

## Biology CR

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
MC	Molecules and Cells		
MC.1	Students shall demonstrate an understanding of the role of chemistry in life processes.	Nature of Science	Throughout Section 2
MC.1.B.1	Describe the structure and function of the major organic molecules found in living systems:		
MC.1.B.1.a	carbohydrates	Nature of Science	Section 2, Part 15
MC.1.B.1.b	proteins	Nature of Science	Section 2, Part 20
MC.1.B.1.c	enzymes	Nature of Science	Section 2, Part 20
MC.1.B.1.d	lipids	Nature of Science	Section 2, Parts 16-19
MC.1.B.1.e	nucleic acids	Nature of Science	Section 2, Parts 21-25
MC.1.B.2	Describe the relationship between an enzyme and its substrate molecule(s)	Photosynthesis and Cellular Respiration	Enzyme Lab
MC.1.B.3	Investigate the properties and importance of water and its significance for life:	Nature of Science	Section 2, Parts 9-11
MC.1.B.3.a	surface tension		
MC.1.B.3.b	adhesion	Nature of Science	Section 2, Part 10

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MC.1.B.3.c	cohesion	Nature of Science	Section 2, Part 10
MC.1.B.3.d	polarity	Nature of Science	Section 2, Part 10
MC.1.B.3.e	pH	Nature of Science	Section 2, Part 11
MC.1.B.4	Explain the role of energy in chemical reactions of living systems:		
MC.1.B.4.a	activation energy	Photosynthesis and Cellular Respiration	Section 1, Part 6
MC.1.B.4.b	exergonic reactions	Photosynthesis and Cellular Respiration	Section 1, Part 1
MC.1.B.4.c	endergonic reactions	Photosynthesis and Cellular Respiration	Section 1, Part 1
MC.2	Students shall demonstrate an understanding of the structure and function of cells.	Cell Structure	Throughout Unit

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MC.2.B.1	Construct a hierarchy of life from cells to ecosystems	Animal Organization	Introduction
MC.2.B.2	Compare and contrast prokaryotes and eukaryotes	Cell Structure	Section 1, Part 5
MC.2.B.3	Describe the role of sub-cellular structures in the life of a cell:		
MC.2.B.3.a	organelles	Cell Structure	Section 1, Part 7
MC.2.B.3.b	ribosomes	Cell Structure	Section 1, Part 8
MC.2.B.3.c	cytoskeleton		
MC.2.B.4	Relate the function of the plasma (cell) membrane to its structure	Cell Structure	Throughout Section 2

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MC.2.B.5	Compare and contrast the structures of an animal cell to a plant cell	Cell Structure	Section 1, Parts 8-9
MC.2.B.6	Compare and contrast the functions of autotrophs and heterotrophs	Photosynthesis and Cellular Respiration	Section 1, Part 9
MC.2.B.7	Compare and contrast active transport and passive transport mechanisms:	Cell Structure	Section 2, Parts 6-8
MC.2.B.7.a	diffusion	Cell Structure	Section 2, Part 6
MC.2.B.7.b	osmosis	Cell Structure	Section 2, Part 6
MC.2.B.7.c	endocytosis	Cell Structure	Section 2, Part 8

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MC.2.B.7.d	exocytosis	Cell Structure	Section 2, Part 8
MC.2.B.7.e	phagocytosis	Cell Structure	Section 2, Part 8
MC.2.B.7.f	pinocytosis		
MC.2.B.8	Describe the main events in the cell cycle, including the differences in plant and animal cell division:	Cell Structure	Mitosis Lab
MC.2.B.8.a	interphase	Cell Structure	Mitosis Lab
MC.2.B.8.b	mitosis	Cell Structure	Mitosis Lab

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MC.2.B.8.c	cytokinesis	Cell Structure	Mitosis Lab
MC.2.B.9	List in order and describe the stages of mitosis:	Cell Structure	Mitosis Lab
MC.2.B.9.a	prophase	Cell Structure	Mitosis Lab
MC.2.B.9.b	metaphase	Cell Structure	Mitosis Lab
MC.2.B.9.c	anaphase	Cell Structure	Mitosis Lab
MC.2.B.9.d	telophase.	Cell Structure	Mitosis Lab

