

VAN BUREN SCHOOL DISTRICT AP BIOLOGY CURRICULUM

Week	CHAPTER	TOPIC	SUB-TOPICS	LABS	FRAMEWORKS	ACT Correlations
1,2&3	1, 2, 3	Introduction to Biology, Chemistry, Water	<ol style="list-style-type: none"> 1. Life's Hierarchical Order 2. Evolution, Unity, and Diversity 3. Science as a Process 4. Chemical elements and Compounds 5. Atoms and Molecules 6. Water's polarity and its Effects 7. The Dissociation of water 8. Acid Precipitation Threatens the Fitness of the Environment 	Enzyme Catalysis	<p>MC.1.B.1 Describe the structure and function of the major organic molecules found in living systems:</p> <ul style="list-style-type: none"> • <i>carbohydrates</i> • <i>proteins</i> • <i>enzymes</i> • <i>lipids</i> • <i>nucleic acids</i> <p>MC.1.B.2 Describe the relationship between an enzyme and its substrate molecule(s)</p> <p>MC.1.B.3 Investigate the properties and importance of water and its significance for life:</p> <ul style="list-style-type: none"> • <i>surface tension</i> • <i>adhesion</i> • <i>cohesion</i> • <i>polarity</i> • <i>pH</i> <p>MC.1.B.4 Explain the role of energy in chemical reactions of living systems:</p> <ul style="list-style-type: none"> • <i>activation energy</i> • <i>exergonic reactions</i> • <i>endergonic reactions</i> <p>MC.2.B.1 Construct a hierarchy of life from cells to <i>ecosystems</i></p> <p>NS.10.B.1 Explain why science is limited to natural explanations of how the world works</p> <p>NS.10.B.2 Compare and contrast <i>hypotheses, theories, and laws</i></p> <p>NS.10.B.3 Distinguish between a scientific <i>theory</i> and the term "<i>theory</i>" used in general conversation</p> <p>NS.10.B.4 Summarize the guidelines of science:</p> <ul style="list-style-type: none"> ▪ <i>explanations</i> are based on observations, evidence, and testing ▪ <i>hypotheses</i> must be testable ▪ understandings and/or conclusions may change with additional empirical 	1,2,3,4,5,6

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					<p>data</p> <ul style="list-style-type: none"> ▪ scientific knowledge must have peer review and verification before acceptance <p>NS.11.B.1 Develop and explain the appropriate procedure, controls, and variables (dependent and independent) in scientific experimentation</p> <p>NS.11.B.2 Research and apply appropriate safety precautions (refer to ADE Guidelines) when designing and/or conducting scientific investigations</p> <p>NS.11.B.3 Identify sources of bias that could affect experimental outcome</p> <p>NS.11.B.4 Gather and analyze data using appropriate summary statistics</p> <p>NS.11.B.5 Formulate valid conclusions without bias</p> <p>NS.11.B.6 Communicate experimental results using appropriate reports, figures, and tables</p> <p>NS.12.B.1 Recognize that theories are scientific explanations that require empirical data, verification, and peer review</p> <p>NS.12.B.2 Understand that scientific theories may be modified or expanded based on additional empirical data, verification, and peer review</p> <p>NS.12.B.3 Summarize <i>biological evolution</i></p> <p>NS.12.B.4 Relate the development of the <i>cell theory</i> to current trends in cellular biology</p> <p>NS.13.B.1 Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables</p> <p>NS.14.B.1 Compare and contrast biological concepts in <i>pure science</i> and <i>applied science</i></p>	
4,5,6&7	4, 5, 6, 7	Biochemistry, Cell Structure, and Cell Transport	<ol style="list-style-type: none"> 1. The Importance of Carbon 2. Functional Groups (Hydroxyl, carboxyl, amino, sulfhydryl, and phosphate) 3. Polymer Principles 4. Carbohydrates: Fuel and Building Material 5. Lipids: Diverse Hydrophobic Molecules 6. Proteins: The Molecular Tools of the Cell 7. Nucleic Acids: Informational Polymers 8. How We Study Cells 9. A Panoramic view of the Cell 	Diffusion and Osmosis	<p>MC.2.B.2 Compare and contrast <i>prokaryotes</i> and <i>eukaryotes</i></p> <p>MC.2.B.3 Describe the role of sub-cellular structures in the life of a cell:</p> <ul style="list-style-type: none"> ▪ <i>organelles</i> ▪ <i>ribosomes</i> ▪ <i>cytoskeleton</i> <p>MC.2.B.3 Describe the role of sub-cellular structures in the life of a cell:</p> <ul style="list-style-type: none"> ▪ <i>organelles</i> 	1,2,3,4,5,6

