PERRY LOCAL SCHOOLS
GUARANTEED AND VIABLE CURRICULUM

AP BIOLOGY

POWER OBJECTIVE #1	**Describe the subunits and polymer structures of biological molecules and explain their importance in biological structures and processes. (APBIO)**	**Grading Period 1**
SUPPORTING INDICATORS	***APBIO.4.1*** *Explain the connection between the sequence and the subcomponents of a biological polymer and its properties.*	*1*
	APBIO.4.2 *Refine representations and models to explain how the subcomponents of a biological polymer and their sequence determine the properties of that polymer.*	*1*
	APBIO.4.3 *Use models to predict and justify that changes in the subcomponents of a biological polymer affect the functionality of the molecule.*	*1*
POWER OBJECTIVE #2	**Detail and explain the essential cell structures and transport mechanisms employed by cells to main homeostasis. (APBIO)**	***1***
SUPPORTING INDICATORS	***APBIO.2.4*** *Use representations to pose scientific questions about what mechanisms and structural features allow organisms to capture, store and use free energy.*	*1*
	APBIO.2.5 *Construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy.*	***1***
	APBIO.2.6 *Use calculated surface area-to-volume ratios to predict which cell(s) might eliminate wastes or procure nutrients faster by diffusion.*	***1***
	APBIO.2.7 *Explain how cell size and shape affect the overall rate of nutrient intake and the rate of waste elimination.*	***1***
	APBIO.2.8 *Justify the selection of data regarding the types of molecules that an animal, plant or bacterium will take up as necessary building blocks and excrete as waste products.*	***1***
	APBIO.2.9 *Represent graphically or model quantitatively the exchange of molecules between an organism and its environment, and the subsequent use of these molecules to build new molecules that facilitate dynamic homeostasis, growth and reproduction.*	***1***
	APBIO.2.10 *Use representations and models to pose scientific questions about the properties of cell membranes and selective permeability based on molecular structure.*	***1***
	APBIO.2.11 *Construct models that connect the movement of molecules across membranes with membrane structure and function.*	***1***
	APBIO.2.12 *Use representations and models to analyze situations or solve problems qualitatively and quantitatively to investigate whether dynamic homeostasis is maintained by the active movement of molecules across membranes.*	***1***
	APBIO.2.13 *Explain how internal membranes and organelles contribute to cell functions.*	***1***
	APBIO.2.14 *Use representations and models to describe differences in prokaryotic and eukaryotic cells.*	***1***
	APBIO.2.15 *Justify a claim made about the effect(s) on a biological system at the molecular, physiological or organismal level when given a scenario in which one or more components within a negative regulatory system is altered.*	***1***
	APBIO.2.16 *Connect how organisms use negative feedback to maintain their internal environments.*	***1***

POWER OBJECTIVE #3	**Explain how biological systems capture and utilize free energy to carry out life processes. (APBIO)**	***2***
SUPPORTING INDICATORS	***APBIO.2.1*** *Explain how biological systems use free energy based on empirical data that all organisms require constant energy input to maintain organization, to grow and to reproduce.*	*2*
	APBIO.2.2 *Justify a scientific claim that free energy is required for living systems to maintain organization, to grow or to reproduce, but that multiple strategies exist in different living systems.*	*2*
	APBIO.2.3 *Predict how changes in free energy availability affect organisms, populations and ecosystems.*	*2*
	APBIO.2.4 *Use representations to pose scientific questions about what mechanisms and structural features allow organisms to capture, store and use free energy.*	*2*
	APBIO.2.17 *Evaluate data that show the effect(s) of changes in concentrations of key molecules on negative feedback mechanisms.*	*2*
	APBIO.2.18 *Make predictions about how organisms use negative feedback mechanisms to maintain their internal environments.*	*2*
	APBIO.2.19 *Make predictions about how positive feedback mechanisms amplify activities and processes in organisms based on scientific theories and models.*	*2*
	APBIO.2.20 *Justify that positive feedback mechanisms amplify responses in organisms.*	*2*
	APBIO.2.21 *Justify the selection of the kind of data needed to answer scientific questions about the relevant mechanism that organisms use to respond to changes in their external environment.*	*2*
POWER OBJECTIVE #4	**Detail and explain the processes of mitosis and meiosis in transmitting genetic information and providing genetic variation. (APBIO)**	***2***
SUPPORTING INDICATORS	***APBIO.3.7*** *Make predictions about natural phenomena occurring during the cell cycle.*	***2***
	APBIO.3.8 *Describe the events that occur in the cell cycle.*	***2***
	APBIO.3.9 *Construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.*	***2***
	APBIO.3.10 *Represent the connection between meiosis and increased genetic diversity necessary for evolution.*	***2***
	APBIO.3.11 *Evaluate evidence provided by data sets to support the claim that heritable information is passed from one generation to another generation through mitosis, or meiosis followed by fertilization.*	***2***
	APBIO.3.12 *Construct a representation that connects the process of meiosis to the passage of traits from parent to offspring.*	***2***
POWER OBJECTIVE #5	**Apply Mendelian models and mathematical analysis to explain patterns of genetic inheritance. (APBIO.5)**	**3**
SUPPORTING INDICATORS	***APBIO.3.13*** *Pose questions about ethical, social or medical issues surrounding human genetic disorders.*	*3*
	APBIO.3.14 *Apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets.*	*3*
	APBIO.3.15 *Explain deviations from Mendel's model of the inheritance of traits.*	*3*
	APBIO.3.16 *Explain how the inheritance patterns of many traits cannot be accounted*	*3*

