BIOLOGY (MAAP SCIENCE)
PACING GUIDE
2021 – 2022

WEST BOLIVAR CONSOLIDATED SCHOOL DISTRICT

BIG GOAL: Students will build a life science foundation emphasizing patterns, processes, and interactions among organisms.

FIRST NINE WEEKS				
WEEKS	**INSTRUCTIONAL DAYS**	**PERFROMACNCE OBJ(S).**	**ACADEMIC FOCUS**	**OBJECTIVE STATEMENTS – MS CCRS**
AUG 5 – 13	**7**	**SEP(s)**	**The Nature of Science: Science and Engineering Practices**	SCIENCE AND ENGINEERING PRACTICES 1. Asking questions and defining problems • LAB: How does temperature affect the dissolving of particles? 2. Planning and carrying out investigations • LAB: pH: Red cabbage juice lab (Biology) 3. Analyzing and interpreting data • ACTIVITY: Graphing the elements in Earth's Crust (8th grade) • ACTIVITY: Graphing the elements found in living organisms? (Biology) 4. Developing and using models • ACTIVITY: How does the cell's structure change during mitosis? 5. Constructing explanations and designing solutions 6. Engaging in argument from evidence 7. Using mathematics and computational thinking 8. Obtaining, evaluating, and communicating information • RESEARCH: Research a branch of science and/or technology. Research a scientist who was famous in that branch and describe why.
AUG 16 – 20	**5**	**BIO.1A.1 BIO.1A.2 BIO.1A.3 BIO.1A.4**	**Characteristics of Life & Biological Organization**	**BIO.1A.1** Develop criteria to differentiate between living and non-living things. **BIO.1A.2** Describe the tenets of cell theory and the contributions of Schwann, Hooke, Schleiden, and Virchow. • ACTIVITY: Cell Theory Poster Project/Cell Theory Timeline Project **BIO.1A.3** Using specific examples, explain how cells can be organized into complex tissues, organs, and organ systems in multicellular organisms. **BIO.1A.4** Use evidence from current scientific literature to support whether a virus is living or non-living. • LAB: Virtual microscope lab
3 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
AUG 23 – 27	**5**	**BIO.1B.1 BIO.1B.2**	**Biochemistry/Macromolecules**	**BIO.1B.1** Develop and use models to compare and contrast the structure and function of carbohydrates, lipids, proteins, and nucleic acids (DNA and RNA) in organisms. • LAB: Testing for organic molecules in foods • INSTRTUCTIONAL FILM STUDY: Lorenzo's Oil **BIO.1B.2** Design and conduct an experiment to determine how enzymes react given various environmental conditions (i.e., pH, temperature, and concentration). Analyze,

				interpret, graph, and present data to explain how those changing conditions affect the enzyme activity and the rate of the reactions that take place in biological organisms. • LAB: How does temperature affect the behavior of enzymes? (Enzymatic Browning in Apples)
3 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
AUG 30 – SEPT 10	**10**	**BIO.1C.1 BIO.1C.2 BIO.1C.3**	**Cell Structure and Function**	**BIO.1C.1** Develop and use models to explore how specialized structures within cells (e.g., nucleus, cytoskeleton, endoplasmic reticulum, ribosomes, Golgi apparatus, lysosomes, mitochondria, chloroplast, centrosomes, and vacuoles) interact to carry out the functions necessary for organism survival. • ACTIVITY: Cell Organelle Poster Project/Create a Plant & Animal Cell Model **BIO.1C.2** Investigate to compare and contrast prokaryotic cells and eukaryotic cells, and plant, animal, and fungal cells. **BIO.1C.3** Contrast the structure of viruses with that of cells, and explain why viruses must use living cells to reproduce. • ACTIVITY: Cells escape room challenge
8 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
SEPT 13 – 17	**5**	**BIO.1D.1 BIO.1D.2**	**Cell Transport**	**BIO.1D.1** Plan and conduct investigations to prove that the cell membrane is a semi-permeable, allowing it to maintain homeostasis with its environment through active and passive transport processes. **BIO.1D.2** Develop and use models to explain how the cell deals with imbalances of solute concentration across the cell membrane (i.e., hypertonic, hypotonic, and isotonic conditions, sodium/potassium pump). • LAB: Nude egg experiment [Alternative: Gummy bears or potatoes] (Osmosis lab)
3 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
SEPT 20 – 24	**5**	**REVIEW**	→	**REVIEW – CHARACTERISTICS OF LIFE (2 DAYS) REVIEW – BIOCHEMISTRY/MACROMOLECULES (3 DAYS)**
SEPT 27 – OCT 1	**5**	**REVIEW**	→	**REVIEW – CELLS AS A SYSTEM (4 DAYS) REVIEW – CELLULAR TRANSPORT (1 DAY)**
OCT 4 – 8	**1ST TERM ASSESSMENT (CUMULATIVE TO THIS POINT)**			

