Mount Pleasant Central School District

AP Biology, Science

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Unit Title	Month	Content	Vocabulary	Standards	Skills	Big Ideas	Assessments
Biochemistry	Sept	- Hydrogen Bonding and properties of water - Biological Macromolecules - Organic Chemistry	- Hydrogen Bonding -Macromolecules -Protein -Lipid -Carbohydrate -Nucleic Acid	1.1.A - Explain how the properties of water that result from its polarity and hydrogen bonding affects its biological function. 1.2.A - Describe the composition of Macromolecules required by living organisms. 1.3.A - Describe the chemical reactions that build and break Biological macromolecules. 1.4.A - Describe the structure and function	- Describe characteristics of visual representations of biological concepts and processes.	Biological systems interact, and these systems and their interactions exhibit complex properties.	- Topic Questions - MC Progress Check - FRQ Progress Check - Unit Test

Educating Each Student Today for Endless Possibilities Tomorrow

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				of carbohydrates. 1.5.A -Describe the structure and function of lipids 1.6.A- Describe the structure and function of DNA and RNA. 1.7.A - Describe the structure and function of proteins			
Cell Structure & Function	Sept -Oct	- Cell Structure/ Function - Cell Permeability/ Size - Diffusion and Cell Transport - Cell Compartmentalization	- Plasma Membrane - Permeability - Membrane Transport - Compartmentaliza	2.1.A - Explain how the structure and function of subcellular components and organelles contribute to the function of cells. 2.2.A - Explain the	- Describe biological concepts and processes. -Predict the causes or effects of a change in,or disruption to, one or more components	Biological systems use energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis.	- Topic Questions - MC Progress Check - FRQ Progress Check - Unit Test

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			tion -Osmoregulation -Tonicity	effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment. 2.3.A- Describe the roles of each of the components of the cell membrane in maintaining the internal environment of the cell. 2.3.B - Describe the fluid mosaic model of cell membranes 2.4.A - Explain how the structure of biological	in a biological system		

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				membranes influences selective permeability. 2.4.B - Describe the role of the cell wall in maintaining cell structure and function 2.5.A - Describe the mechanisms that organisms use to maintain solute and water balance. 2.5.B -Describe the mechanisms that organisms use to transport large molecules across the plasma membrane			

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				2.6.A - Explain how the structure of a molecule affects its ability to pass through the plasma membrane 2.7.A - Explain how the structure of a molecule affects its ability to pass through the plasma membrane 2.7.B -Explain how osmoregulatory mechanisms contribute to the health and survival of organisms. 2.8.A - Describe the processes that allow			

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				ions and other molecules to move across membranes 2.9.A - Describe the processes that allow ions and other molecules to move across membranes 2.9.B - Explain how internal membranes and membranebound organelles contribute to compartmentalization of eukaryotic cell functions 2.10.A - Describe similarities and/or			

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				differences in compartmentalization between prokaryotic and eukaryotic cells			
Energy Transformation	Oct -Nov	- Enzymes and Impacts on Enzymes - Cellular Energy - Photosynthesis - Cellular Respiration	- Enzyme - Inhibitor - Cellular Energetics -Chemical Pathway - Photosynthesis - Cell Respiration	3.1.A - Explain how enzymes affect the rate of biological reactions. 3.2.A - Explain how changes to the structure of an enzyme may affect its function. 3.2.B - Explain how the cellular environment affects enzyme activity. 3.3.A - Describe the	- Provide reasoning to justify a claim by connecting evidence to biological theories. - Construct a graph to represent the data, including: x-y graphs (bar, histogram, line, log scale, dually), scatter plot, box and whisker plot, and pie chart.	Biological systems use energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis	- Topic Questions - MC Progress Check - FRQ Progress Check - Unit Test

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				role of energy in living organisms. 3.3.B - Explain how shared, conserved, and fundamental processes and features support the concept of common ancestry for all organisms. 3.4.A - Describe the photosynthetic processes and structural features of the chloroplast that allow organisms to capture and store energy (exclusion:			

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				Memorization of the steps in the Calvin cycle, the structure of the molecules, and the names of the enzymes involved, with the exception of ATP synthase, is beyond the scope of the AP Exam.) 3.4.B - Explain how cells capture energy from light and transfer it to biological molecules for storage and use. 3.5.A - Describe the processes and			

