to current trends in cellular biology	Identification of Conclusions, Hypothesis, Models or Predictions.

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
5	8	Cell membrane, Diffusion, Osmosis, Cell Size	• Plasma membrane structure and function • brownian motion • active and passive transport • bulk transport	Plasmolysis Egg demonstration Potato Osmosis Lab *Diffusion Lab *Osmosis Lab	MC.2.B.7 Compare and contrast *active transport* and *passive transport mechanisms:* ▪ *diffusion* ▪ *osmosis* ▪ *endocytosis* ▪ *exocytosis* ▪ *phagocytosis* ▪ *pinocytosis*	Purpose of Experimental Procedures.
1	-	Common Assessment				
4	9	Photosynthesis and Respiration	• Photosynthesis • Cellular respiration	*Fermentation Lab/Cellular Respiration *Enzyme variables	MC.3.B.1 Compare and contrast the structure and function of *mitochondria* and *chloroplasts* MC.3.B.2 Describe and model the conversion of stored energy in organic molecules into usable cellular energy (ATP): ▪ *glycolysis* ▪ *citric acid cycle* ▪ *electron transport chain* MC.3.B.3 Compare and contrast *aerobic* and *anaerobic respiration:* ▪ *lactic acid fermentation* ▪ *alcoholic fermentation* MC.3.B.4 Describe and model the conversion of light energy to chemical energy by photosynthetic organisms: ▪ *light dependent* reactions ▪ *light independent* reactions MC.3.B.5 Compare and contrast *cellular respiration* and *photosynthesis* as energy conversion pathways	

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
4	11	Protein Synthesis, Replication, Transcription, & Translation DNA	• DNA structure and function • RNA structure and function • Protein synthesis • Mutations • Genetic engineering • human genome	Construct DNA model Mutation-Mini lab, pg. 326 *Transcription, Replication, Protein Synthesis Paper Lab *DNA Isolation	HE.5.B.1 Model the components of a *DNA nucleotide* and an *RNA nulcleotide* HE.5.B.2 Describe the Watson-Crick *double helix model* of *DNA,* using the *base-pairing rule* (a*denine-thymine*, *cytosine-guanine*) *leotide* HE.5.B.3 Compare and contrast the structure and function of *DNA* and *RNA* HE.5.B.4 Describe and model the processes of replication, *transcription*, and *translation* HE.5.B.5 Compare and contrast the different types of *mutation* events, including *point mutation*, *frameshift mutation*, *deletion*, and *inversion* HE.5.B.6 Identify effects of changes brought about by *mutations:* ▪ beneficial ▪ harmful ▪ neutral NS.14.B.4 Explain how the cyclical relationship between science and *technology* results in reciprocal advancements in science and *technology*	Identification of Patterns, Trends, and Relationships of Data, Purpose of Experimental Procedures.
3	8.2	Cell Reproduction, Mitosis, Cell Size	• cell size • cell division • chromosomal change • uncontrolled cell division	Volume versus Surface Area Ratio Mitosis Lab- pipe cleaners *Mitosis Lab	MC.2.B.8 Describe the main events in the *cell cycle*, including the differences in plant and animal cell division: ▪ *interphase* ▪ *mitosis* ▪ *cytokinesis* MC.2.B.9 List in order and describe the stages of *mitosis:* ▪ *prophase* ▪ *metaphase* ▪ *anaphase* ▪ *telophase*. MC.2.B.10 Analyze the meiotic maintenance of a constant *chromosome* number from one generation to the next CDL.7.B.8 Compare and contrast life cycles of familiar organisms ▪ sexual reproduction ▪ asexual reproduction ▪ metamorphosis ▪ *alternation of generations*	Interpretation of Data and Other Information.

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
6	10, 12, 13	Genetics	• Mendel's work • dominant and recessive • homozygous and heterozygous • phenotype and genotype Punnett squares • monohybrid and dihybrid crosses • incomplete dominance • Inheritance • pedigrees • karyotypes • chromosomal disorders • Technology • human genome • homologous chromosomes • phases • crossing over • genetic recombination • Meiosis	Face head variation, Pedigree chart Karyotype lab-Insect Modeling meiosis page 300 *Meiosis Lab *Medelian Genetic Lab *Probability Lab *Analysis of Karyotype	HE.4.B.1 Summarize the outcomes of Gregor Mendel's experimental procedures HE.4.B.2 Differentiate among the *laws and principles of inheritance:* ▪ *dominance* ▪ *segregation* ▪ *independent assortment* HE.4.B.3 Use the *laws* of probability and *Punnett squares* to predict *genotypic* and *phenotypic ratios* HE.4.B.4 Examine different modes of inheritance: ▪ *sex linkage* ▪ *codominance* ▪ *crossing over* ▪ *incomplete dominance* ▪ *multiple alleles* HE.4.B.5 Analyze the historically significant work of prominent geneticists HE.4.B.6 Evaluate *karyotypes* for abnormalities: • monosomy • trisomy NS.12.B.6 Relate the *chromosome theory of heredity* to recent findings in genetic research (e.g., *Human Genome Project-HGP, chromosome therapy)*	Identification of Conclusions, Hypotheses, Models or Predictions.
1	-	Common Assessment				

