JACKSON PUBLIC SCHOOLS

Science Pacing Document 2023-2024

Content Area	Biology		
Term One: August 7 – October 10, 2023			
Instructional Days 45	**MS College and Career Readiness Standards**	**Instructional Resources**	**Assessment Resources**
	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.** **BIO.1A.3 Using specific examples, explain how cells can be organized into complex tissues, organs, and organ systems in multicellular organisms.** **BIO.1C.3 Contrast the structure of viruses with that of cells and explain why viruses must use living cells to reproduce.** **BIO.1A.4 Use evidence from current scientific literature to support whether a virus is living or non-living.** **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.** **BIO.1C.2 Investigate to compare and contrast prokaryotic cells and eukaryotic cells, and plant, animal, and fungal cells.**	**Lesson Plan Template** **Savvas Easy Bridge/ Pearson** **MDE Instructional Planning Guides for Science** **MDE Framework** **Biology I Instructional Suggestion Guide**	**MDE Updated Assessment Blueprints** **How to Access Online Tools Training for Biology** **2018-2019 Biology Sample Items with Key** **2020-2021 Biology Sample Items with Key** **2021-2022 Biology Sample Items with Key** **2022-2023 Biology Sample Items with Key**
District Term 1 Midterm Assessment			

	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).** **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.** **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.**		
Academic Vocabulary			
Cell Organelle, Cell Theory, Eukaryote, Homeostasis, Law, Prokaryote, Scientific Claim, Virus, Bacteria, Cell Membrane, Cell Wall, Mitochondria, Chloroplast, Nucleus, Organelle, Ribosome, Vacuole, Golgi Body, Lysosome, Endoplasmic Reticulum, Carbohydrate, Enzyme, Fatty Acids, Lipid, Monomer, Nucleic Acid, Polymer, Protein, Active Transport, Diffusion, Homeostasis, Metabolism, Osmosis, Passive Transport, Semi-Permeable (selectively permeable)			
District Term 1 Benchmark Assessment October 2-12, 2023			
Term Two: October 11 – December 21, 2023			
Instructional Days 45	**MS College and Career Readiness Standards**	**Instructional Resources**	**Assessment Resources**
	BIO.1E.1 Construct models to explain how the processes of cell division and cell differentiation produce and maintain complex multicellular organisms. **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).**	**Lesson Plan Template** **Savvas Easy Bridge/ Pearson** **MDE Instructional Planning Guides for Science**	**MDE Updated Assessment Blueprints** **How to Access Online Tools Training for Biology**

JACKSON PUBLIC SCHOOLS

Science Pacing Document 2023-2024

	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. **Enrichment BIO.1E.4: 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.*** **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).** **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.**	**MDE Framework** **Biology I Instructional Suggestion Guide**	**2018-2019 Biology Sample Items with Key** **2020-2021 Biology Sample Items with Key** **2021-2022 Biology Sample Items with Key** **2022-2023 Biology Sample Items with Key**
District Term 2 Midterm Assessment			

	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). 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.** **BIO.2.1 Use models to demonstrate that ATP and ADP are cycled within a cell to transfer 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.** **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.**		

	ENRICHMENT **BIO.2.5 Enrichment: Investigate variables (e.g., nutrient availability, temperature) that affect anaerobic respiration and current real-world applications of fermentation.** **BIO.2.6 Enrichment: Use an engineering design process to manipulate factors involved in fermentation to optimize energy production.***		
Academic Vocabulary			
Anaphase, Binary Fission, Cancer, Cell Cycle, Cytokinesis, DNA Replication, Interphase, Metaphase, Mitosis, Prophase, Somatic Cell, Stem Cell, Telophase Allele, Cell Cycle, Chromosome, Crossing Over, Diploid, Gametes, Genetic Modification, Haploid, Meiosis, Mutation, Spore, Trait, Chromosome, Allele, Codominance, Crossing Over, Dihybrid Cross, Diploid, Genetic Modification, Genotype, Haploid, Heterozygous, Homozygous, Incomplete Dominance, Inheritance, Monohybrid Cross, Phenotype Polygenic, Recessive, Sex-linked Trait, Aerobic Cellular Respiration, Anaerobic Cellular Respiration, Cellular Respiration, Electron Transport Chain, Glucose, Glycolysis, Krebs Cycle, Light-Dependent Reactions, Light-Independent Reactions (Calvin Cycle), Photosynthesis, Reactant			
District First Semester Benchmark Assessment December 11-21, 2023			
Term Three: January 9 – March 22, 2024			
Instructional Days 45	**MS College and Career Readiness Standards**	**Instructional Resources**	**Assessment Resources**
	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.2 Evaluate the mechanisms of transcription and translation in protein synthesis.** **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.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**	**Lesson Plan Template** **Savvas Easy Bridge/ Pearson** **MDE Instructional Planning Guides for Science** **MDE Framework** **Biology I Instructional Suggestion Guide**	**MDE Updated Assessment Blueprints** **How to Access Online Tools Training for Biology** **2018-2019 Biology Sample Items with Key** **2020-2021 Biology Sample Items with Key**