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				structural features of mitochondria that allow organisms to use energy stored in biological macromolecules. 3.5.B- Explain how cells obtain energy from biological macromolecules in order to power cellular functions (Exclusion: Memorization of the steps in glycolysis and the Krebs cycle, and of the structures of the molecules and the names of the enzymes			

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				involved, is beyond the scope of this course and the AP Exam.)			
Cell Communication & Cell Cycle	Nov -Dec	- Cell Communication - Signal Transduction Pathways - Cell Cycle and Regulation -Feedback Mechanisms	- Transduction - Ligand - Regulation - Mitosis - Cell Cycle - Feedback - Signalling Pathway	4.1.A - Describe the ways that cells can communicate with one another. 4.1.B - Explain how cells communicate with one another over short and long distances 4.2.A -Describe the components of a signal transduction pathway 4.2.B - Describe the role of components of	- Describe data from a table or graph, including: identifying specific data points, describing trends and patterns in the data, and describing relationships between variables -Predict the causes or effects of a change in, or disruption to, one or more components in a biological system.	Biological systems use energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis	- Topic Questions - MC Progress Check - FRQ Progress Check - Unit Test

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				a signal transduction pathway in producing a cellular response. 4.3.A - Describe the different types of cellular responses elicited by a signal transduction pathway. 4.3.B - Explain how a change in the structure of any signaling molecule affects the activity of the signaling pathway. 4.4.A - Explain how positive and negative feedback helps maintain homeostasis.			

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				4.5.A - Describe the events that occur in the cell cycle. 4.5.B - Explain how mitosis results in the transmission of chromosomes from one generation of cells to the next. 4.6.A - Describe the role of checkpoints in regulating the cell cycle 4.6.B - Describe the effects of disruptions to the cell cycle on the cell or organism.			

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Heredity	Jan-Feb	- Meiosis - Mendelian Genetics - Non Mendelian Genetics - Epigenetics	- Meiosis - Genetic Diversity - Mendelian - Non-Mendelian - Linked Genes - Phenotype	5.1.A - Explain how meiosis results in the transmission of chromosomes from one generation to the next. 5.1.B - Describe similarities and differences between the phases and outcomes of mitosis and meiosis. 5.2.A - Explain how the process of meiosis generates genetic diversity. 5.3.A - Explain the inheritance of genes	- Identify or pose a testable question based on an observation, data, or a model -Perform chi-square hypothesis testing.	Living systems store, retrieve, transmit, and respond to information essential to life processes.	- Topic Questions - MC Progress Check - FRQ Progress Check - Unit Test

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				and traits as described by Mendel's laws 5.4.A - Explain deviations from Mendel's model of the inheritance of traits. 5.5.A - Explain how the same genotype can result in multiple phenotypes under different environmental conditions.			
Gene Expression & Regulation	Feb-Mar	- DNA/RNA and Replication - Regulation of Gene Expression	- Transcription - Translation - Regulation - Cell	6.1.A - Describe the structures involved in passing hereditary information from one	- Explain relationships between characteristics of biological models in	Living systems store, retrieve, transmit, and respond to information essential	- Topic Questions - MC Progress Check

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		- Mutations - Biotechnology	Specialization - Mutation -Biotechnology	generation to the next 6.1.B -Describe the characteristics of DNA that allow it to be used as hereditary material. 6.2.A - Describe the mechanisms by which genetic information is copied for transmission between generations. (Exclusion: The names of the steps and particular enzymes involved, excluding DNA polymerase, ligase, RNA polymerase, helicase, and topoisomerase,	both theoretical and applied contexts - Explain how biological models relate to larger principles, concepts, processes, systems, or theories	to life processes.	- FRQ Progress Check - Unit Test

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				are beyond the scope of the AP Exam.) 6.3.A - Describe the mechanisms by which genetic information flows from DNA to RNA to protein. 6.4.A - Explain how the phenotype of an organism is determined by its genotype 6.5.A - Describe the types of interactions that regulate gene expression. 6.5.B - Explain how the location of regulatory			

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				sequences relates to their function. 6.6.A - Explain how the binding of transcription factors to promoter regions affects gene expression and the phenotype of the organism. 6.6.B - Explain the connection between the regulation of gene expression and phenotypic differences in cells and organisms. 6.7.A - Describe the various types of mutation. (Exclusion:			