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MC.2.B.10	Analyze the meiotic maintenance of a constant chromosome number from one generation to the next	Cell Structure	Meiosis Lab
MC.2.B.11	Discuss homeostasis using thermoregulation as an example	Animal Organization	Section 2, Part 3
MC.3	Students shall demonstrate an understanding of how cells obtain and use energy (energetics).		
MC.3.B.1	Compare and contrast the structure and function of mitochondria and chloroplasts	Cell Structure	Section 1, Parts 8-9
MC.3.B.2	Describe and model the conversion of stored energy in organic molecules into usable cellular energy (ATP):	Photosynthesis and Cellular Respiration	Throughout Unit
MC.3.B.2.a	glycolysis	Photosynthesis and Cellular Respiration	Section 3, Part 2

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MC.3.B.2.b	citric acid cycle	Photosynthesis and Cellular Respiration	Section 3, Parts 9-10
MC.3.B.2.c	electron transport chain	Photosynthesis and Cellular Respiration	Section 3, Part 12
MC.3.B.3	Compare and contrast aerobic and anaerobic respiration:	Photosynthesis and Cellular Respiration	Section 3, Parts 6-11
MC.3.B.3.a	lactic acid fermentation	Photosynthesis and Cellular Respiration	Section 3, Part 7
MC.3.B.3.b	alcoholic fermentation	Photosynthesis and Cellular Respiration	Section 3, Part 7
MC.3.B.4	Describe and model the conversion of light energy to chemical energy by photosynthetic organisms:		

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MC.3.B.4.a	light dependent reactions	Photosynthesis and Cellular Respiration	Section 2, Part 10
MC.3.B.4.b	light independent reactions	Photosynthesis and Cellular Respiration	Section 2, Part 9
MC.3.B.5	Compare and contrast cellular respiration and photosynthesis as energy conversion pathways	Photosynthesis and Cellular Respiration	Section 3, Part 11
HE	Heredity and Evolution		
HE.4	Students shall demonstrate an understanding of heredity.	Genetics	Throughout Unit
HE.4.B.1	Summarize the outcomes of Gregor Mendel's experimental procedures	Genetics	Section 1, Part 4

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HE.4.B.2	Differentiate among the laws and principles of inheritance:	Genetics	Throughout Section 1
HE.4.B.2.a	dominance	Genetics	Section 1, Part 7
HE.4.B.2.b	segregation	Genetics	Section 1, Part 8
HE.4.B.2.c	independent assortment	Genetics	Section 1, Parts 10-11
HE.4.B.3	Use the laws of probability and Punnett squares to predict genotypic and phenotypic ratios	Genetics	Section 1, Part 6
HE.4.B.4	Examine different modes of inheritance:		

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HE.4.B.4.a	sex linkage	Genetics	Section 2, Part 3
HE.4.B.4.b	codominance	Genetics	Section 2, Part 6
HE.4.B.4.c	crossing over	Cell Structure	Meiosis Lab
HE.4.B.4.d	incomplete dominance	Genetics	Section 2, Part 7
HE.4.B.4.e	multiple alleles	Genetics	Section 2, Part 8
HE.4.B.5	Analyze the historically significant work of prominent geneticists	Genetics	Section 1, Parts 1-4

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HE.4.B.6	Evaluate karyotypes for abnormalities:		
HE.4.B.6.a	monosomy		
HE.4.B.6.b	trisomy		
HE.5	Students shall investigate the molecular basis of genetics.		
HE.5.B.1	Model the components of a DNA nucleotide and an RNA nucleotide	Genetics	Section 4, Part 3 Section 5, Part 2
HE.5.B.2	Describe the Watson-Crick double helix model of DNA, using the base-pairing rule (adenine-thymine, cytosine-guanine)	Genetics	DNA Lab

