
*The Mission of the Chardon Local Schools is High Achievement
for All Students, Where Learning is Our Most Important Work.*

Science Course of Study:

AP BIOLOGY

Revised March 2022



AP Biology

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AP Biology

Learning Standards: Unit 1 - Chemistry of Life

~Explain how the properties of water that result from its polarity and hydrogen bonding affect its biological function.

~Describe the composition of macromolecules required by living organisms.

~Describe the properties of the monomers and the type of bonds that connect the monomers in biological macromolecules.

~Describe the properties of the monomers and the type of bonds that connect the monomers in biological macromolecules.

~Explain how a change in the subunits of a polymer may lead to changes in structure or function of the macromolecule.

~Describe the structural similarities and differences between DNA and RNA.

How Taught?

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- Students closely read select passages from documents to analyze text structure, development, and consequent meanings.
- Teacher provides direct instruction, give feedback, and model critical thinking
- Small group and class discussions.
- Pogil Activities
- Cooperative learning groups
- Students analyze video content related to standards that provide a broader global perspective of content.
- Design and conduct lab-based investigations that connect content to real-life experiences.
- Inquiry Labs
- Analysis of lab results, with focus on sources of error and how experimental designs may be improved.
- Small groups - White board problem solving and sharing
- Investigating alternative approaches to problem solving.
- Using technology and mathematics to improve investigations and communications.
- Utilize data to impact instruction

Materials:

- Textbook
- College Board AP Biology Investigative Labs
- AP Biology Classroom
- Lab equipment and lab materials
- Vernier probes and Labquests
- AP Bio Formula Sheet
- Online resources (Crash Course Chemistry, Bozeman Videos, lab simulations, images)
- Gradecam/Google Forms
- Calculators

How Assessed?

Assessments may include, but are not limited to:

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- Summative Assessments (free response questions, using rubrics, multiple choice questions)

How Re-Taught?

Re-teaching activities may include, but are not limited to:

- descriptive feedback on original task/assessment
- student examples of expectations

- modeling
- student self assessments
- manipulatives
- presenting the information again in a different way
- review sessions
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Learning Standards: Unit 2- Cell Structure and Function

~Explain how a change in the subunits of a polymer may lead to changes in structure or function of the macromolecule.

~Describe the structural similarities and differences between DNA and RNA.

~Describe the structure and/ or function of subcellular components and organelles.

~Explain how subcellular components and organelles contribute to the function of the cell.

~Describe the structural features of a cell that allow organisms to capture, store, and use energy.

~Explain the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment.

~Explain how specialized structures and strategies are used for the efficient exchange of molecules to the environment.

~Describe the roles of each of the components of the cell membrane in maintaining the internal environment of the cell.

~Describe the Fluid Mosaic Model of cell membranes.

~Explain how the structure of biological membranes influences selective permeability.

~Describe the role of the cell wall in maintaining cell structure and function.

~Describe the mechanisms that organisms use to maintain

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solute and water balance.

~Describe the mechanisms that organisms use to transport large molecules across the plasma membrane.

~Explain how the structure of a molecule affects its ability to pass through the plasma membrane.

~Explain how concentration gradients affect the movement of molecules across membranes.

~Explain how osmoregulatory mechanisms contribute to the health and survival of organisms.

~Describe the processes that allow ions and other molecules to move across membranes.

~Describe the membrane bound structures of the eukaryotic cell.

~Explain how internal membranes and membrane bound organelles contribute to compartmentalization of eukaryotic cell functions.

~Describe similarities and/or differences in compartmentalization between prokaryotic and eukaryotic cells.

~Describe the relationship between the functions of endosymbiotic organelles and their free-living ancestral counterparts.

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<p>Learning Standards: Unit 3- Cellular Energetics</p> <p>~Describe the properties of enzymes.</p> <p>~Explain how enzymes affect the rate of biological reactions.</p> <p>~Explain how changes to the structure of an enzyme may affect its function.</p> <p>~Explain how the cellular environment affects enzyme activity</p> <p>~Describe the role of energy in living organisms.</p> <p>~Describe the photosynthetic processes that allow organisms to capture and store energy.</p> <p>~Explain how cells capture energy from light and transfer it to biological molecules for storage and use.</p> <p>~Describe the processes that allow organisms to use energy stored in biological macromolecules.</p> <p>~Explain how cells obtain energy from biological macromolecules in order to power cellular functions.</p> <p>~Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.</p>	<p>How Taught?</p> <p>Teaching activities may include, but are not limited to:</p> <ul style="list-style-type: none"> ● Students closely read select passages from documents to analyze text structure, development, and consequent meanings. ● Teacher provides direct instruction, give feedback, and model critical thinking ● Small group and class discussions. ● Pogil Activities ● Cooperative learning groups ● Students analyze video content related to standards that provide a broader global perspective of content. ● Design and conduct lab-based investigations that connect content to real-life experiences. ● Inquiry Labs ● Analysis of lab results, with focus on sources of error and how experimental designs may be improved. ● Small groups - White board problem solving and sharing ● Investigating alternative approaches to problem solving. ● Using technology and mathematics to improve investigations and communications. ● Utilize data to impact instruction
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Learning Standards: Unit 4- Cell Communication and Cell Cycle

~Describe the ways that cells can communicate with one another.

~Explain how cells communicate with one another over short and long distances.

~Describe the components of a signal transduction pathway

~Describe the role of components of a signal transduction pathway in producing a cellular response.

