

## AP Biology Pacing Guide 22-23

| Unit/ Days to teach unit   | Standard/ Big Idea  | Learning Targets   |
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| <p><b>Unit 1<br/>Chemistry<br/>of life</b></p> <p>5-7 days</p> <p>8-11%</p>                          | <p><b>Big Idea 2 Energetics</b><br/>→ What is the role of energy in the making and breaking of polymers?</p> <p><b>Big Idea 3 Information Storage and Transmission</b><br/>→ How do living systems provide information in order to ensure their survival?</p> <p><b>Big Idea 4 Systems Interactions</b><br/>→ How do living systems function without the polarity of water molecules?</p>                                     | <p><b>LT1U1CoL:</b> I can explain how the properties of water that result from its polarity and hydrogen bonding affect its biological function. (B14)</p> <p><b>LT2U1CoL:</b> I can describe the composition and properties of macromolecules required by living organisms.<br/>-Describe the properties of the monomers and the type of bonds that connect the monomers in biological Macromolecules.</p> <p><b>LT3U1CoL:</b> I can explain how a change in the subunits of a polymer may lead to changes in structure or function of the macromolecule.</p> <p><b>LT4U1CoL:</b> I can compare and contrast the structural similarities and differences between DNA and RNA.</p>   |
| <p><b>Unit 2 Cell<br/>Structure<br/>and<br/>Function</b></p> <p>11-13 days</p> <p>10-13% of test</p> | <p><b>Big Idea 1 Evolution</b><br/>→ Defend the Origin of eukaryotic cells.</p> <p><b>Big Idea 2 Energetics</b><br/>→ How do mechanisms of transport across membranes support energy conservation?<br/>→ What are advantages and disadvantages of cellular compartmentalization?</p> <p><b>Big Idea 4 Systems Interactions</b><br/>→ How are living systems affected by the presence or absence of subcellular components</p> | <p><b>LT1U2CSF:</b> I can summarize the structure and/or function of subcellular components and organelles.<br/>-Explain how subcellular components and organelles contribute to the function of the cell.</p> <p><b>LT2U2CSF:</b> I can identify and describe the structural features of a cell that allow organisms to capture, store, and use energy.</p> <p><b>LT3U2CSF:</b> I can explain the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment.<br/>-Explain how specialized structures and strategies are used for the efficient exchange of molecules to the environment.</p> <p><b>LT4U2CSF:</b> I can describe the roles of each of the components of the cell membrane in maintaining the internal environment of the cell.<br/>-Describe the Fluid Mosaic Model of cell membranes.<br/>-Explain how the structure of biological membranes influences selective permeability.<br/>-Describe the role of the cell wall in maintaining cell structure and function.</p> |

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|  |   | <p><b>LT5U2CSF:</b> I can summarize the mechanisms that organisms use to maintain solute and water balance.</p> <ul style="list-style-type: none"> <li>-Describe the mechanisms that organisms use to transport large molecules across the plasma membrane.</li> <li>-Explain how the structure of a molecule affects its ability to pass through the plasma membrane.</li> <li>-Explain how concentration gradients affect the movement of molecules across membranes.</li> <li>-Explain how osmoregulatory mechanisms contribute to the health and survival of organisms.</li> <li>-Describe the processes that allow ions and other molecules to move across membranes.</li> </ul> <p><b>LT6U2CSF:</b> I can describe the membrane- bound structures of the eukaryotic cell.</p> <p><b>LT7U2CSF:</b> I can explain how internal membranes and membrane- bound organelles contribute to compartmentalization of eukaryotic cell functions.</p> <ul style="list-style-type: none"> <li>-Describe similarities and/or differences in compartmentalization between prokaryotic and eukaryotic cells.</li> <li>-Describe the relationship between the functions of endosymbiotic organelles and their free-living ancestral counterparts.</li> </ul> |
| <p><b>Unit 3<br/>Cellular<br/>Energetics</b></p> <p><b>14-17 days</b></p> <p><b>12-16% of the<br/>test</b></p> | <p><b>Big Idea 2 Energetics</b></p> <ul style="list-style-type: none"> <li>→ How is energy captured and then used by a living system?</li> </ul> <p><b>Big Idea 4 System Interactions</b></p> <ul style="list-style-type: none"> <li>→ How do organisms use energy or conserve energy to respond to environmental stimuli?</li> </ul> | <p><b>LT1U3CE:</b> I can describe the role of energy in living organisms.</p> <p><b>LT2U3CE:</b> I can describe the properties of enzymes and explain how enzymes affect the rate of biological reactions.</p> <p><b>LT3U3CE:</b> I can explain how changes to the structure of an enzyme may affect its function.</p> <p><b>LT4U3CE:</b> I can explain how the cellular environment affects enzyme activity.</p> <p><b>LT5U3CE:</b> I can describe the photosynthetic processes that allow organisms to capture and store energy.</p> <p><b>LT6U3CE:</b> I can explain how cells capture energy from light and transfer it to</p>   |

