Department: Science
Course Title: Advanced Placement Biology (with lab semester included) *following the 2025 CED
Creator: Sherree Wolfgang
Date: 7/16/25

Unit Title	Unit Length (weeks)	Dates of Unit (Month - Month)	Essential Questions	Topics to be Covered Texts Used	Skills to be Assessed	Standard Alignment	Formative Assessments	Summative Assessments
AP Bio Science and Math Skills	2	Aug-Sept	Which type of graph is appropriate to illustrate a given set of data? How do I properly set up an investigation? How do I apply statistical analysis to data?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; lab safety, planning proper investigations, analyzing data, using mathematical formulas on the AP Bio Formula Sheet plus conversions and percent change, how to choose a graph type and create it properly, how to write a science explanation, review how to properly use a microscope	AP: Science Practice 3 Questions and Methods, Science Practice 4 Representing and Describing Data, Science Practice 5 Perform statistical tests and mathematical calculations to analyze and interpret data, Science Practice 6 Develop and justify scientific arguments using evidence; NGSS: Asking questions and defining problems, planning and carrying out investigations, Analyzing and interpreting data, Using mathmatics and computational thinking, Constructing explanations and designing solutions, Engaging in argument using evidence, Obtaining, evaluating and communicating information	HS-LS2-8	Class Discussion, Reading checks, Practice Worksheets, M&M Activity Chi Square Analysis, Oreo Activity, FRQ practice, AP Classroom Progress Check	Lab Safety Quiz, Fruit Fly Behavior Lab
Chemistry of Life	3	Sept	How do the properties of water that result from its polarity and hydrogen bonding affect its biological function? How are the macromolecules required by living organisms composed? What happens during the chemcial reactions that build and break biological macromolecules? What are the structures and functions of each type of macromolecule?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; properties of water, atomic and molecule structure, hydrolysis, dehydration synthesis, carbohydrates, lipids, nucleic acids, proteins	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 3: Questions and methods; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Use mathematical computational thinking; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-PS1-1, HS-PS1-2, HS-PS1-3, HS-PS1-7, HS-LS 1-1, HS-LS1-6, HS-LS4-1	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, AP Classroom Progress Check, Chromatography Dry Lab	Properties of Water Quiz, Penny Drop Lab, Banana Carbohydrate Lab, Unit 1 Test

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Cells	4	Sept-Oct	How do the structure and function of subceullar components and organelles contribute to the function of cells? What is the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment? What are the roles of each component of the cell membrane in maintaining the internal environment of the cell? What is the fluid mosaic model of the cell membrane? How does the structure of biological membranes influence selective permeability? What is the role of the cell wall in maintaining cell structure and function? What are the mechanisms that organisms use to maintain solute and water balance? What are the mechanisms that organisms use to transport large molecules across the plasma membrane? How does the structure of a molecule affect its ability to pass through the plasma membrane? How do concentration gradients affect the movement of molecules across membranes? How do osmoregulatory mechanisms contribute to the health and survival of organisms? What are the processes that allow ions and other molecules to move across membranes? How do internal membranes and membrane-bound organelles contribute to compartmentalization of eukaryotic cell function? What are the similarities and differences in compartmentalization between prokaryotic and eukaryotic cells?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; structure and function of cell parts, surface area-to-volume ratios, structure and function of plasma membrane, mechanisms for molecules to be transported across the plasma membrane, water potential, compartmentalization	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 3: Questions and methods; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Use mathematical computational thinking; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-LS4-1	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, AP Classroom Progress Check, Cell Membrane Bubble Lab, Modeling the Cell Membrane	Quizzes, Cell Organelle Project, Cell Size (Beet) Lab, Potato Osmosis Lab, Unit 2 Test