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
8	2,3,4,5	Ecology	• Ecological levels • Abiotic vs Biotic • feeding relationships • ecological cycles • biomes • population growth • biodiverstiy	Owl Pellet Design food web *Biodiversiy Scavenger Hunt *Water analysis *Soil Analysis *Build a Biome	EBR.8.B.1 Cite examples of abiotic and *biotic factors* of *ecosystems* EBR.8.B.2 Compare and contrast the characteristics of *biomes* EBR.8.B.3 Diagram the carbon, nitrogen, phosphate, and water cycles in an *ecosystem* EBR.8.B.4 Analyze an *ecosystem's* energy flow through food chains, food webs, and *energy pyramids* EBR.8.B.5 Identify and predict the factors that control *population*, including *predation*, *competition*, crowding, water, nutrients, and shelter EBR.8.B.6 Summarize the symbiotic ways in which individuals within a *community* interact with each other: ▪ *commensalism* ▪ *parasitism* ▪ *mutualism* EBR.8.B.7 Compare and contrast *primary succession* with *secondary succession* EBR.8.B.8 Identify the properties of each of the five levels of *ecology:* ▪ organism ▪ *population* ▪ *community* ▪ *ecosystem* ▪ *biosphere* EBR.9.B.1 Analyze the effects of human *population* growth and *technology* on the environment/*biosphere* EBR.9.B.2 Evaluate long range plans concerning resource use and by-product disposal in terms of their environmental, economic, and political impact EBR.9.B.3 Assess current world issues applying scientific themes (e.g., global changes in climate, *epidemics*, *pandemics*, ozone depletion, UV radiation, natural resources, use of *technology*, and public policy) MC.2.B.1 Construct a hierarchy of life from cells to *ecosystems* NS.14.B.3 Evaluate long-range plans concerning resource use and by-product disposal for environmental, economic, and political impact	Interpretation of Data and Other Information, Data Representation, Identification of Patterns, Trends, and Relationships of Data.

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
3	14,15, 16	Evolution	• Natural Selection • Geologic time scale	*Radioactive Decay *Natural Selection and Adaptation Lab *Fossil Lab	HE.6.B.1 Compare and contrast Lamarck's explanation of *evolution* with Darwin's *theory* of *evolution* by *natural selection* HE.6.B.2 Recognize that *evolution* involves a change in allele frequencies in a *population* across successive generations HE.6.B.3 Analyze the effects of *mutations* and the resulting *variations* within a *population* in terms of *natural selection* HE.6.B.4 Illustrate *mass extinction* events using a time line HE.6.B.5 Evaluate *evolution* in terms of evidence as found in the following: • fossil record • *DNA* analysis • *artificial selection* • morphology • embryology • viral *evolution* • geographic distribution of related *species* • *antibiotic* and *pesticide resistance* in various organisms HE.6.B.6 Compare the processes of *relative dating* and *radioactive dating* to determine the age of fossils HE.6.B.7 Interpret a *Cladogram* NS.12.B.3 Summarize *biological evolution*	

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3	17	Classification Kingdoms	• Relationships • dichotomous keys • taxons • binomial nomenclature	Taxonomy Lab, *Dichotomous Keys, Leaf Collection in the Fall Term	CDL.7.B.1 Differentiate among the different *domains:* • Bacteria • Archaea • Eukarya CDL.7.B.2 Differentiate the characteristics of the six kingdoms: • Eubacteria • Archaea • Protista • *Fungi* • Plantae • Animalia CDL.7.B.3 Identify the seven major taxonomic categories: • kingdom • phylum • class • order • family • *genus* • *species* CDL.7.B.4 Classify and name organisms based on their similarities and differences applying *taxonomic nomenclature* using *dichotomous keys* CDL.7.B.5 Investigate Arkansas' *biodiversity* using appropriate tools and *technology*	Process of scientific investigation, Interpretation of data and other information, Identification of Patterns, Trends, and Relationships of Data.