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HE.5.B.3	Compare and contrast the structure and function of DNA and RNA	Cell Structure	RNA Lab
HE.5.B.4	Describe and model the processes of replication, transcription, and translation	Genetics	RNA Lab
HE.5.B.5	Compare and contrast the different types of mutation events, including point mutation, frameshift mutation, deletion, and inversion	Genetics	Section 5, Part 5
HE.5.B.6	Identify effects of changes brought about by mutations:		
HE.5.B.6.a	beneficial		
HE.5.B.6.b	harmful		

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HE.5.B.6.c	neutral		
HE.6	Students shall examine the development of the theory of biological evolution.	Evolution	Throughout Unit
HE.6.B.1	Compare and contrast Lamarck's explanation of evolution with Darwin's theory of evolution by natural selection	Evolution	Section 1, Parts 2-3
HE.6.B.2	Recognize that evolution involves a change in allele frequencies in a population across successive generations	Evolution	Section 2, Parts 3-4
HE.6.B.3	Analyze the effects of mutations and the resulting variations within a population in terms of natural selection	Evolution	Section 2, Part 3
HE.6.B.4	Illustrate mass extinction events using a time line	History of Life on Earth	Throughout Sections 3-4

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HE.6.B.5	Evaluate evolution in terms of evidence as found in the following:		
HE.6.B.5.a	fossil record	Evolution	Section 1, Part 5
HE.6.B.5.b	DNA analysis	Evolution	Section 1, Part 7
HE.6.B.5.c	artificial selection		
HE.6.B.5.d	morphology	Evolution	Section 1, Part 6
HE.6.B.5.e	embryology	Evolution	Section 1, Part 7

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HE.6.B.5.f	viral evolution		
HE.6.B.5.g	geographic distribution of related species	Evolution	Section 1, Part 6
HE.6.B.5.h	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	History of Life on Earth	Section 1, Part 2
HE.6.B.7	Interpret a Cladogram	Biological Diversity	Section 1, Part 5
CDL	Classification and the Diversity of Life		

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CDL.7	Students shall demonstrate an understanding that organisms are diverse.	Biological Diversity	Throughout Unit
CDL.7.B.1	Differentiate among the different domains:	Biological Diversity	Section 1, Part 9
CDL.7.B.1.a	Bacteria	Biological Diversity	Section 1, Part 11
CDL.7.B.1.b	Archaea	Biological Diversity	Section 1, Part 12
CDL.7.B.1.c	Eukarya	Biological Diversity	Section 1, Part 13
CDL.7.B.2	Differentiate the characteristics of the six kingdoms:		

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CDL.7.B.2.a	Eubacteria	Biological Diversity	Section 1, Part 11
CDL.7.B.2.b	Archaea	Biological Diversity	Section 1, Part 12
CDL.7.B.2.c	Protista	Biological Diversity	Section 1, Part 13
CDL.7.B.2.d	Fungi	Biological Diversity	Section 1, Part 13
CDL.7.B.2.e	Plantae	Biological Diversity	Section 1, Part 13
CDL.7.B.2.f	Animalia	Biological Diversity	Section 1, Part 14

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CDL.7.B.3	Identify the seven major taxonomic categories:	Biological Diversity	Section 1, Part 1
CDL.7.B.3.a	kingdom	Biological Diversity	Section 1, Part 1
CDL.7.B.3.b	phylum	Biological Diversity	Section 1, Part 1
CDL.7.B.3.c	class	Biological Diversity	Section 1, Part 1
CDL.7.B.3.d	order	Biological Diversity	Section 1, Part 1
CDL.7.B.3.e	family	Biological Diversity	Section 1, Part 1

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CDL.7.B.3.f	genus	Biological Diversity	Section 1, Part 1
CDL.7.B.3.g	species	Biological Diversity	Section 1, Part 1
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		
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		

