

## ADVANCED PLACEMENT BIOLOGY

### Students will:

- Understand how energy flows through an ecological system and how nutrients cycle
- Describe how abiotic and biotic factors affect community structure and ecosystem function
- Describe what models are used in describing population growth and how population size is affected by abiotic and biotic factors
- Investigate how humans are affecting the biosphere
- Describe how the chemical and physical properties of water make life on Earth possible
- Investigate the role of carbon in the molecular diversity of life
- Analyze how the structures of biologically important molecules (proteins, carbohydrates, nucleic acids and lipids) account for their functions
- Describe how the structure of an enzyme relates to its function in carrying out chemical reactions
- Understand that cells are the structural and functional units of life and describe the differences between plant, animal and prokaryotic cells
- Analyze the structure and function of the cell membrane and cellular organelles
- Investigate the cell cycle and its regulation
- Discuss the role of ATP in coupling the cell's anabolic and catabolic processes
- Explore fermentation and cellular respiration
- Investigate photosynthesis and describe the interactions that exist between photosynthesis and cellular respiration
- Relate meiosis and gametogenesis to heredity



## ADVANCED PLACEMENT BIOLOGY (continued)

### Students will:

- Describe how the structures of DNA and RNA relate to their functions of information storage and protein synthesis
- Explore some of the current DNA technology and its applications
- Understand the current biological models for the origins of biological macromolecules, prokaryotic and eukaryotic cells
- Understand the current evidence to support the evolutionary theory, the role of natural selection and the mechanisms that account for speciation
- Investigate the major body plans of plants and animals and the patterns of reproduction and development
- Understand how the organization of cells, tissues and organs determine the structure and function in plant and animal systems

## ANATOMY

### Students will:

- Identify and learn the parts of each organ system
- Describe how organ structure and function work together (homeostasis)
- Identify and explain the structural and functional synergy of a basic cell
- Identify the anatomical reference points on the human body using anatomical position
- Understand the pathology and risk factors of bacterial meningitis
- Demonstrate knowledge and proper usage of dissection equipment and safety procedures



## ANATOMY (continued)

### Students will:

- Using the microscope, identify the four basic types of tissues and how they integrate into human body systems
- For each of the major organ systems of a human (skin, cardio vascular, muscular, skeletal, nervous, digestive), using the rabbit as the basic model:
  - \*Learn the structure and function of each part and how it affects the homeostasis of the body
  - \*Apply the rabbit model for each system to humans
  - \*Understand the pathology of each system
- Investigate and apply current experiences involving the human immune system

## ENVIRONMENTAL SCIENCE

### Students will:

- Understand that Earth is a dynamic system interconnected by the flows of internal and external energy
- Describe the characteristics of electromagnetic radiation and give examples of its impact on life and Earth's systems
- Explain how the transfer of energy defines global atmospheric processes, such as storms, winds, and currents
- Understand how energy resources sustain human civilization
- Recognize, describe, and compare renewable and non renewable energy resources
- Describe the carbon cycle
- Describe the nitrogen cycle
- Explain the water cycle and how water flows into and through a watershed



## ENVIRONMENTAL SCIENCE (continued)

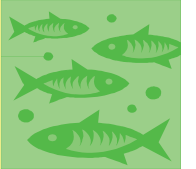
### Students will:

- Describe the rock cycle, physical and chemical weathering, erosion and the formation of soils and sediments and landscapes
- Describe the absolute and relative dating methods used to measure geologic time
- Understand that ecology is the interaction among organisms and their environments, including the roles of climate and human activity in changing populations and biodiversity

## OCEANOGRAPHY

### Students will:

- Investigate how humans study the oceans and the history of oceanography
- Relate the ocean and the atmosphere in the study of global winds and the formation of hurricanes
- Identify the properties of water and the chemistry of seawater and how it affects life in the oceans
- Study the basic structure of the Earth and identify the mechanics of plate tectonics
- Explore the structures on the ocean floor and how they formed
- Investigate oceanic circulation and how it affects the global climate
- Explore the formation and structure of waves
- Describe tides and what influences tidal activity
- Identify the different types of coasts and coastal features and describe their formation
- Describe how living organisms are adapted to life in and near the ocean
- Research and identify types of marine plankton, algae, plants, and animals



## PHYSICS

### Students will:

- Analyze mathematically the relationships among an object's position, velocity, acceleration and time
- Assess, measure, and calculate the relationship among the net force on a body, the mass of the body and the nature of the acceleration produced
- Distinguish qualitatively between static and kinetic friction, and describe their effects on the motion of objects.
- Analyze, evaluate, and apply the principles of conservation of energy
- Analyze and measure the transfer of mechanical energy through work
- Analyze interactions between objects and recognize that total momentum is conserved in collisions and recoil situations
- Analyze mathematically and explain the relationships among the measurable properties of waves: velocity, wavelength, frequency, period and amplitude
- Explain the difference between transverse and longitudinal waves; draw and label diagrams of each
- Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect)
- Analyze simple arrangements of electrical components in both serial and parallel circuits
- Recognize symbols and understand the functions of common circuit elements (battery, connecting wire, switch, fuse, and resistance) in a schematic diagram
- Describe conceptually and calculate the attractive or repulsive forces between objects relative to their charges and the distance between them (Coulomb's law)



## PHYSICS (continued)

### Students will:

- Recognize that moving electric charges produce magnetic forces and moving magnets produce electric forces
- Recognize that the interplay of electric and magnetic forces is the basis for electric motors, generators, and other technologies
- Describe the electromagnetic spectrum in terms of frequency and wavelength and identify the location of radio waves, microwaves, infrared radiation, visible light (red, orange, yellow, green, blue, indigo, and violet), ultraviolet rays, x-rays, and gamma rays on the spectrum
- Distinguish between scalar and vector quantities\*
- Calculate the component of a vector along a specific axis, or resolve a vector into components along a specific mutually perpendicular axes\*
- Analyze mathematically situations involving multiple forces acting in multiple directions on an object\*
- State the generalized work-energy theorem and use it to relate the work done by non conservative forces on a body to its change in kinetic and potential energy\*
- Analyze mathematically the flow of fluids and the relationship of pressure to velocity\*
- Understand the kinematics of simple harmonic motion and analyze mathematically its displacement, velocity and acceleration\*
- Develop a qualitative and quantitative understanding of current, voltage, resistance, and the connection between them (Ohm's law)\*



\*Denotes Honors Physics with Calculus

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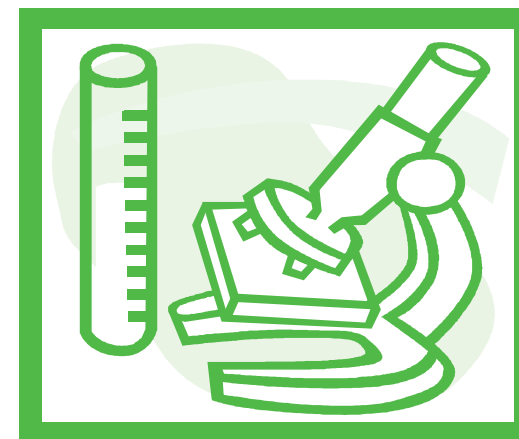
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## SCIENCE CURRICULUM GRADES 9-12



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