SECOND NINE WEEKS				
WEEKS	**INSTRUCTIONAL DAYS**	**PERFROMACNCE OBJ(S).**	**ACADEMIC FOCUS**	**OBJECTIVE STATEMENTS – MS CCRS**
OCT 11 – 22	**10**	**BIO.2.1 BIO.2.2 BIO.2.3 BIO.2.4 BIO.2.5 BIO.2.6**	**Energy Transfer**	**BIO.2.1** Use models to demonstrate that ATP and ADP are cycled within a cell as a means to transfer energy. • DEMONSTRATION: Using a hot potato and oven mitt to demonstrate the transfer of heat energy. **BIO.2.2** Develop models of the major reactants and products of photosynthesis to demonstrate the transformation of light energy into stored chemical energy in cells. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed and energy is stored. • LAB: Pigments in leaves (Chromatography Lab) **BIO.2.3** Develop models of the major reactants and products of cellular respiration (aerobic and anaerobic) to demonstrate the transformation of the chemical energy stored in food to the available energy of ATP. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed and energy is stored. **BIO.2.4** Conduct scientific investigations or computer simulations to compare aerobic and anaerobic cellular respiration in plants and animals, using real world examples. **BIO.2.5 Enrichment:** Investigate variables (e.g., nutrient availability, temperature) that affect anaerobic respiration and current real-world applications of fermentation.* • LAB: How does exercise affect the rate of cellular respiration?
8 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
OCT 25 – NOV 5	**10**	**BIO.1E.1 BIO.1E.2 BIO.1E.3**	**Cell Cycle/Cell Division**	**BIO.1E.1** Construct models to explain how the processes of cell division and cell differentiation produce and maintain complex multicellular organisms. • ACTIVITY: Mitosis and the Cell Cycle Flipbook **BIO.1E.2** Identify and describe the changes that occur in a cell during replication. Explore problems that might occur if the cell does not progress through the cycle correctly (cancer). • BOOK/FILM STUDY: The Immortal Life of Henrietta Lacks (cancer research) • RESEARCH: Cancer Poster Project • LAB: Online Root Tip Mitosis Lab **BIO.1E.3** Relate the processes of cellular reproduction to asexual reproduction in simple organisms (i.e., budding, vegetative propagation, regeneration, binary fission). Explain why the DNA of the daughter cells is the same as the parent cell. • DISCUSSION: Discuss the modes of asexual reproduction in different living organisms. (group discussions) **BIO.1E.4 Enrichment:** Use an engineering design process to investigate the role of stem cells in regeneration and asexual reproduction, then develop applications of stem cell research to solve human medical conditions. * • RESEACRH: Research the Pros and Cons of Stem Cell Research (booklet, Presentation, or Speech)
8 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				

