Biology, Quarter 1	
Big Ideas: **From Molecules to Organisms: Structures and Processes (BIO1.LS1)**	
Focus Standards	**Focus Guide for CFA's**
BIO1.LS1.2 Evaluate comparative models of various cell types with a focus on organic molecules that make up cellular structures. **BIO1.LS1.3** Integrate evidence to develop a **structural model of a DNA molecule**. Using the model, develop and communicate an explanation for how DNA serves as a template for self-replication and **encodes biological information**.	**Organic Molecules:** I can identify and model the structure and function of the four macromolecules. I can identify the source of the four major macromolecules in the food we eat and relate how the human body uses the four macromolecules. I can explain how monomers are built into polymers through dehydration synthesis and how polymers are broken down through hydrolysis. I can design and conduct a scientific investigation to test for the presence of macromolecules (simple sugars, complex carbohydrates, lipids, and proteins). **ACT* I can use data from indicator tests (Sudan Red, Iodine, Benedict's Solution, Biuret Reagent) to identify the presence of macromolecules in unknown solutions. **ACT* I can compare conclusions that offer different, but acceptable explanations for the same set of experimental data.
BIO1.LS1.5 Research examples that demonstrate the functional variety of proteins and construct an argument based on evidence for the importance of the molecular structure to its function. Plan and carry out a controlled investigation to test predictions about factors,	**Enzymes:** I can identify how enzymes control chemical reactions in the body. I can compare and contrast graphs showing a reaction without enzymes vs. an enzyme catalyzed reaction. **ACT*

which should cause an effect on the structure and function of a protein. **BIO1.LS1.1** Compare and contrast existing models, identify patterns, and use structural and functional evidence to analyze the characteristics of life. Engage in argument about the designation of viruses as non-living based on these characteristics.	I can design and write an experiment to test the effect of a variable (pH, temperature, enzyme concentration, substrate concentration) on enzyme rate of reaction. **ACT* I can select appropriate tools to measure pH, concentration, temperature, and rate of enzyme reaction. I can defend a conclusion based on scientific evidence. **ACT* I can analyze experimental results and reflect upon possible sources of bias or experimental error. **ACT* I can model in 2D and 3D, the structure and function of an enzyme and the enzyme substrate relationship. **ACT* **Cell Parts:** I can trace the historical development of cell theory. I can compare and contrast the structures and functions of cell organelles and components. I can use a microscope to differentiate between prokaryotic and eukaryotic cells, and between plant and animal cells. I can recreate models that focus on organic molecules making up cellular structures. I can compare and contrast models, identify patterns and use structural and functional evidence to engage in an argument about the characteristics of life. **ACT*

BIO1.LS1.7 Utilize a model of a cell plasma membrane to compare the various types of cellular transport and test predictions about the movement of molecules into or out of a cell based on the homeostasis of energy and matter in cells.	**Diffusion and Osmosis:** I can explain the significance of the surface area-to-volume ratio of cells. I can predict the movement of water or particles, given a diagram of relative concentrations on either side of a selectively permeable membrane (hypotonic, hypertonic, and isotonic solutions). I can choose and construct appropriate graphical representations for a data set showing the change in mass of a "cell" (dialysis tubing bag, egg, potato, etc.) in a hypotonic, hypertonic, isotonic solution. **ACT* I can design experiments and collect and analyze experimental data showing the movement of materials from high concentration to a low concentration or vice versa to distinguish between active and passive transport. I can model osmosis and diffusion. I can compare and contrast cellular examples of active and passive transport. **ACT* I can model the processes of active and passive transport.