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Cellular Energetics	4	Oct-Nov	How do enzymes affect the rate of biological reactions? How do the changes to the structure of an enzyme affect its function? How does the cellular environment affect enzyme activity? What is the role of energy in living organisms? How do shared, conserved and fundamental processes and features support the concept of common ancestry for all organisms? What are the photosynthetic processes and structural features of the chloroplast that allow organisms to capture and store energy? How do cells capture energy from light and transfer it to biological molecules for storage and use? What are the processes and structural features of mitochondria that allow organisms to use energy stored in bilogical macromolecules? How do cells obtain energy from biological macromolecules in order to power cellular functions?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; structure and function of enzymes, energy input/output in cellular processes, processes of photosynthesis, processes of cellular respiration	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 3: Questions and methods; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Ask questions; Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Use mathematical computational thinking; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-LS 1-5, HS-LS 1-7, HS-LS 2-3, HS-LS 2-5	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, AP Classroom Progress Check, Toothpickase Activity, Hosta Leaf Activity, Gizmo simulation assignments	Yeast Catalase Lab, Quiz, Cellular Respiration Lab, Unit 3 Test

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Cell Communication and Cell Cycle	3	Nov-Dec	What are the ways that cells can communicate with one another over short and long distances? What are the components of a signal transduction pathway? What is the role of components of a signal transduction pathway in producing a cellular response? What are the different types of cellular responses elicited by a signal transduction pathway? How does a change in the structure of any signaling molecule affects the activity of the signaling pathway? How does positive and negative feedback help to maintain homeostasis? What are the events that occur in the cell cycle? How does mitosis result in the transmission of chromosomes from one generation of cells to the next? What is the role of checkpoints in regulating the cell cycle? What are the effects of disruptions to the cell cycle on the cell or organism?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; cell communication, signal transduction pathways, positive and negative feedback systems, cell cycle	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 3: Questions and methods; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Use mathematical computational thinking; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-LS1-3, HS-LS1-4,	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, AP Classroom Progress Check, POGILs,	Miracle Berry lab, Quiz, Homeostasis lab, Scallion/Caffeine lab, Unit test

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Heredity	3	Dec-Jan	How does meiosis result in the transmission of chromosomes from one generation to the next? What are the similarities and differences between the phases and outcomes of mitosis and meiosis? How does the process of meiosis generate genetic diversity? How do Mendel's laws explain the inheritance of genes and traits? What other models of inherited traits deviate from Mendel's model? How can the same genotype result in multiple phenotypes under different environmental conditions?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; process of meiosis, nondisjunction, recombination, law of segregation, law of independent assortment, crosses (monohybrid, dihybrid and test), patterns of inheritance, punnett squares, laws of probability, gene mapping, pleiotropy, mitochondrial/chloroplast DNA, phenotypic plasticity, pedigree charts	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 3: Questions and methods; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Ask questions; Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Use mathematical computational thinking; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-LS3-1, HS-LS3-2, HS-LS-3-3, HS-LS4-1	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, AP Classroom Progress Check, Skew dice activity	Quiz, Genetics of fruit flies simulation lab, Unit test

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Gene Extression and Regulation	4	Jan-Feb	What are the structures involved in passing hereditary information from one generation to the next? What are the characteristics of DNA that allow it to be used as hereditary material? What are the mechanisms by which genetic information is copied for transmission between generations? What are the mechanisms by which genetic information flows from DNA to RNA to protein? How does the genotype of an organism determine its phenotype? What are the types of interactions that regulare gene expression? How does the location of regulatory sequences relate to their function? How does the binding of transcription factors to promoter regions affect gene expression and the phenotype of the organism? What is the connection between the regulation of gene expression and phenotypic differences in cells and organisms? What are the various types of mutations? How does a change in genotype possibly result in a change in phenotype? How do alterations in DNA sequences contribute to variation that can be subject to natural selection? How do we use genetic engineering techniques in analyzing and manipulating DNA?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; structure of DNA and base pairing, DNA replication, transcription, RNA processing, translation, regulation of gene expression, gene expression, cell specialization, mutations, biotechnology	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 3: Questions and methods; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-LS1-1, HS-LS3-1, HS-LS3-2, HS-LS3-3	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, POGIL, AP Classroom Progress Check	Quizzes, pGlo Bacteria Transformation Lab, MiniPCR PTC Taste Lab, Unit test