NOV 8 – 12	**5**	**BIO.3A.1 BIO.3A.2 BIO.3A.3**	**Meiosis**	**BIO.3A.1** Model sex cell formation (meiosis) and combination (fertilization) to demonstrate the maintenance of chromosome number through each generation in sexually reproducing populations. Explain why the DNA of the daughter cells is different from the DNA of the parent cell. **BIO.3A.2** Compare and contrast mitosis and meiosis in terms of reproduction. **BIO.3A.3** Investigate chromosomal abnormalities (e.g., Down syndrome, Turner's syndrome, and Klinefelter syndrome) that might arise from errors in meiosis (nondisjunction) and how these abnormalities are identified (karyotypes). • LAB: Virtual Karyotype Lab (The Biology Project) • RESEARCH/PRESENTATION: Human Chromosomes Disorder
3 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
NOV 15 – 19	**5**	**BIO.3C.1 BIO.3C.4**	**DNA/DNA Technology**	**BIO.3C.1** Develop and use models to explain the relationship between DNA, genes, and chromosomes in coding the instructions for the traits transferred from parent to offspring. **BIO.3C.4** Research and identify how DNA technology benefits society. Engage in scientific argument from evidence over the ethical issues surrounding the use of DNA technology (e.g., cloning, transgenic organisms, stem cell research, and the Human Genome Project, gel electrophoresis). • LAB: DNA Extraction (strawberries) • LAB: Virtual gel electrophoresis activity • FIELD TRIP?: Gel electrophoresis lab (Delta State University)
4 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY				
NOV 22 – 26 THANKSGIVING BREAK				
NOV 29 – DEC 6	**5**	**BIO.3C.2 BIO.3C.3 BIO.3C.5**	**Proteins Synthesis Mutations Biotechnical Applications of Genetic Research**	**BIO.3C.2** Evaluate the mechanisms of transcription and translation in protein synthesis. • LAB: Virtual Transcription lab (biomanbio.com) **BIO.3C.3** Use models to predict how various changes in the nucleotide sequence (e.g., point mutations, deletions, and additions) will affect the resulting protein product and the subsequent inherited trait. **BIO.3C.5** Enrichment: Investigate current biotechnological applications in the study of the genome (e.g., transcriptome, proteome, individualized sequencing, and individualized gene therapy).*
3 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
DEC 6 – 14	**7**	**REVIEW**	→	**REVIEW – ENERGY TRANSFER (1 DAY) REVIEW – CELL DIVISION AND MEIOSIS (2 DAYS) REVIEW – DNA AND PROTEIN SYNTHESIS (2 DAY) REVIEW – 1ST TERM KEY STANDARDS (2 DAYS)**
DEC 15 – 21	**2ND TERM ASSESSMENT (CUMUALTIVE UP TO THIS POINT)**			
DEC 22 – JAN 4 WINTER BREAK				

THIRD NINE WEEKS				
WEEKS	**INSTRUCTIONAL DAYS**	**PERFROMACNCE OBJ(S).**	**ACADEMIC FOCUS**	**OBJECTIVE STATEMENTS – MS CCRS**
JAN 6 – 21	**10**	**BIO.3B.1** **BIO.3B.2** **BIO.3B.3** **BIO.3B.4**	**Mendelian & Non-Mendelian Genetics (Inheritance)**	**BIO.3B.1** Demonstrate Mendel's law of dominance and segregation using mathematics to predict phenotypic and genotypic ratios by constructing Punnett squares with both homozygous and heterozygous allele pairs. **BIO.3B.2** Illustrate Mendel's law of independent assortment using Punnett squares and/or the product rule of probability to analyze monohybrid crosses. **BIO.3B.3** Investigate traits that follow non-Mendelian inheritance patterns (e.g., incomplete dominance, codominance, multiple alleles in human blood types, and sex-linkage). • ACTIVITY: Punnett square analysis of Non-Mendelian inheritance patterns. **BIO.3B.4** Analyze and interpret data (e.g., pedigrees, family, and population studies) regarding Mendelian and complex genetic traits (e.g., sickle-cell anemia, cystic fibrosis, muscular dystrophy, color-blindness, and hemophilia) to determine patterns of inheritance and disease risk. • RESEARCH: Human Genetic Disorders
8 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
JAN 24 – FEB 4	**10**	**BIO.5.1** **BIO.5.2** **BIO.5.3** **BIO.5.4** **BIO.5.5** **BIO.5.6** **BIO.5.7** **BIO.5.8** **BIO.5.9**	**Interdependence of Organisms and Their Environment**	**BIO.5.1** Illustrate levels of ecological hierarchy, including organism, population, community, ecosystem, biome, and biosphere. **BIO.5.2** Analyze models of the cycling of matter (e.g., carbon, nitrogen, phosphorus, and water) between abiotic and biotic factors in an ecosystem and evaluate the ability of these cycles to maintain the health and sustainability of the ecosystem. • ACTIVITY: Conservation of water flyer • ACTIVITY/RESEARCH: Group activity…research biogeochemical cycles (poster/presentation, etc.) **BIO.5.3** Analyze and interpret quantitative data to construct an explanation for the effects of greenhouse gases on the carbon dioxide cycle and global climate. **BIO.5.4** Develop and use models to describe the flow of energy and amount of biomass through food chains, food webs, and food pyramids. • ACTIVITY: Construct/analyze food webs and food chains based in different ecosystems. **BIO.5.5** Evaluate symbiotic relationships (e.g., mutualism, parasitism, and commensalism) and other coevolutionary (e.g., predator-prey, cooperation, competition, and mimicry) relationships within specific environments. **BIO.5.6** Analyze and interpret population data, both density-dependent and density-independent, to define limiting factors. Use graphical representations (growth curves) to illustrate the carrying capacity within ecosystems. • LAB: Oh, Deer! **BIO.5.7** Investigate and evaluate factors involved in primary and secondary ecological succession using local, real world examples. • LAB: Ecological Succession Virtual Lab • INSTRUCTIONAL FILM STUDY: Rio 2