Quarter 2	
Big Ideas: **Ecosystems: Interactions, Energy, and Dynamics (BIO1.LS2)**	
Focus Standards	**Focus Guide for CFA's**
BIO1.LS1.8 Create a model of photosynthesis demonstrating the net flow of matter and energy into a cell. Use the model to explain energy transfer from light energy into stored chemical energy in the product.	**Photosynthesis and Respiration:** I can identify the organelles of photosynthesis and respiration and describe how their structure relates to their function. I can compare and contrast photosynthesis and respiration in terms or reactants, products, and energy transformation. I can demonstrate the relatedness of the equations for both photosynthesis and respiration. I can compare and contrast aerobic respiration to anaerobic respiration, identifying reactants, products, and efficiency of energy transfer to ATP.
BIO1.LS1.9 Create a model of aerobic respiration demonstrating flow of matter and energy out of a cell. Use the model to explain energy transfer mechanisms. Compare aerobic respiration to alternative processes of glucose metabolism.	**Population Dynamics:** I can analyze graphs of predator prey population fluctuations. **ACT* I can analyze population growth curves and age structure diagrams. **ACT* I can determine how the carrying capacity of an ecosystem for one species can be affected by changes in the populations of other species in that ecosystem.
BIO1.LS2.1 Analyze mathematical and/or computational representations of population data that support explanations of factors that affect population size and carrying capacities of	**Biodiversity and Ecosystem Stability:** I can predict, in writing through evidence based research, how a specific environmental changes, both natural and/or man-made, may

populations within an ecosystem. Examine a representative ecosystem and, based on interdependent relationships present, predict population size effects due to a given disturbance.	lead to environmental stress that can affect the amount of biodiversity, and/or lead to the extinction of a species. **Succession:** I can analyze examples of ecological succession, identifying and explaining the factors and order of events responsible for the formation of a new ecosystem in response to extreme fluctuation in environmental conditions or catastrophic events.
BIO1.LS2.2 Create a model tracking carbon atoms between inorganic and organic molecules in an ecosystem. Explain human impacts on climate based on this model.	**Energy Transfer:** I can model the flow of energy through an ecosystem, such as a food chain, web, or pyramid for a given ecosystem. I can use a mathematical model to describe the transfer of energy between trophic levels.
BIO1.LS2.3 Analyze through research the cycling of matter in our biosphere and explain how biogeochemical cycles are critical for ecosystem function.	**Nutrient Cycles:** I can describe the major events which occur during the carbon, nitrogen, and water cycles.
BIO1.LS2.4 Analyze data demonstrating the decrease in biomass observed in each successive trophic level. Construct an explanation considering the laws of conservation of energy and matter and represent this phenomenon in a mathematical model to describe the transfer of energy and matter between trophic levels. **BIO1.LS2.5** Analyze examples of ecological succession, identifying and explaining the order of events responsible for the formation of a new ecosystem in response to extreme fluctuations in environmental conditions or catastrophic events.	I can explain how the inefficiency of energy transfer between trophic levels affects the relative number of organisms supported at each trophic level. I can explain how energy loss and organic matter loss between trophic levels remains consistent with the laws of conservation of energy and matter.

Biology, Quarter 3	
Big Ideas: **BIO1.LS1: From Molecules to Organisms: Structures and Processes** **BIO1.LS3: Heredity: Inheritance and Variation of Traits**	
Focus Standards	**Focus Guide for CFA's**
BIO1.LS1.6 Create a model for the major events of the eukaryotic cell cycle, including mitosis. Compare and contrast the rates of cell division in various eukaryotic cell types in multicellular organisms.	**Cell Cycle:** I can explain the relationship between a cell growing 'too large' and the cell's need to divide and reproduce. I can compare rates of cell division for various cell types. I can explain cellular differentiation processes that allow and organism's genetically identical cells to become structurally and functionally unique. I can identify the stages of mitosis given a visual image and model the movement of chromosomes during mitosis. I can model the cell cycle events of Interphase and Mitosis, identifying points where signal proteins promote or inhibit the rate of cell cycle progression. I can explain the importance of cell cycle regulation related to the cell's role in tissue growth, maintenance, or repair. I can explain how mutations in genes that code for cell cycle regulatory proteins can cause a cell to become cancerous. I can compare and contrast a cell cycle diagram of a plant and animal cell.