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			<ol style="list-style-type: none"> 10. The Nucleus and Ribosomes 11. The Endomembrane System 12. Other Membranous Organelles 13. The Cytoskeleton 14. Cell Surfaces and Junctions 15. Membrane Structure 16. Traffic Across Membranes 		<ul style="list-style-type: none"> ▪ <i>ribosomes</i> ▪ <i>cytoskeleton</i> <p>MC.2.B.4 Relate the function of the <i>plasma (cell) membrane</i> to its structure</p> <p>MC.2.B.5 Compare and contrast the structures of an animal cell to a plant cell</p> <p>MC.2.B.6 Compare and contrast the functions of <i>autotrophs</i> and <i>heterotrophs</i></p> <p>MC.2.B.7 Compare and contrast <i>active transport</i> and <i>passive transport mechanisms</i>:</p> <ul style="list-style-type: none"> ▪ <i>diffusion</i> ▪ <i>osmosis</i> ▪ <i>endocytosis</i> ▪ <i>exocytosis</i> ▪ <i>phagocytosis</i> ▪ <i>pinocytosis</i> <p>NS.13.B.1 Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables</p>	
8&9	6, 9, 10, 11, 12	Metabolism, Respiration, Photosynthesis, Cell Communication and the Cell Cycle	<ol style="list-style-type: none"> 1. Metabolism, Energy and Life 2. Enzymes 3. The Control of Metabolism 4. Principles of Energy Conservation 5. The Process of Cellular Respiration 6. Related Metabolic Processes 7. Photosynthesis in Nature 8. The Pathways of Photosynthesis 9. An Overview of Cell Signaling 10. Signal Reception and the Initiation of Transduction 11. Signal Transduction Pathways 12. Cellular Responses to Signals 13. The Key Roles of Cell division 14. The Mitotic Cell Cycle 15. Regulation of the Cell Cycle 	Cell Respiration	<p>MC.2.B.8 Describe the main events in the <i>cell cycle</i>, including the differences in plant and animal cell division:</p> <ul style="list-style-type: none"> ▪ <i>interphase</i> ▪ <i>mitosis</i> ▪ <i>cytokinesis</i> <p>MC.2.B.9 List in order and describe the stages of <i>mitosis</i>:</p> <ul style="list-style-type: none"> ▪ <i>prophase</i> ▪ <i>metaphase</i> ▪ <i>anaphase</i> ▪ <i>telophase</i>. <p>MC.2.B.10 Analyze the meiotic maintenance of a constant <i>chromosome</i> number from one generation to the next</p> <p>MC.2.B.11 Discuss <i>homeostasis</i> using <i>thermoregulation</i> as an example</p> <p>MC.3.B.1 Compare and contrast the structure and function of <i>mitochondria</i> and <i>chloroplasts</i></p> <p>MC.3.B.2 Describe and model the conversion of stored energy in organic molecules into usable cellular energy (ATP):</p> <ul style="list-style-type: none"> ▪ <i>glycolysis</i> ▪ <i>citric acid cycle</i> 	1,2,3,4,5,6

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					<ul style="list-style-type: none"> ▪ <i>electron transport chain</i> <p>MC.3.B.3 Compare and contrast <i>aerobic</i> and <i>anaerobic respiration</i>:</p> <ul style="list-style-type: none"> ▪ <i>lactic acid fermentation</i> ▪ <i>alcoholic fermentation</i> <p>MC.3.B.4 Describe and model the conversion of light energy to chemical energy by photosynthetic organisms:</p> <ul style="list-style-type: none"> ▪ <i>light dependent</i> reactions ▪ <i>light independent</i> reactions <p>MC.3.B.5 Compare and contrast <i>cellular respiration</i> and <i>photosynthesis</i> as energy conversion pathways</p> <p>NS.13.B.1 Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables</p>	
10,11& 12	13, 14, 15	Meiosis, Mendel and the Chromosomal Basis of Inheritance	<ol style="list-style-type: none"> 1. Introduction to Heredity 2. The Role of Meiosis in Sexual Life Cycles 3. Origins of Genetic Variation 4. Gregor Mendel's Discoveries 5. Extending Mendelian Genetics 6. Mendelian Inheritance in Humans 7. Relating Mendelism to Chromosomes 8. Sex Chromosomes 9. Errors and Exceptions in Chromosomal Inheritance 	Mitosis and Meiosis	<p>HE.4.B.1 Summarize the outcomes of Gregor Mendel's experimental procedures</p> <p>HE.4.B.2 Differentiate among the <i>laws and principles of inheritance</i>:</p> <ul style="list-style-type: none"> ▪ <i>dominance</i> ▪ <i>segregation</i> ▪ <i>independent assortment</i> <p>HE.4.B.3 Use the <i>laws</i> of probability and <i>Punnett squares</i> to predict <i>genotypic</i> and <i>phenotypic ratios</i></p> <p>HE.4.B.4 Examine different modes of inheritance:</p> <ul style="list-style-type: none"> ▪ <i>sex linkage</i> ▪ <i>codominance</i> ▪ <i>crossing over</i> ▪ <i>incomplete dominance</i> ▪ <i>multiple alleles</i> <p>HE.4.B.5 Analyze the historically significant work of prominent geneticists</p> <p>HE.4.B.6 Evaluate <i>karyotypes</i> for abnormalities:</p> <ul style="list-style-type: none"> • monosomy • trisomy <p>NS.12.B.6 Relate the <i>chromosome theory of heredity</i> to recent findings in genetic research (e.g., <i>Human Genome Project-HGP, chromosome therapy</i>)</p>	1,2,3,4 ,5,6