				BIO.5.8 Enrichment: Use an engineering design process to create a solution that addresses changing ecological conditions (e.g., climate change, invasive species, loss of biodiversity, human population growth, habitat destruction, biomagnification, or natural phenomena).* • RESEARCH: Invasive Species Booklet **BIO.5.9** Enrichment: Use an engineering design process to investigate and model current technological uses of biomimicry to address solutions to real-world problems.*
8 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAYS; UNIT TEST – 1 DAY				
FEB 7 – 11	**5**	**BIO.4.1 BIO.4.2 BIO.4.5**	**Natural Selection**	**BIO.4.1** Use models to differentiate between organic and chemical evolution, illustrating the steps leading to aerobic heterotrophs and photosynthetic autotrophs. **BIO.4.2** Evaluate empirical evidence of common ancestry and biological evolution, including comparative anatomy (e.g., homologous structures and embryological similarities), fossil record, molecular/biochemical similarities (e.g., gene and protein homology), and biogeographic distribution. **BIO.4.5** Use Darwin's Theory to explain how genetic variation, competition, overproduction, and unequal reproductive success acts as driving forces of natural selection and evolution. • LAB: Natural Selection Beak Lab
3 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
FEB 14 – 18	**5**	**BIO.4.3 BIO.4.4 BIO.4.6 BIO.4.7**	**Application of Natural Selection and Taxonomy**	**BIO.4.3** Construct cladograms/phylogenetic trees to illustrate relatedness between species. • ACTIVITY: Construct/analyze cladograms and phylogenetic trees of different organisms. **BIO.4.4** Design models and use simulations to investigate the interaction between changing environments and genetic variation in natural selection leading to adaptations in populations and differential success of populations. **BIO.4.6** Construct explanations for the mechanisms of speciation (e.g., geographic and reproductive isolation). • ACTIVITY: Create a new species project. **BIO.4.7** Enrichment: Construct explanations for how various disease agents (bacteria, viruses, chemicals) can influence natural selection.
3 INSTRUCTIONAL DAYS; UNIT REVIEW – 1 DAY; UNIT TEST – 1 DAY				
FEB 21 – 25	**5**	**REVIEW**		**REVIEW – MENDELIAN AND APPLIED GENETICS (1 DAY) REVIEW – INTERDEPENDENCE OF ORGANISMS (1 DAY) REVIEW – NATURAL SELECTION AND TAXONOMY (1 DAY) REVIEW – 1ST TERM KEY STANDARDS (1 DAY) REVIEW – 2ND TERM KEY STANDARDS (1 DAY)**
FEB 28 – MAR 4	**3RD TERM ASSESSMENT (CUMULATIVE UP TO THIS POINT, ALL STANDARDS WILL BE TESTED)**			
MAR 7 – 11	**5**	**REVIEW SEPs**		
MAR 14 – 18 SPRING BREAK				