BIO1.LS3.1 Model chromosome progression through meiosis and fertilization in order to argue how the processes of sexual reproduction lead to both genetic similarities and variation in diploid organisms. Compare and contrast the processes of sexual and asexual reproduction, identifying the advantages and disadvantages of each.	**Meiosis:** I can describe how the process of meiosis controls the number of chromosomes in a gamete. I can model chromosomal progression events through meiosis and fertilization that cause genetically unique haploid gametes and diploid organisms. I can explain the mechanism by which sexual reproduction produces offspring that contain genetic similarities and differences with parents, and how much this contributes to genetic variation in a population. I can analyze a karyotype to determine patterns, such as the presence or absence of a chromosomal disorder.
BIO1.LS1.3 Integrate evidence to develop a structural model of a DNA molecule. Using the model, develop and communicate an explanation for how DNA serves as a template for self-replication and encodes biological information.	**DNA Replication:** I can integrate evidence from Franklin and Chargaff to develop a structural model of DNA molecule, as Watson and Crick did. I can model the structure and function of DNA and its significance as the basis for inheritance. I can extract DNA using appropriate scientific tools and procedures. **ACT*
BIO1.LS1.4 Demonstrate how DNA sequence information is decoded through transcriptional and translational processes within the cell in order to synthesize proteins. Examine the relationship of structure and function of various types of RNA and the importance of this relationship in these processes.	**Protein Synthesis:** I can analyze the organization and ability of DNA to encode information, and explain how transcriptional and translational processes are used by the cell to convert gene sequences based on 4 nucleotides, into protein sequences based on 20 amino acids.

	I can model the interaction of DNA, RNA, and amino acids to explain protein synthesis. I can model transcription and translation.

Quarter 4	
Big Ideas: **Heredity: Inheritance and Variance of Traits (BIO1.LS3)** **Ecosystems: Interactions, Energy, and Dynamics (BIO1.LS4)**	
Focus Standards	**Focus Guide for CFA's**
BIO1.LS3.2 Explain how protein formation results in phenotypic variation and discuss how changes in DNA can lead to somatic or germ line mutations.	**Sexual Reproduction:** I can explain cellular differentiation processes that allow an organism's identical cells to become structurally and functionally unique. I can explain how the process of meiosis controls the number of chromosomes in a gamete. I can model chromosomal progression events through meiosis and fertilization that cause genetically unique haploid gametes and diploid organisms. I can explain the mechanism by which sexual reproduction produces offspring that contain genetic similarities and differences with parents, and how much this contributes to genetic variation in a population.

BIO1.LS3.3 Through pedigree analysis, identify patterns of trait inheritance to predict family member genotypes. Use mathematical thinking to predict the likelihood of various types of trait transmission.	I can determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance. **Phenotype Determining Factors:** I can predict the outcome of mono and dihybrid crosses. I can determine whether a trait is dominant of recessive, given information on the phenotypes of parents and offspring. I can explain co-dominance, multiple alleles, sex-linkage, and polygenic traits. **Pedigree Analysis and Predictions:** I can apply pedigree data to interpret and predict various modes of genetic inheritance. I can describe the relationship between human genetic disorders and mutations. I can analyze a karyotype to determine patterns, such as the presence or absence of a chromosomal disorder. **Ethical Debates of Biotechnology Use:** I can assess the scientific and ethical ramifications of emerging genetic technologies. **ACT*
BIO1.LS4.1 Evaluate scientific data collected from analysis of molecular sequences, fossil records, biogeography, and embryology. Identify chronological patterns of change and communicate that biological evolution is supported by multiple lines of empirical evidence that identify similarities inherited from a common ancestor (homologies).	**Biological Change:** I can infer how an adaptation has helped a species survive in its environment. I can compare and contrast the structural, functional, and behavioral adaptations of animals or plants in different environments.

BIO1.LS4.2 Using a model that demonstrates the change in allele frequencies resulting in evolution of a population over many generations, identify causative agents of change.	I can model the role of mutation and variation in the process of natural selection. I can explain how natural selection is responsible for the accumulation of progressively complex traits in a population over time in a given environment. I can evaluate evidence supporting claims that isolation and/or environmental changes that persist over generations can result in speciation. I can explain how changing environments and natural selection over time can lead to an increase in biodiversity over the history of life on earth.
BIO1.LS4.3 Identify ecosystem services and assess the role of biodiversity in support of these services. Analyze the role human activities have on disruption of these services.	I can summarize the main threats to biodiversity in our world today. I can infer the relatedness of species by comparing similar anatomical, embryological, or cellular structures. **ACT* I can compare the relative ages of fossils, given a diagram of the rock layers in which they were found.