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					NS.13.B.1 Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables	
13&14	16, 17, 18	Molecular Genetics I: DNA Structure, KNA Replication, Protein Synthesis, Genetic Code, and Control of Gene Expression	<ol style="list-style-type: none"> 1. DNA as the Genetic Material 2. DNA Replication and Repair 3. The Connection between Genes and Proteins 4. The Synthesis and Processing of RNA 5. The Synthesis of Protein 6. The Genetics of Viruses 7. The Genetics of Bacteria 	Molecular Biology	<p>HE.5.B.1 Model the components of a DNA nucleotide and an RNA nucleotide</p> <p>HE.5.B.2 Describe the Watson-Crick double helix model of DNA, using the base-pairing rule (adenine-thymine, cytosine-guanine)</p> <p>HE.5.B.3 Compare and contrast the structure and function of DNA and RNA</p> <p>HE.5.B.4 Describe and model the processes of replication, transcription, and translation</p> <p>HE.5.B.5 Compare and contrast the different types of mutation events, including point mutation, frameshift mutation, deletion, and inversion</p> <p>HE.5.B.6 Identify effects of changes brought about by mutations:</p> <ul style="list-style-type: none"> ▪ beneficial ▪ harmful ▪ neutral <p>NS.12.B.7 Research current events and topics in biology</p> <p>NS.13.B.1 Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables</p> <p>NS.14.B.2 Discuss why scientists should work within ethical parameters</p>	1,2,3,4,5,6
15&16	22, 23, 24, 25	Mechanisms of Evolution	<ol style="list-style-type: none"> 1. Historical Context for Evolutionary Theory 2. The Darwinian Revolution 3. Evidence of Evolution 4. Population Genetics 5. Causes of Microevolution 6. Genetic Variation, The Substrate for Natural Selection 7. Natural Selection as the Mechanism of Adaptive Evolution 8. What is a Species? 9. Modes of Speciation 10. The Origin of Evolutionary Novelty 11. The Fossil Record and Geologic Time 12. Phylogeny and Systematics 13. The Science of Phylogenetic Systematics 14. Molecular Based Inheritance 		<p>HE.6.B.1 Compare and contrast Lamarck's explanation of evolution with Darwin's theory of evolution by natural selection</p> <p>HE.6.B.2 Recognize that evolution involves a change in allele frequencies in a population across successive generations</p> <p>HE.6.B.3 Analyze the effects of mutations and the resulting variations within a population in terms of natural selection</p> <p>HE.6.B.4 Illustrate mass extinction events using a time line</p> <p>HE.6.B.5 Evaluate evolution in terms of evidence as found in the following:</p> <ul style="list-style-type: none"> • fossil record • DNA analysis 	1,2,3,4,5,6