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
8	18, 19,20	Viruses, Bacteria, Protist, Fungi	• Structure of viruses • Pandemics & epidemics • lytic and lysogenic cycles • retrovirus • RNA • Bacteria classification and structure • Antibiotics • Fungi classification and structure • adaptations for survival • reproduction • economic importance • Protist characteristics	Virus replication Bacteria cultures Pond water lab Bread mold lab *Fungi Lab (mushroom) *Spread of Infectious Disease	CDL.7.B.6 Compare and contrast the structures and characteristics of *viruses* (*lytic* and *lysogenic cycles*) with non-living and living things CDL.7.B.7 Evaluate the medical and economic importance of *viruses* CDL.7.B.9 Classify *bacteria* according to their characteristics and adaptations CDL.7.B.10 Evaluate the medical and economic importance of *bacteria* CDL.7.B.11 Describe the characteristics used to classify protists: ▪ plant-like ▪ animal-like ▪ *fungal*-like CDL.7.B.12 Evaluate the medical and economic importance of protists CDL.7.B.13 Compare and contrast *fungi* with other eukaryotic organisms CDL.7.B.14 Evaluate the medical and economic importance of *fungi* NS.12.B.5 Describe the relationship between the *germ theory of disease* and our current knowledge of immunology and control of infectious diseases EBR.9.B.3 Assess current world issues applying scientific themes (e.g., global changes in climate, *epidemics*, *pandemics*, ozone depletion, UV radiation, natural resources, use of *technology*, and public policy) CDL.7.B.8 Compare and contrast life cycles of familiar organisms ▪ sexual reproduction ▪ asexual reproduction ▪ metamorphosis ▪ *alternation of generations* NS.12.B.7 Research current events and topics in biology	Identification of Patterns, Trends, and Relationships of Data. Interpretation of Data and Other Information
1	-	Common Assessment				

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
6	25-29	Animal Characteristics, Invertebrates.	• Animal development and characteristics • symmetry • Invertibrates • Embryology • comparative anatomy	Dissect Earthworm, Crayfish	CDL.7.B.20 Identify the symmetry of organisms: ▪ radial ▪ bilateral ▪ asymmetrical CDL.7.B.21 Compare and contrast the major invertebrate classes according to their nervous, respiratory, excretory, circulatory, and digestive systems CDL.7.B.8 Compare and contrast life cycles of familiar organisms ▪ sexual reproduction ▪ asexual reproduction ▪ metamorphosis ▪ *alternation of generations*	Identification of Patterns, Trends, and Relationships of Data.
7	30-32	Vertebrates	• Fish • Amphibians • Birds • reptiles • mammals • comparative anatomy	Dissect Frog *Comparative Anatomy Lab	CDL.7.B.22 Compare and contrast the major vertebrate classes according to their nervous, respiratory, excretory, circulatory, digestive, reproductive and integumentary systems	Identification of Patterns, Trends, and Relationships of Data.
8	21-24	Plants	Plant divisions life cycles Plant structures and functions Economic impact of plants Biodiversity	Leaf Collection in The Spring Term *Adhesion and Cohesion Lab *Chromatography Lab *Use of Dichotomous Key *Plant Anatomy Lab (root, stem, leaf, seed)	CDL.7.B.5 Investigate Arkansas' *biodiversity* using appropriate tools and *technology* CDL.7.B.15 Differentiate between *vascular* and *nonvascular plants* CDL.7.B.16 Differentiate among cycads, gymnosperms, and angiosperms CDL.7.B.17 Describe the structure and function of the major parts of a plant: ▪ roots ▪ stems ▪ leaves ▪ flowers CDL.7.B.18 Relate the structure of plant tissue to its function • epidermal • ground • vascular CDL.7.B.19 Evaluate the medical and economic importance of plants CDL.7.B.8 Compare and contrast life cycles of familiar organisms ▪ sexual reproduction ▪ asexual reproduction ▪ metamorphosis ▪ *alternation of generations*	Interpretation of Data and Other Information, Data Representation, Identification of Patterns, Trends, and Relationships of Data.

DAYS	CHAPTER	TOPIC	SUB-TOPICS	LABS	Frameworks	ACT
		Ongoing Skills	These skills will be incorporated throughout the year .Careers incorporated with each topic.	Career Booklet Review	NS.13.B.1 Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables NS.13.B.2 Use appropriate equipment and *technology* as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware) NS.13.B.3 Utilize *technology* to communicate research findings NS.15.B.1 Research and evaluate science careers using the following criteria: ▪ educational requirements ▪ salary ▪ availability of jobs ▪ working conditions	
1	All	MAP Testing	Measure of Academic Progress			
2	-	Geometry and Algebra EOC Test				

The learner will demonstrate an understanding of life science as a process of inquiry. The content goals will incorporate historical and cultural aspects, standard safety procedures, laboratory experiences and the scientific method.