	for by Mendelian genetics.	
	APBIO.3.17 *Describe representations of an appropriate example of inheritance patterns that cannot be explained by Mendel's model of the inheritance of traits.*	***3***
POWER OBJECTIVE #6	**Detail, explain and relate DNA and RNA structure to the transmission of heritable information and protein synthesis. (APBIO.6)**	**3**
SUPPORTING INDICATORS	***APBIO.3.1*** *Construct scientific explanations that use the structures and mechanisms of DNA and RNA to support the claim that DNA and, in some cases, that RNA are the primary sources of heritable information.*	***3***
	APBIO.3.2 *Justify the selection of data from historical investigations that support the claim that DNA is the source of heritable information.*	***3***
	APBIO.3.3 *Describe representations and models that illustrate how genetic information is copied for transmission between generations.*	***3***
	APBIO.3.4 *Describe representations and models illustrating how genetic information is translated into polypeptides.*	***3***
	APBIO.3.5 *Justify the claim that humans can manipulate heritable information by identifying at least two commonly used technologies.*	***3***
	APBIO.3.18 *Predict how a change in a specific DNA or RNA sequence can result in changes in gene expression.*	***3***
	APBIO.3.19 *Describe the connection between the regulation of gene expression and observed differences between different kinds of organisms.*	***3***
	APBIO.3.20 *Describe the connection between the regulation of gene expression and observed differences between individuals in a population.*	***3***
	APBIO.3.21 *Explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function.*	***3***
	APBIO.3.22 *Use representations to describe how gene regulation influences cell products and function.*	***3***
	APBIO.3.23 *Explain how signal pathways mediate gene expression, including how this process can affect protein production.*	***3***
	APBIO.3.24 *Use representations to describe mechanisms of the regulation of gene expression.*	***3***
	APBIO.3.25 *Create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced.*	***3***
POWER OBJECTIVE #7	**Detail and explain evolutionary mechanisms and the evidence supporting the Theory of Evolution as an explanation for the unity and diversity of life. (APBIO)**	***4***
SUPPORTING INDICATORS	***APBIO.1.1*** *Convert a data set from a table of numbers that reflect a change in the genetic makeup of a population over time and to apply mathematical methods and conceptual understandings to investigate the cause(s)and effect(s) of this change.*	***4***
	APBIO.1.2 *Evaluate evidence provided by data to qualitatively and quantitatively investigate the role of natural selection in evolution.*	***4***
	APBIO.1.3 *Apply mathematical methods to data from a real or simulated population to predict what will happen to the population in the future.*	***4***
	APBIO.2.26 *Analyze data to identify phylogenetic patterns or relationships, showing that homeostatic mechanisms reflect both continuity due to common ancestry and*	***4***

	change due to evolution in different environments.	
	APBIO.2.27 *Connect differences in the environment with the evolution of homeostatic mechanisms.*	***4***
	APBIO.3.10 *Represent the connection between meiosis and increased genetic diversity necessary for evolution.*	***4***
	APBIO.3.24 *Predict how a change in genotype, when expressed as a phenotype, provides a variation that can be subject to natural selection.*	***4***
	APBIO.3.28 *Construct an explanation of the multiple processes that increase variation within a population.*	***4***
	APBIO.3.29 *Construct an explanation of how viruses introduce genetic variation in host organisms.*	***4***
	APBIO.3.30 *Use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population.*	***4***
	APBIO.3.31 *Describe basic chemical processes for cell communication shared across evolutionary lines of descent.*	***4***
	APBIO.3.32 *Generate scientific questions involving cell communication as it relates to the process of evolution.*	***4***
POWER OBJECTIVE #8	**Explain the structures and mechanisms of neural and endocrine Systems in regulation responses to internal and external stimuli. (APBIO)**	***5***
SUPPORTING INDICATORS	***APBIO.2.29*** *Create representations and models to describe immune responses.*	***5***
	APBIO.2.30 *Create representations or models to describe nonspecific immune defenses in plants and animals.*	***5***
	APBIO.2.36 *Justify scientific claims with evidence to show how timing and coordination of physiological events involve regulation.*	***5***
	APBIO.2.37 *Connect concepts that describe mechanisms that regulate the timing and coordination of physiological events.*	***5***
	APBIO.2.38 *Analyze data to support the claim that responses to information and communication of information affect natural selection.*	***5***
	APBIO.2.39 *Justify scientific claims, using evidence, to describe how timing and coordination of behavioral events in organisms are regulated by several mechanisms.*	***5***
	APBIO.2.40 *Connect concepts in and across domain(s) to predict how environmental factors affect responses to information and change behavior.*	***5***
	APBIO.3.33 *Use representation(s) and appropriate models to describe features of a cell signaling pathway.*	***5***
	APBIO.3.34 *Construct explanations of cell communication through cell-to-cell direct contact or through chemical signaling.*	***5***
	APBIO.3.35 *Create representation(s) that depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling.*	***5***
	APBIO.3.36 *Describe a model that expresses the key elements of signal transduction pathways by which a signal is converted to a cellular response.*	***5***
	APBIO.3.37 *Justify claims based on scientific evidence that changes in signal transduction pathways can alter cellular response.*	***5***
	APBIO.3.38 *Describe a model that expresses key elements to show how change in*	***5***

