Name of Course: CP Biology

Course Overview:

Course Overview: This course is aligned with the NGSS performance indicators, and emphasizes the components of all life, from the molecular level to the biosphere. We will explore the characteristics and diversity of life, the scientific method, cellular structure and function, systems of the human body, genetics, evolution, ecology, and climate change. Through reading, writing, inquiry-based assignments, lab activities, class discussions, and projects, students investigate these topics and how they are relevant to their own health, heredity, the environment we live in, and other organisms. We will also look at current biological advances and technology throughout each unit.

Performance Indicators:

1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (HS-LS4-1)
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-LS4-2)
3. 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-LS1-6).
4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms (HS-LS1-4).
5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy (HS-LS1-5)..
6. 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-LS1-7).
7. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis (HS-LS1-3).
8. 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-LS1-1).
9. 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-LS3-1)
10. 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-LS3-2)
11. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (HS-LS3-3)
12. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (HS-LS4-5)
13. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity (HS-LS2-7).
14. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems (HS-ESS3-4).
15. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem (HS-LS2-4).
16. Evaluate the claims, evidence, and reasoning 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-LS2-6).

Unit of Study	Essential Question(s)	Content/Skill/Concept	Instructional Strategies
Intro to Biology	How do we classify living things? How do we know something is alive?	Observations vs Inferences; Characteristics of Life; Evidence for Evolution; Classification of Life	Hands-on lab activities; peppered moth simulation; "Darwin's Dangerous Idea"; instructional videos and demonstrations; observation & inference application; binomial nomenclature guided practice; "speed-dating" information workshop; reliable resource evaluation.
Biochemistry	What is all life composed of? What are the four types of macromolecules, and what are their functions in living organisms?	Structure of macromolecules; Properties of water; understanding how macromolecule monomers form polymers; importance of trace elements	Hands on lab activities: molecular modeling lab; water properties lab; bond types and their properties: direct instruction and practice problems; article reading and questions
Cells	What are the components of cells? What processes do cells undergo? How do cells contribute to cancer? How do cells make energy to carry out their functions?	Types of Cells; Organelles; Diffusion & Osmosis; the Cell Cycle; Mitosis & Meiosis; Stem Cells & Differentiation; Cancer; Photosynthesis & Cellular Respiration	"The Hidden Life of Cells"; instructional videos and demonstrations; hands-on lab activities; paper plate cell cycle; "Emperor of All Maladies"; role-play activities; independent research projects; "What Plants Talk About"; reflections; current events; video project.
Body Systems	How does the respiratory system interact with the circulatory system to maintain homeostasis? How does the immune system help prevent us from infections? How does the endocrine system contribute to homeostasis?	Homeostasis; Mammalian Dive Reflex; Heart Rate & Blood Pressure; Respiratory & Circulatory Anatomy & Diseases; Blood Typing; Components of the Immune System; Vaccines; Infectious Diseases; Hormones & Endocrine Glands	Instructional videos and demonstrations; hands-on lab activities; dive reflex demonstration; TED-Ed videos; planning a lab and writing reports; simulations & online games;; "Contagion" movie; WebQuest; comic strip; "The Vaccine War" documentary; infectious disease project & presentation; hormone project; endocrine expo; endocrine bingo.
Genetics	What is genetic variation and how does it occur? How does DNA code for specific traits? How do genetic mutations occur, and what are their consequences?	DNA structure & replication; Gene Expression; Genetic Mutations & Variation; Inheritance of Traits; Meiosis; Karyotyping; Mendelian & Non-Mendelian Genetics; Punnett Squares; Genetic Disorders	Web-based transcription/translation activity; DNA modeling; Profile of Individual Traits analysis; Strawberry DNA Lab; Build a Monster (transcription/translation activity); direct instruction w/notetakers; Karyotype Analysis with "letter to the parents"; Mutation analysis; GATTACCA movie-genetics and ethics discussion; formative

			assessments (warm-up questions); Unit 5.1 and 5.2 quizzes (summative assessments).
Evolution	How do traits change over time in a population? What is a species, and how are new species formed?	Inheritance & Adaptations; Speciation & Extinction; Endangered Species	"What Darwin Never Knew" video; hands-on lab activities; instructional videos & demonstrations; research paper; WebQuest; endangered species project; rat island activity; "Planet Earth II - Jungles" video.
Ecology	How do interruptions to the carbon and nitrogen cycles affect ecosystems around the world? How has humanity impacted the earth's ecosystems?	Types of Ecosystems/Biomes; Carrying Capacity; Food Chains & Food Webs; Abiotic & Biotic Limiting Factors; Carbon Cycle; Nitrogen Cycle; Invasive Species; Human Impact on Ecosystems	Instructional videos & demonstrations; "Before the Flood" documentary; WebQuests; online simulations; self-reflection of carbon footprint; "Treasures of the Earth - Power" video; Climate Change final project.