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					<ul style="list-style-type: none"> • <i>artificial selection</i> • morphology • embryology • <i>viral evolution</i> • geographic distribution of related <i>species</i> • <i>antibiotic and pesticide resistance</i> in various organisms <p>HE.6.B.6 Compare the processes of <i>relative dating</i> and <i>radioactive dating</i> to determine the age of fossils</p> <p>HE.6.B.7 Interpret a <i>Cladogram</i></p>	
17&18	26, 27, 28	The Evolutionary History of Biologic Diversity	<ol style="list-style-type: none"> 1. Prebiotic Chemical Evolution and the Origin of Life 2. The Major Lineages of Life 3. The World of Prokaryotes 4. Structure, Function, and Reproduction of Prokaryotes 5. Nutritional and Metabolic Diversity 6. Phylogeny of Prokaryotes 7. Ecological Impact of Prokaryotes 8. Introduction to the Protists. Eukaryotic Diversity 9. Protist Systematics and Phylogeny 	Dissolved Oxygen and Aquatic Primary Productivity	<p>CDL.7.B.1 Differentiate among the different <i>domains</i>:</p> <ul style="list-style-type: none"> • Bacteria • Archaea • Eukarya <p>CDL.7.B.2 Differentiate the characteristics of the six kingdoms:</p> <ul style="list-style-type: none"> • Eubacteria • Archaea • Protista • <i>Fungi</i> • Plantae • Anamalia <p>CDL.7.B.3 Identify the seven major taxonomic categories:</p> <ul style="list-style-type: none"> • kingdom • phylum • class • order • family • genus • species <p>CDL.7.B.4 Classify and name organisms based on their similarities and differences applying <i>taxonomic nomenclature</i> using <i>dichotomous keys</i></p> <p>CDL.7.B.5 Investigate Arkansas' <i>biodiversity</i> using appropriate tools and <i>technology</i></p> <p>CDL.7.B.6 Compare and contrast the</p>	1,2,3,4,5,6

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					<p>structures and characteristics of <i>viruses</i> (<i>lytic</i> and <i>lysogenic cycles</i>) with non-living and living things</p> <p>CDL.7.B.7 Evaluate the medical and economic importance of <i>viruses</i></p> <p>CDL.7.B.8 Compare and contrast life cycles of familiar organisms</p> <ul style="list-style-type: none"> ▪ sexual reproduction ▪ asexual reproduction ▪ metamorphosis <p><i>alternation of generations</i></p> <p>CDL.7.B.9 Classify <i>bacteria</i> according to their characteristics and adaptations</p> <p>CDL.7.B.10 Evaluate the medical and economic importance of <i>bacteria</i></p> <p>CDL.7.B.11 Describe the characteristics used to classify protists:</p> <ul style="list-style-type: none"> ▪ plant-like ▪ animal-like ▪ <i>fungus-like</i> <p>CDL.7.B.12 Evaluate the medical and economic importance of protists</p>	
19&20			Review and Semester Test			
21&22	29, 30, 21, 35, 36, 37, 38, 39	Plant Diversity, Plant Structure and Growth, Transport, Nutrition, Reproduction and Control Systems, Fungi	<ol style="list-style-type: none"> 1. An Overview of Plant Evolution 2. The Origins of Plants 3. Bryophytes 4. The Origin of Vascular Plants 5. Seedless Vascular Plants 6. Reproductive Adaptations of Seed Plants 7. Gymnosperms 8. Angiosperms 9. The Global Impact of Plants 10. Introduction to Fungi 11. Diversity of Fungi 12. Ecological Impacts of Fungi 13. Phylogenetic Relationships of fungi 	Plant Pigments and Photosynthesis Transpiration	<p>CDL.7.B.15 Differentiate between <i>vascular</i> and <i>nonvascular plants</i></p> <p>CDL.7.B.16 Differentiate among cycads, gymnosperms, and angiosperms</p> <p>CDL.7.B.17 Describe the structure and function of the major parts of a plant:</p> <ul style="list-style-type: none"> ▪ roots ▪ stems ▪ leaves ▪ flowers <p>CDL.7.B.18 Relate the structure of plant tissue to its function</p> <ul style="list-style-type: none"> • epidermal • ground • vascular <p>CDL.7.B.19 Evaluate the medical and economic importance of plants</p>	1,2,3,4,5,6
23&24	32, 33, 34	Animal Evolution, Invertebrates,	<ol style="list-style-type: none"> 1. What is an Animal 2. The Origins of Animal Diversity 3. The Parazoa 	Animal Behavior	<p>CDL.7.B.20 Identify the symmetry of organisms:</p> <ul style="list-style-type: none"> ▪ radial 	1,2,3,4,5,6