~Describe the role of the environment in eliciting a cellular

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<p>response</p> <p>~Describe the different types of cellular responses elicited by a signal transduction pathway.</p> <p>~Explain how a change in the structure of any signaling molecule affects the activity of the signaling pathway.</p> <p>~Describe positive and/ or negative feedback mechanisms.</p> <p>~Explain how negative feedback helps to maintain homeostasis.</p> <p>~Explain how positive feedback affects homeostasis.</p> <p>~Describe the events that occur in the cell cycle.</p> <p>~Explain how mitosis results in the transmission of chromosomes from one generation to the next.</p> <p>~Describe the role of checkpoints in regulating the cell cycle.</p> <p>~Describe the effects of disruptions to the cell cycle on the cell or organism.</p>	<ul style="list-style-type: none"> ● Design and conduct lab-based investigations that connect content to real-life experiences. ● Inquiry Labs ● Analysis of lab results, with focus on sources of error and how experimental designs may be improved. ● Small groups - White board problem solving and sharing ● Investigating alternative approaches to problem solving. ● Using technology and mathematics to improve investigations and communications. ● Utilize data to impact instruction
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Learning Standards: Unit 5- Heredity

~Explain how meiosis results in the transmission of chromosomes from one generation to the next.

~Describe similarities and/ or differences between the phases and outcomes of mitosis and meiosis.

~Explain how the process of meiosis generates genetic diversity.

~Explain how shared, conserved, fundamental processes and features support the concept of common ancestry for all organisms.

~Explain the inheritance of genes and traits as described by Mendel's laws.

~Explain deviations from Mendel's model of the inheritance of traits.

~Explain how the same genotype can result in multiple phenotypes under different environmental conditions

~Explain how chromosomal inheritance generates genetic variation in sexual reproduction.

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Learning Standards: Unit 6- Gene Expression and Regulation

~Describe the structures involved in passing hereditary information from one generation to the next.

~Describe the characteristics of DNA that allow it to be used as the hereditary material.

~Describe the mechanisms by which genetic information is copied for transmission between generations.

~Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

~Explain how the phenotype of an organism is determined by its genotype.

~Describe the types of interactions that regulate gene expression.

~Explain how the location of regulatory sequences relates to their function

~Explain how the binding of transcription factors to promoter

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regions affects gene expression and/or the phenotype of the organism.

~Explain the connection between the regulation of gene expression and phenotypic differences in cells and organisms.

~Describe the various types of mutation.

~Explain how changes in genotype may result in changes in phenotype.

~Explain how alterations in DNA sequences contribute to variation that can be subject to natural selection.

~Explain the use of genetic engineering techniques in analyzing or manipulating DNA.

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Learning Standards: Unit 7- Natural Selection

~Describe the causes of natural selection.
~Explain how natural selection affects populations.
~Describe the importance of phenotypic variation in a population.
~Explain how humans can affect diversity within a population.
~Explain the relationship between changes in the environment and evolutionary changes in the population.
~Explain how random occurrences affect the genetic makeup of a population.
~Describe the role of random processes in the evolution of specific populations.
~Describe the change in the genetic makeup of a population over time
~Describe the conditions under which allele and genotype frequencies will change in populations.
~Explain the impacts on the population if any of the conditions of HardyWeinberg are not met.
~Describe the types of data that provide evidence for evolution.
~Explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time.
~Describe the fundamental molecular and cellular features shared across all domains of life, which provide evidence of common ancestry.
~Describe structural and functional evidence on cellular and molecular levels that provides evidence for the common ancestry of all eukaryotes.
~Explain how evolution is an ongoing process in all living organisms.
~Describe the types of evidence that can be used to infer an evolutionary relationship.
~Explain how a phylogenetic tree and/or cladogram can be used to infer evolutionary relatedness.
~Describe the conditions under which new species may arise.
~Describe the rate of evolution and speciation under different ecological conditions.
~Explain the processes and mechanisms that drive speciation.
~Describe factors that lead to the extinction of a population.
~Explain how the risk of extinction is affected by changes in the environment.
~Explain species diversity in an ecosystem as a function of speciation and extinction rates.
~Explain how extinction can make new environments available for adaptive radiation.
~Explain how the genetic diversity of a species or population affects its ability to withstand environmental pressures.
~Describe the scientific evidence that provides support for models of the origin of life on Earth.

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Learning Standards: Unit 8- Ecology

~Explain how the behavioral and/or physiological response of an organism is related to changes in internal or external environment.
 ~Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of the population.
 ~Describe the strategies organisms use to acquire and use energy
 ~Explain how changes in energy availability affect populations and ecosystems.
 ~Explain how the activities of autotrophs and heterotrophs enable the flow of energy within an ecosystem.

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~Describe factors that influence growth dynamics of populations.

~Explain how the density of a population affects and is determined by resource availability in the environment.

~Describe the structure of a community according to its species composition and diversity

~Explain how interactions within and among populations influence community structure.

~Explain how community structure is related to energy availability in the environment.

~Describe the relationship between ecosystem diversity and its resilience to changes in the environment.

~Explain how the addition or removal of any component of an ecosystem will affect its overall short-term and long term structure.

~Explain the interaction between the environment and random or preexisting variations in populations.

~Explain how invasive species affect ecosystem dynamics.

~Describe human activities that lead to changes in ecosystem structure and/ or dynamics.

~Explain how geological and meteorological activity leads to changes in ecosystem structure and/or dynamics.

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