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CDL.7.B.8	Compare and contrast life cycles of familiar organisms		
CDL.7.B.8.a	sexual reproduction	Animal Organization	Section 10, Part 1
CDL.7.B.8.b	asexual reproduction	Animal Organization	Section 10, Part 1
CDL.7.B.8.c	metamorphosis		
CDL.7.B.8.d	alternation of generations	Plant Structure	Flowers, Fruits, and Seeds Lab
CDL.7.B.9	Classify bacteria according to their characteristics and adaptations	Biological Diversity	Section 2, Parts 8-10

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CDL.7.B.10	Evaluate the medical and economic importance of bacteria		
CDL.7.B.11	Describe the characteristics used to classify protists:		
CDL.7.B.11.a	plant-like	Biological Diversity	Section 3, Parts 2-6
CDL.7.B.11.b	animal-like	Biological Diversity	Section 3, Parts 2-6
CDL.7.B.11.c	fungus-like	Biological Diversity	Section 3, Parts 2-6
CDL.7.B.12	Evaluate the medical and economic importance of protists		

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CDL.7.B.13	Compare and contrast fungi with other eukaryotic organisms	Biological Diversity	Section 5, Part 1
CDL.7.B.14	Evaluate the medical and economic importance of fungi	Biological Diversity	Section 5, Part 1
CDL.7.B.15	Differentiate between vascular and nonvascular plants	Plant Structure	Plant Structure Lab
CDL.7.B.16	Differentiate among cycads, gymnosperms, and angiosperms	Plant Structure	Flowers, Fruit and Seeds Lab
CDL.7.B.17	Describe the structure and function of the major parts of a plant:	Plant Structure	Plant Structure Lab
CDL.7.B.17.a	roots	Plant Structure	Plant Structure Lab

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CDL.7.B.17.b	stems	Plant Structure	Plant Structure Lab
CDL.7.B.17.c	leaves	Plant Structure	Plant Structure Lab
CDL.7.B.17.d	flowers	Plant Structure	Flowers, Fruit, and Seeds Lab
CDL.7.B.18	Relate the structure of plant tissue to its function	Plant Structure	Plant Structure Lab
CDL.7.B.18.a	epidermal	Plant Structure	Plant Structure Lab
CDL.7.B.18.b	ground	Plant Structure	Plant Structure Lab

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CDL.7.B.18.c	vascular	Plant Structure	Plant Structure Lab
CDL.7.B.19	Evaluate the medical and economic importance of plants	Biological Diversity	Section 4, Parts 22-23
CDL.7.B.20	Identify the symmetry of organisms:	Biological Diversity	Section 6, Part 4
CDL.7.B.20.a	radial	Biological Diversity	Section 6, Part 4
CDL.7.B.20.b	bilateral	Biological Diversity	Section 6, Part 4
CDL.7.B.20.c	asymmetrical	Biological Diversity	Section 6, Part 4

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CDL.7.B.21	Compare and contrast the major invertebrate classes according to their nervous, respiratory, excretory, circulatory, and digestive systems	Biological Diversity	Section 6, Parts 6-14
CDL.7.B.22	Compare and contrast the major vertebrate classes according to their nervous, respiratory, excretory, circulatory, digestive, reproductive and integumentary systems	Biological Diversity	Throughout Section 7
EBR	Ecology and Behavioral Relationships		
EBR.8	Students shall demonstrate an understanding of ecological and behavioral relationships among organisms.	Ecology	Throughout Unit
EBR.8.B.1	Cite examples of abiotic and biotic factors of ecosystems	Ecology	Section 2, Part 6
EBR.8.B.2	Compare and contrast the characteristics of biomes	Ecology	Biomes Lab