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		Vertebrate Evolution and Diversity	<ol style="list-style-type: none"> 4. The Radiata 5. The Acoelomates 6. The Pseudocoelomates 7. The Coelomates: Protostomes 8. The Coelomates: Deuterostomes 9. Invertebrate Chordates and the Origin of Vertebrates 10. Introduction to the Vertebrates 11. Superclass Agnatha 12. Superclass Gnathostomata <p>Primates and the Phylogeny of <i>Homo sapiens</i></p>		<ul style="list-style-type: none"> ▪ bilateral ▪ asymmetrical <p>CDL.7.B.21 Compare and contrast the major invertebrate classes according to their nervous, respiratory, excretory, circulatory, and digestive systems</p> <p>CDL.7.B.22 Compare and contrast the major vertebrate classes according to their nervous, respiratory, excretory, circulatory, digestive, reproductive and integumentary systems</p>	
25,26 &27	40, 41, 42, 43	Animal Structure and Function, Nutrition Circulation and Gas Exchange and the Bodies Defenses	<ol style="list-style-type: none"> 1. Levels of Structural Organization 2. Introduction to the Bioenergetics of Animals 3. Body Plans and the External Environment 4. Regulating the Internal Environment 5. Animal Circulatory systems 6. Animal Nutritional Requirements 7. Food types and Feeding Mechanisms 8. Overview of Food Processing 9. The Mammalian Digestive System 10. Evolutionary Adaptations of Vertebrate Digestive Systems 11. Regulation of Body Temperature 12. Water Balance and waste Disposal 13. Excretory Systems 14. An Introduction to Regulatory Systems 15. The Vertebrate Endocrine System 	Physiology of the Circulatory System	<p>OHB.1.AP.2 Sequence the levels of organization of the human body</p> <p>OHB.1.AP.8 Identify the major characteristics of life:</p> <ul style="list-style-type: none"> • metabolism • responsiveness • movement • growth • reproduction • differentiation <p>BS.5.AP.1 Identify the components of the <i>integumentary system</i></p> <p>OHB.1.AP.6 Investigate <i>homeostatic</i> control mechanisms and their importance to health and diseases</p> <p>BS.13.AP.3 Identify the macroscopic, microscopic, and molecular structure of the <i>digestive system</i></p> <p>CC.2.AP.6 Analyze the role of water in the human body</p> <p>BS.5.AP.2 Discuss the physiological mechanisms of the skin</p> <p>BS.9.AP.1 Identify the components of the <i>endocrine system</i></p> <p>BS.10.AP.2 Discuss the physiological mechanisms of the <i>cardiovascular system</i></p> <p>NS.12.B.5 Describe the relationship between the <i>germ theory of disease</i> and our current knowledge of immunology and control of infectious diseases</p>	1,2,3,4 ,5,6
28&29	42, 43	Reproductive System and	<ol style="list-style-type: none"> 1. Animal Reproduction 2. Mechanisms of Sexual Reproduction 		BS.15.AP.1 Describe the components and the organization of the <i>reproductive system</i>	1,2,3,4 ,5,6

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		Development	<ol style="list-style-type: none"> 3. Mammalian Reproduction 4. Stages of Early Embryonic Development 5. The Cellular and Molecular Basis of Morphogenesis and Differentiation in animals 		BS.15.AP.3 Identify the macroscopic, microscopic, and molecular structure of the <i>reproductive system</i>	
30&31	50-55	Ecology	<ol style="list-style-type: none"> 1. Population Dynamics 2. Communities and Ecosystems 3. Global issues 		<p>EBR.9.B.1 Analyze the effects of human <i>population growth</i> and <i>technology</i> on the environment/<i>biosphere</i></p> <p>EBR.9.B.2 Evaluate long range plans concerning resource use and by-product disposal in terms of their environmental, economic, and political impact</p> <p>EBR.9.B.3 Assess current world issues applying scientific themes (e.g., global changes in climate, <i>epidemics</i>, <i>pandemics</i>, ozone depletion, UV radiation, natural resources, use of <i>technology</i>, and public policy)</p> <p>NS.14.B.3 Evaluate long-range plans concerning resource use and by-product disposal for environmental, economic, and political impact</p> <p>NS.14.B.4 Explain how the cyclical relationship between science and <i>technology</i> results in reciprocal advancements in science and <i>technology</i></p>	
		Labs	Due to their complexity, all of the AP Biology Labs conform to the following Life Science Systems Content Standards		<p>NS.13.B.3 Utilize <i>technology</i> to communicate research findings</p> <p>NS.15.B.1 Research and evaluate science careers using the following criteria:</p> <ul style="list-style-type: none"> ▪ educational requirements ▪ salary ▪ availability of jobs ▪ working conditions 	

1. Interpretation of Data and Other Information
2. Data Representation
3. Identification of Patterns, Trends, and Relationships of Data
4. Purpose of Experimental Procedures
5. Process of Scientific Investigation
6. Identification of Conclusions, Hypotheses, Models or Predictions