	signal transduction can alter cellular response.	
	APBIO.3.39 *Construct an explanation of how certain drugs affect signal reception and, consequently, signal transduction pathways.*	***5***
	APBIO.3.40 *Analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior.*	***5***
	APBIO.3.41 *Create a representation that describes how organisms exchange information in response to internal changes and external cues, and which can result in changes in behavior.*	***5***
	APBIO.3.42 *Describe how organisms exchange information in response to internal changes or environmental cues.*	***5***
	APBIO.3.43 *Construct an explanation, based on scientific theories and models, about how nervous systems detect external and internal signals, transmit and integrate information, and produce responses.*	***5***
	APBIO.3.44 *Describe how nervous systems detect external and internal signals.*	***5***
	APBIO.3.45 *Describe how nervous systems transmit information.*	***5***
	APBIO.3.46 *Describe how the vertebrate brain integrates information to produce a response.*	***5***
	APBIO.3.47 *Create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses.*	***5***
	APBIO.3.48 *Create a visual representation to describe how nervous systems detect external and internal signals.*	***5***
	APBIO.3.49 *Create a visual representation to describe how nervous systems transmit information.*	***5***
	APBIO.3.50 *Create a visual representation to describe how the vertebrate brain integrates information to produce a response.*	***5***
POWER OBJECTIVE #9	**Relate the concept of homeostasis to a cellular and organismal processes and chemical and energy balances. (APBIO)**	***5***
SUPPORTING INDICATORS	***APBIO.4.4*** *Make a prediction about the interactions of subcellular organelles.*	***5***
	APBIO.4.5 *Construct explanations based on scientific evidence as to how interactions of subcellular structures provide essential functions.*	***5***
	APBIO.4.6 *Use representations and models to analyze situations qualitatively to describe how interactions of subcellular structures, which possess specialized functions, provide essential functions*	***5***
	APBIO.4.7 *Refine representations to illustrate how interactions between external stimuli and gene expression result in specialization of cells, tissues and organs.*	***5***
	APBIO.4.8 *Evaluate scientific questions concerning organisms that exhibit complex properties due to the interaction of their constituent parts.*	***5***
	APBIO.4.9 *Predict the effects of a change in a component(s) of a biological system on the functionality of an organism(s).*	***5***
	APBIO.4.10 *Refine representations and models to illustrate biocomplexity due to interactions of the constituent parts.*	***5***
POWER OBJECTIVE #10	**Utilize an understanding of populations, communities and ecosystems to**	***6***

	explain complex relationships and interactions between species. (APBIO.10)	
SUPPORTING INDICATORS	***APBIO.4.11*** *Justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities.*	***6***
	APBIO.4.12 *Apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways.*	***6***
	APBIO.4.13 *Predict the effects of a change in the community's populations on the community.*	***6***
	APBIO.4.14 *Apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy.*	***6***
	APBIO.4.15 *Use visual representations to analyze situations or solve problems qualitatively to illustrate how interactions among living systems and with their environment result in the movement of matter and energy.*	***6***
	APBIO.4.16 *Predict the effects of a change of matter or energy availability on communities.*	***6***
	APBIO.4.17 *Analyze data to identify how molecular interactions affect structure and function.*	***6***
	APBIO.4.18 *Use representations and models to analyze how cooperative interactions within organisms promote efficiency in the use of energy and matter.*	***6***
	APBIO.4.19 *Use data analysis to refine observations and measurements regarding the effect of population interactions on patterns of species distribution and abundance.*	***6***
	APBIO.4.20 *Explain how the distribution of ecosystems changes over time by identifying large-scale events that have resulted in these changes in the past.*	***6***
	APBIO.4.21 *Predict consequences of human actions on both local and global ecosystems.*	***6***
	APBIO.4.22 *Construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions.*	***6***
	APBIO.4.23 *Construct explanations of the influence of environmental factors on the phenotype of an organism.*	***6***
	APBIO.4.24 *Predict the effects of a change in an environmental factor on the genotypic expression of the phenotype.*	***6***
	APBIO.4.25 *Use evidence to justify a claim that a variety of phenotypic responses to a single environmental factor can result from different genotypes within the population.*	***6***
	APBIO.4.26 *Use theories and models to make scientific claims and/or predictions about the effects of variation within populations on survival and fitness.*	***6***
	APBIO.4.27 *Make scientific claims and predictions about how species diversity within an ecosystem influences ecosystem stability.*	***6***
POWER OBJECTIVE #11	**Appraise emerging scientific issues associated with the life sciences. (APBIO.11)**	**1-6**