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Natural Selection	4	Feb-Mar	What are the causes of natural selection? How does natural selection affect populations? What is the importance of phenotypic variation in populations? How does variation in molecules within cells connect to the fitness of an organism? How do humans affect diversity within a population? How do random occurances affect the genetic makeup of a population? What is the role of random processes in the evolution of specific populations? What is the change in the genetic makeup of a population over time? What are the conditions under which allele and genotype frequencies will change in populations? What are the types of data that provide evidence for evolution? How do morphological, biochemical and geological data provide evidence that organisms have changed over time? What structural and functional evidence on cellular and molecular levels provide evidence for the common ancestry of all eukaryotes? How is evolution an ongoing process in all living organisms? What types of evidence can be used to infer an evolutionary relationship? How do phylogenetic trees and cladograms be used to infer evolutionary readiness? What conditions promote new species to arise? How does the rate of evolution and speciation different change under different ecological conditions? What processes and mechanisms drive speciation? How does the genetic diversity of a species or population affect its ability to withstand environmental pressures? What scientific evidence provides support for models	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; Darwin's theory of natural selection, evolutionary fitness/reproductive success, genetic variation, selective pressures, artificial selection, genetic drift, bottleneck effect, founder effect, gene flow, Hardy-Weinberg equilibrium, evidence of evolution, evidence of common ancestry, phylogenetic trees and cladograms, speciation, punctuated equilibrium, divergent equilibrium, convergent evolution, sympatric speciation, allopatric speciation, prezygotic and post zygotic mechanisms, evidence for the origin of life on Earth	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 3: Questions and methods; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Use mathematical computational thinking; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, POGIL, AP Classroom Progress Check; Fruit Looper activity, Candy Cladistics	Quizzes, Artificial Selection Brine Shrimp Lab, Phylogeny of Marine Mammals Lab, Unit Test

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Ecology	4	Mar-Apr	How do the behavioral and physiological response of an organism relate to changes in internal or external environment? How do the behavorial responses of organisms affect their overall fitness and contribute to the success of a population? What strategies do organisms use to acquire and use energy? How does energy flow and matter cycle through trophic levels? How do changes in energy availability affect populations, communities and ecosystems? How do the activities of autotrophs and heteroptrophs enable the flow of energy within an ecosystem? What factors influence the growth dynamics of populations? How does the density of a population affect and is determined by resource availability in the environment? What is the structure of a community according to its species composition and diversity? How do interactions within and among populations influence community structure? What is the relationship between ecosystem diversity and its resilience to changes in the environment? How do the addition or removal of any component of an ecosystem affect its overall short-term and long-term structure? What is the interaction between the environment and random or preexisting variations in populations? How do invasive species affect ecosystem dynamics? What human activities lead to changes in ecosystem structure and dynamics? How do geological and meteorological activity lead to changes in ecosystem structure and dynamics?	Biology for the AP Course by Morris, Castignetti, Lepri, and Relyea, 2022; respond to stimulus, organism communication, metabolism and energy use, reproductive strategies, ecological levels of organization, biogeochemical cycles, trophic levels, food webs, ecological relationships, population growth dynamics, carrying capacity, Simpson's Diversity Index, biodiveristy, keystone species, invasive species, human impact, geological and meteorological impact	AP Skills: Science Practice 1: Concept explanation; Science Practice 2: Visual representations; Science Practice 4: Representing and describing data; Science Practice 5: Statistical tests and data analysis; Science Practice 6: Argumentation; NGSS Skills: Develop and use a model; Plan and carry out an investigation; Analyze and interpret data; Use mathematical computational thinking; Constructing explanations; Engaging in argument from evidence; Obtaining, evaluating and communicating information	HS-LS2-1, HS-LS2-2, HS-LS2-3, HS-LS2-4, HS-LS2-5, HS-LS2-6, HS-LS207, HS-LS2-8	Class Discussion, Reading checks, Practice Worksheets, FRQ practice, AP Classroom Progress Check;case study, Food web poster project,	Quizzes, Transpiration lab, Simpson's Diversity Index lab, Mark and Recapture lab, Unit Test

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AP Biology Exam scheduled for May 4, 2026.								