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				Knowledge of specific mutations and their effects is beyond the scope of the AP Exam.) 6.7.B - Explain how changes in genotype may result in changes in phenotype. 6.7.C -Explain how alterations in DNA sequences contribute to variation that can be subject to natural selection. 6.8.A - Explain the use of genetic engineering techniques in analyzing or			

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				manipulating DNA. (Exclusion: Knowledge of the details of each of these genetic engineering techniques is beyond the scope of the AP Exam.)			
Natural Selection	Mar- Apr	- Natural Selection - Population Genetics - Evidence of Evolution - Hardy-Weinberg Equilibrium	- Population Genetics - Hardy-Weinberg - Common Ancestry -Phylogeny - Speciation	7.1.A - Describe the causes of natural selection 7.1.B - Explain how natural selection affects populations. 7.2.A - Describe the importance of phenotypic variation in a population.	- Explain biological concepts and processes - Provide reasoning to justify a claim by connecting evidence to biological theories.	The process of evolution drives the diversity and unity of life.	- Topic Questions - MC Progress Check - FRQ Progress Check - Unit Test

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				7.2.B - Explain how variation in molecules within cells connects to the fitness of an organism. 7.2.B.1 Variation in the number and types of molecules within cells can provide populations a greater ability to survive and reproduce in different environments. 7.3.A - Explain how humans can affect diversity within a population. 7.4.A - Explain how			

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				random occurrences affect the genetic makeup of a population. 7.4.B - Describe the role of random processes in the evolution of specific populations. 7.4.C - Describe the change in the genetic makeup of a population over time 7.5.A - Describe the conditions under which allele and genotype frequencies will change in populations.			

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				7.6.A - Describe the types of data that provide evidence for evolution. 7.6.B - Explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time. 7.7.A - Describe structural and functional evidence on cellular and molecular levels that provides evidence for the common ancestry of			

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				all eukaryotes. 7.8.A - Explain how evolution is an ongoing process in all living organisms. 7.9.A - Describe the types of evidence that can be used to infer an evolutionary relationship. 7.9.B - Explain how phylogenetic trees and cladograms can be used to infer evolutionary relatedness. 7.10.A - Describe the conditions under which			

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				new species may arise. 7.10.B - Describe the rate of evolution and speciation under different ecological conditions. 7.10.C - Explain the processes and mechanisms that drive speciation. 7.11.A - Explain how the genetic diversity of a species or population affects its ability to withstand environmental pressures. 7.12.A - Describe the			

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				scientific evidence that supports models of the origin of life on Earth.			
Ecology	April	- Energy Flow through Ecosystems - Biodiversity - Community Ecology - Disruptions to Ecosystems	- Environment - Energy flow -Trophic Levels - Population Density - Biodiversity	8.1.A -Explain how the behavioral and physiological response of an organism is related to changes in internal or external environment. 8.1.B - Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of a population. (Exclusion:	- Explain the relationship between experimental results and larger biological concepts, processes, or theories.	Biological systems interact, and these systems and their interactions exhibit complex properties.	- Topic Questions - MC Progress Check - FRQ Progress Check - Unit Test

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				Knowledge of specific mechanisms of communication is beyond the scope of the AP Exam. The details of the various communications and community behavioral systems are beyond the scope of the AP Exam) 8.2.A -Describe the strategies organisms use to acquire and use energy. 8.2.B -Explain how energy flows and			

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				matter cycles through trophic levels 8.2.C -Explain how changes in energy availability affect populations, communities, and ecosystems. 8.2.D - Explain how the activities of autotrophs and heterotrophs enable the flow of energy within an ecosystem. 8.3.A - Describe factors that influence growth dynamics of			

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				populations. 8.4.A -Explain how the density of a population affects and is determined by resource availability in the environment. 8.5.A -Describe the structure of a community according to its species composition and diversity. 8.5.B - Explain how interactions within and among populations influence community structure.			

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				8.6.A - Describe the relationship between ecosystem diversity and its resilience to changes in the environment. 8.6.B - Explain how the addition or removal of any component of an ecosystem will affect its overall short-term and long-term structure. 8.7.A -Explain the interaction between the environment and random or preexisting variations in			

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				populations. 8.7.B -Explain how invasive species affect ecosystem dynamics. 8.7.C - Describe human activities that lead to changes in ecosystem structure and dynamics. 8.7.D - Explain how geological and meteorological activity leads to changes in ecosystem structure and dynamics.			