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Marking Period 1 (MP1)	Science Curriculum Pacing Guide Grade HS AP BIOLOGY
MP1 **Standards for Science Content**	HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. HS-PS1-3. Plan and investigate to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. HS-PS1-5. Apply scientific principles and evidence to explain the effects of changing temperature or concentration of the reacting particles on the rate at which a reaction occurs. HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3. Plan and investigate to provide evidence that feedback mechanisms maintain homeostasis. HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
MP1 **Topics**	Chemistry of Life Cells
MP1 **Skills/Concepts**	The process of evolution drives the diversity and unity of life. Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis. Living systems store, retrieve, transmit and respond to information essential to life processes. Biological systems interact, and these systems and their interactions possess complex properties. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. Systems of specialized cells within organisms help them perform the essential functions of life Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.
MP1 **Core Materials**	Pearson - Campbell Biology 12th Edition

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Marking Period 2 (MP2)	Science Curriculum Pacing Guide Grade HS AP BIOLOGY
MP2 **Standards for Science Content**	HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
MP2 **Topics**	Cellular Energetics Cell Communication and Cell Cycle
MP2 **Skills/Concepts**	Biological systems interact, and these systems and their interactions exhibit complex properties. Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis. Living systems store, retrieve, transmit and respond to information essential to life processes. Chemical energy stored in food is used to generate ATP, the molecule that drives most cellular works. Fermentation and anerobic respiration enable cells to produce ATP without the use of oxygen. Photosynthesis feeds the biosphere. Photosynthesis converts light energy to the chemical energy of food. External signals are converted to responses within the cells. Apoptosis requires integration of multiple cell-signaling pathways. Most cell divisions result in genetically identical daughter cells. The continuity of life is based on heritable information in the form of DNA. The eukaryotic cell cycle is regulated by a molecular control system Many species can reproduce either asexually or sexually. Genetic variation produced in sexual life cycles contributes to evolution.
MP2 **Core Materials**	Pearson - Campbell Biology 12th Edition

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Marking Period 3 (MP3)	Science Curriculum Pacing Guide Grade HS AP BIOLOGY
MP3 **Standards for Science Content**	HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
MP3 **Topics**	Unit 5 - Heredity Unit 6 – Gene Expression and Regulation
MP3 **Skills/Concepts**	The rationale behind AP Biology's structure, particularly in units 5 and 6, is to provide a comprehensive understanding of biological sci-ences. Unit 5 focuses on the structure and function of biological macromolecules, emphasizing the importance of understanding their chemistry for success in the unit. It also covers enzymes, DNA and RNA, and biotechnology, which are foundational for advanced topics like genetics and cellular processes. • Continuity of life is based on heritable information in the form of DNA. • Meiosis followed by fertilization ensures genetic diversity in sexually reproducing organisms. • In sexually reproducing species each individual inherits DNA from both parent organisms. • The meticulous work of Mendel and others provided evidence for the mechanism of evolution. • DNA sequences can act as “tape measures of evolution.” • The highly conserved idea of gene transcription and translation is shared by all domains. • The practical applications of DNA-based biotechnology affect our lives in many ways. • Mutations in protein coding genes and regulatory DNA contribute to evolution. • Anatomical and molecular features often fit a similar nested pattern. • Changes to an organism's physical environment are likely to result in evolutionary change. • The process of evolution is revealed by the imperfections of the living organisms. • Molecular and cellular events lead to emergent properties at individual and population levels of biological organization.
MP3 **Core Materials**	Pearson - Campbell Biology 12th Edition

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Marking Period 4 (MP4)	Science Curriculum Pacing Guide Grade HS AP BIOLOGY
MP4 **Standards for Science Content**	HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS2-6. Evaluate the claims, evidence, and reason that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS4-1.Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. HS-LS4-2.Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-3.Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS4-4.Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5.Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
MP4 **Topics**	Unit 7 – Natural Selection Unit 8 – Ecology
MP4	

Skills/Concepts	Mutations in protein coding genes and regulatory DNA contribute to evolution. Anatomical and molecular features often fit a similar nested pattern. Changes to an organism's physical environment are likely to result in evolutionary change. Process of evolution is revealed by the imperfections of the living organisms. Molecular and cellular events lead to emergent properties at individual and population levels of biological organization. In sexually reproducing species each individual inherits DNA from both parent organisms. Gene flow, genetic drift, and natural selection all can influence macroevolution. Genetic information enables scientists to reconstruct phylogenies that extend hundreds of millions of years back in time. Aquatic biomes are diverse and dynamic systems that covers most of the Earth. Interactions between organisms and their environment limit the distribution of species. Ecological change and evolution affect one another over long and short periods of time. Biotic and abiotic factors affect population density, dispersion, and demographics. The exponential model describes population growth in an idealized, unlimited environment. Density dependent factors regulate population growth. Interactions between species can help, harm, or have no effect on individuals involved. Energy and other limiting factors control primary production in ecosystems. Energy transfer between trophic levels is typically only 10% efficient. Biological and geochemical processes cycle nutrients and water in ecosystems. Community diversity threatens Earth's biodiversity.
MP4 **Core Materials**	Pearson - Campbell Biology 12th Edition