	organisms, stem cell research, and the Human Genome Project, gel electrophoresis). **ENRICHMENT** **BIO.3C.5 Enrichment: Investigate current biotechnological applications in the study of the genome (e.g., transcriptome, proteome, individualized sequencing, and individualized gene therapy).** **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.4.3 Construct cladograms/phylogenetic trees to illustrate relatedness between species.** **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.4.5 Use Darwin's Theory to explain how genetic variation, competition, overproduction, and unequal reproductive success acts as driving forces of natural selection and evolution.** **BIO.4.6 Construct explanations for the mechanisms of speciation (e.g., geographic and reproductive isolation).** **BIO.4.7 Enrichment: Construct explanations for how various disease agents (bacteria, viruses, chemicals) can influence natural selection.** **BIO.5.1 Illustrate levels of ecological hierarchy, including organism, population, community, ecosystem, biome, and biosphere.**		**2021-2022 Biology Sample Items with Key** **2022-2023 Biology Sample Items with Key**

	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.		
District Term 3 Midterm Assessment			
	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.5.7 Investigate and evaluate factors involved in primary and secondary ecological succession using local, real world examples.** **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.** **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.5.6 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.**		

	ENRICHMENT **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).*** **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.***		

Academic Vocabulary
Adenine, Codon, Cytosine, Double Helix, Frameshift Mutation, Gene, Genetic Disorder, Guanine, Histone, Messenger RNA (mRNA), Mutagen, Nitrogen Base, Nucleic Acid, Nucleotide, Peptide Bond, Phosphate, Point Mutation, Ribosomal RNA, Thymine, Transcription, Transfer RNA (tRNA), Translation, Uracil, Adenosine Triphosphate, Atmosphere, Biogeochemical Cycles, Biosphere, Carbon Cycle, Carrying Capacity, Climate, Community (communities), Denitrification, Ecosystem, Geosphere, Global Warming, Greenhouse Gas, Niche, Nitrification, Nitrogen Cycle, Nitrogen Fixation, Nutrient Cycle, Stimuli, Water Cycle, Food Chain, Food Web, Trophic Level, Ecological Pyramid, Primary Consumer, Secondary Consumer, Tertiary Consumer, Quaternary Consumer, Decomposer, Autotrophic, Heterotroph, Producer, Consumer, Predator, Prey, Parasitism, Parasite, Host, Biodiversity, Carrying Capacity, Climax Community, Community (communities), Ecosystem, Emigration, Habitat Destruction, Homeostasis, Immigration, Invasive Species, Limiting Factor, Natural Disaster, Niche, Pioneer Species, Population, Primary Succession, Salinity, Secondary Succession, Succession, Anatomical Homologies, Ancestry, Biogeography, Developmental Homologies, Evolution, Fossil Record, Gradualism, Homology (homologies), Molecular Homologies, Punctuated Equilibrium, Speciation, Stasis, Adaptation, Biodiversity, Biological Fitness, Charles Darwin, Genetic Variation, Limiting Factor, Natural Selection, Overpopulation, Population, Reproductive Success, Subspecies
District Final Benchmark Assessment February 26 – March 8, 2024
Term Four: March 25 – May 29, 2024

Instructional Days 45	**MS College and Career Readiness Standards**	**Instructional Resources**	**Assessment Resources**
	Review Standards: Bio. 1A-E (in this order using the previous outlined instructional flow) **Students will review key concepts learned, review science engineering practices used, and relate previous understandings to upcoming learning targets.**	**Lesson Plan Template** **Savvas Easy Bridge/ Pearson** **MDE Instructional Planning Guides for Science**	**MDE Updated Assessment Blueprints**

JACKSON PUBLIC SCHOOLS

Science Pacing Document 2023-2024

	Review Standards: BIO 3A-C (in this order using the previous outlined instructional flow) **Students will review key concepts learned, review science engineering practices used, and relate previous understandings to upcoming learning targets.** **Review Standards: BIO 4.1-7 & BIO 2.1-6 (in this order using the previous outlined instructional flow)** **Students will review key concepts learned, review science engineering practices used, and relate previous understandings to upcoming learning targets.** **Review Standards: BIO 5.1-9 (in this order using the previous outlined instructional flow)** **Students will review key concepts learned, review science engineering practices used, and relate previous understandings to upcoming learning targets.**	**MDE Framework** **MDE Updated Assessment Blueprints** **Biology I Instructional Suggestion Guide**	**How to Access Online Tools Training for Biology** **2018-2019 Biology Sample Items with Key** **2020-2021 Biology Sample Items with Key** **2021-2022 Biology Sample Items with Key** **2022-2023 Biology Sample Items with Key**
End-of-Year Assessments			