FOURTH NINE WEEKS				
WEEKS	**INSTRUCTIONAL DAYS**	**PERFROMACNCE OBJ(S).**	**ACADEMIC FOCUS**	**OBJECTIVE STATEMENTS – MS CCRS**
MAR 21 – APR 1	**10**	**VARIED**	**REVIEW PRIORITY STANDARDS (SEE ATTACHED TEST BLUEPRINT)**	**REVIEW PRIORITY STANDARDS – CELLS AS A SYSTEM; CELL ENERGY**
APR 4 – 15	**10**	**VARIED**	**REVIEW PRIORITY STANDARDS (SEE ATTACHED TEST BLUEPRINT)**	**REVIEW PRIORITY STANDARDS – REPRODUCTION AND HEREDITY; NATURAL SELECTION**
APR 18 – 22	**5**	**VARIED**	**REVIEW PRIORITY STANDARDS (SEE ATTACHED TEST BLUEPRINT)**	**REVIEW PRIORITY STANDARDS – ECOLOGY AND INTERDEPENDENCE**
APR 25 – 29	**BIOLOGY BOOTCAMP**			
MAY 2 – 6	**MAAP EOY ASSESSMENT**			
MAY 9 – 13	**5**	**REVIEW SEPs**		
MAY 16 – 20	**REVIEW 4TH 9 WEEKS EXAM**			

*Enrichment objectives are marked with an asterisk. While they may not be tested per say, please use these performance objectives to explore and use their higher order thinking skills. Students should be provided a safe environment for failure without consequence, which is one of the most powerful drivers in learning. Providing many opportunities for students to fail, learn, and try again, with appropriate levels of support, fosters a deeper level of understanding and greater student interest and engagement. (MS CCRS, p. 13)

*If you do not finish covering standards by the end of the 3rd 9 weeks, we encourage you to use the 4th 9 weeks to finish covering these standards to prepare our young scientists for the MAAP SCI ASSESSMENT FOR BIOLOGY and for other science electives!

Starting 2021-2022 School Year

MAAP

Assessment Blueprint

Biology

This blueprint describes the content and structure of an assessment and defines the ideal percentage of operational test items by reporting category for the Mississippi Academic Assessment Program (MAAP).

Content Strand/Disciplinary Core Idea	MS CCRS Standards Available for Assessment			Percentage of Points by Reporting Category
Cells and Energy				**27% – 50%**
Cells as a System	BIO.1A; BIO.1B; BIO.1C; BIO.1D; BIO.1E *(14 objectives)*			
Energy Transfer	BIO.2 *(4 objectives)*			
Heredity and Evolution				**25%-38%**
Reproduction & Heredity	BIO.3A; BIO.3B; BIO.3C *(11 objectives)*			
Adaptations and Evolution	BIO.4 *(6 objectives)*			
Interdependence of Organisms and Their Environments	BIO.5 *(7 objectives)*			**13%-17%**
Operational Items	**55**	**Total Points**	**60**	**100%**
Field Test Items	10	**Total Testing Time**		**180 Minutes (3 Hours)**
Total Items	**65**			

- The Depth of Knowledge (DOK) level of items across the operational test form will be tracked to have as much variety as possible. The goal is for 65-85% of the items on the form to be DOK level 2 and approximately 5-10% of the items on the form to be DOK level 1 and DOK level 3 combined. However, we recognize that standard distribution, item types, and item statistics take priority when building the form.
- All science assessments will utilize an embedded field-test design and will consist of
  - Multiple Choice (MC) items including 1 answer/4 options and multi-select 2-4 answers/many options; and
  - Technology-Enhanced (TE) items.
- The TE items are designed to elicit evidence of a broad range of student understanding; student interacts with enhanced features of these computer-delivered, ***auto-scorable*** test items to show understanding of skills and concepts; includes drag-and-drop, hot-spot, bar graphs, data displays, matching interactions, text highlights, text entry, and drop-down menus. These items are scored on a 0-1 or 0-2 point scale using item-specific scoring rules.