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EBR.8.B.3	Diagram the carbon, nitrogen, phosphate, and water cycles in an ecosystem	Ecology	Section 3, Parts 2-5
EBR.8.B.4	Analyze an ecosystem's energy flow through food chains, food webs, and energy pyramids	Ecology	Section 2, Parts 7-9
EBR.8.B.5	Identify and predict the factors that control population, including predation, competition, crowding, water, nutrients, and shelter	Ecology	Section 1, Part 5
EBR.8.B.6	Summarize the symbiotic ways in which individuals within a community interact with each other:	Ecology	Section 1, Part 5
EBR.8.B.6.a	commensalism	Ecology	Section 1, Part 5
EBR.8.B.6.b	parasitism	Ecology	Section 1, Part 5

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EBR.8.B.6.c	mutualism	Ecology	Section 1, Part 5
EBR.8.B.7	Compare and contrast primary succession with secondary succession	Ecology	Section 2, Part 5
EBR.8.B.8	Identify the properties of each of the five levels of ecology:		
EBR.8.B.8.a	organism	Animal Organization	Introduction
EBR.8.B.8.b	population	Ecology	Section 1, Part 1
EBR.8.B.8.c	community	Ecology	Section 2, Part 1

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EBR.8.B.8.d	ecosystem	Ecology	Section 2, Part 6
EBR.8.B.8.e	biosphere	Ecology	Throughout Section 3
EBR.9	Students shall demonstrate an understanding of the ecological impact of global issues.	Ecology	Section 3, Part 11
EBR.9.B.1	Analyze the effects of human population growth and technology on the environment/biosphere	Ecology	Section 3, Part 11
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)	Ecology	Throughout Section 3

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NS	Nature of Science		
NS.10	Students shall demonstrate an understanding that science is a way of knowing.	Nature of Science	Scientific Method Lab
NS.10.B.1	Explain why science is limited to natural explanations of how the world works	Nature of Science	Section 1, Part 4
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	Nature of Science	Section 1, Part 7
NS.10.B.4	Summarize the guidelines of science:	Nature of Science	Scientific Method Lab

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NS.10.B.4.a	explanations are based on observations, evidence, and testing	Nature of Science	Scientific Method Lab
NS.10.B.4.b	hypotheses must be testable	Nature of Science	Scientific Method Lab
NS.10.B.4.c	understandings and/or conclusions may change with additional empirical data	Nature of Science	Scientific Method Lab
NS.10.B.4.d	scientific knowledge must have peer review and verification before acceptance	Nature of Science	Scientific Method Lab
NS.11	Students shall design and safely conduct scientific inquiry.		
NS.11.B.1	Develop and explain the appropriate procedure, controls, and variables (dependent and independent) in scientific experimentation		

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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	Nature of Science	Scientific Method Lab
NS.11.B.6	Communicate experimental results using appropriate reports, figures, and tables	Nature of Science	Scientific Method Lab
NS.12	Students shall demonstrate an understanding of current life science theories.		

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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.12.B.3	Summarize biological evolution	Evolution	Throughout Unit
NS.12.B.4	Relate the development of the cell theory to current trends in cellular biology		
NS.12.B.5	Describe the relationship between the germ theory of disease and our current knowledge of immunology and control of infectious diseases		
NS.12.B.6	Relate the chromosome theory of heredity to recent findings in genetic research (e.g., Human Genome Project-HGP, chromosome therapy)	Genetics	Throughout Section 6

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NS.12.B.7	Research current events and topics in biology	Genetics	Biotechnology Lab
NS.13	Students shall use mathematics, science equipment, and technology as tools to communicate and solve life science problems.		
NS.13.B.1	Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables	Nature of Science	Scientific Method Lab
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.14	Students shall describe the connections between pure and applied science.		

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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.14.B.3	Evaluate long-range plans concerning resource use and by-product disposal for environmental, economic, and political impact		
NS.14.B.4	Explain how the cyclical relationship between science and technology results in reciprocal advancements in science and technology	Genetics	Throughout Section 6
NS.15	Students shall describe various life science careers and the training required for the selected career.		
NS.15.B.1	Research and evaluate science careers using the following criteria:		



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NS.15.B.1.a	educational requirements		
NS.15.B.1.b	salary		
NS.15.B.1.c	availability of jobs		
NS.15.B.1.d	working conditions		