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|   |   | <p>biological molecules for storage and use.</p> <p><b>LT7U3CE:</b> I can describe the processes that allow organisms to use energy stored in biological macromolecules.</p> <p><b>LT8U3CE:</b> I can explain how cells obtain energy from biological macromolecules in order to power cellular functions.</p> <p><b>LT9U3CE:</b> I can 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><b>Unit 4 Cell Communication and Cell Cycle</b></p> <p>9-11 days</p> <p>10-15% of test</p> | <p><b>Big Idea 2 Energetics</b></p> <p>→ In what ways do cells use energy to communicate with one another?</p> <p><b>Big Idea 3 Information Storage and Transmission</b></p> <p>→ How does the cell cycle aid in the conservation of genetic information?</p> <p>→ Why and in what ways do cells communicate with each other?</p> | <p><b>LT1U4CC:</b> I can describe the ways that cells can communicate with one another.</p> <p><b>LT2U4CC:</b> I can explain how cells communicate with one another over short and long distances.</p> <p><b>LT3U4CC:</b> I can describe the components of a signal transduction pathway.<br/>-Describe the role of components of a signal transduction pathway in producing a cellular response.</p> <p><b>LT4U4CC:</b> Describe the role of the environment in eliciting a cellular response.</p> <p><b>LT5U4CC:</b> Describe the different types of cellular responses elicited by a signal transduction pathway.</p> <p><b>LT6U4CC:</b> I can explain how a change in the structure of any signaling molecule affects the activity of the signaling pathway.</p> <p><b>LT7U4CC:</b> I can describe positive and/or negative feedback mechanisms.<br/>-Explain how negative feedback helps to maintain homeostasis.<br/>-Explain how positive feedback affects homeostasis.</p> <p><b>LT8U4CC:</b> I can describe the events that occur in the cell cycle.</p> |

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|   |  | <p><b>LT9U4CC:</b> I can explain how mitosis results in the transmission of chromosomes from one generation to the next.</p> <p><b>LT10U4CC:</b> I can describe the role of checkpoints in regulating the cell cycle.</p> <p><b>LT11U4CC:</b> I can describe the effects of disruptions to the cell cycle on the cell or organism.</p>   |
| <p><b>Unit 5 Heredity</b></p> <p>9-11 days</p> <p>8-11% of test</p>                         | <p><b>Big Idea 1 Evolution</b></p> <ul style="list-style-type: none"> <li>→ How is our understanding of evolution influenced by our knowledge of genetics?</li> </ul> <p><b>Big Idea 3 Information Storage and Transmission</b></p> <ul style="list-style-type: none"> <li>→ Why is it important that not all inherited characteristics get expressed in the next generation?</li> <li>→ How would Mendel's laws have been affected if he had studied a different type of plant?</li> </ul> <p><b>Big Idea 4 System Interactions</b></p> <ul style="list-style-type: none"> <li>→ How does the diversity of a species affect inheritance?</li> </ul> | <p><b>LT1U5H:</b> I can explain how meiosis results in the transmission of chromosomes from one generation to the next.</p> <p><b>LT2U5H:</b> I can describe similarities and/or differences between the phases and outcomes of mitosis and meiosis.</p> <p><b>LT3U5H:</b> I can explain how the process of meiosis generates genetic diversity.</p> <p><b>LT4U5H:</b> I can explain how shared, conserved, fundamental processes and features support the concept of common ancestry for all organisms.</p> <p><b>LT5U5H:</b> I can explain the inheritance of genes and traits as described by Mendel's laws.</p> <p><b>LT6U5H:</b> I can explain deviations from Mendel's model of the inheritance of traits.</p> <p><b>LT7U5H:</b> I can explain how the same genotype can result in multiple phenotypes under different environmental conditions.</p> <p><b>LT8U5H:</b> I can explain how chromosomal inheritance generates genetic variation in sexual reproduction.</p> |
| <p><b>Unit 6 Gene Expression and Regulation</b></p> <p>18-21 days</p> <p>12-16% of test</p> | <p><b>Big Idea 3 Information Storage and Transmission</b></p> <ul style="list-style-type: none"> <li>→ How does gene regulation relate to the continuity of life?</li> <li>→ How is a species' genetic information diversified from generation to generation?</li> </ul>   | <p><b>LT1:</b> I can describe the structures involved in passing hereditary information from one generation to the next.</p> <p><b>LT2:</b> I can describe the characteristics of DNA that allow it to be used as the hereditary material.</p> <p><b>LT3:</b> I can describe the mechanisms by which genetic information</p>   |

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|  |  | <p>is copied for transmission between generations.</p> <p>LT4: I can describe the mechanisms by which genetic information flows from DNA to RNA to protein.</p> <p>LT 5: I can explain how the phenotype of an organism is determined by its genotype.</p> <p>LT6: I can describe the types of interactions that regulate gene expression.</p> <p>LT7: I can explain how the binding of transcription factors to promoter regions affects gene expression and/or the phenotype of the organism.</p> <p>LT8: I can explain the connection between the regulation of gene expression and phenotypic differences in cells and organisms.</p> <p>LT9 : I can describe the various types of Mutation and explain how they may change the phenotype.</p> <p>LT10: I can explain how alterations in DNA sequences contribute to variation that can be subject to natural selection.</p> <p>LT 11: Explain the use of genetic engineering techniques in analyzing or manipulating DNA.</p> |
| <p><b>Unit 7</b><br/> <b>Natural Selection</b><br/> 20-23 days<br/> 13-20% of test</p> | <p><b>BIG IDEA 1 Evolution</b></p> <ul style="list-style-type: none"> <li>→ What conditions in a population make it more or less likely to evolve?</li> <li>→ Scientifically defend the theory of evolution.</li> </ul> <p><b>BIG IDEA 4 Systems Interactions</b></p> <ul style="list-style-type: none"> <li>→ How does species interaction encourage or slow changes in species?</li> </ul> | <p><b>LT1U7NS:</b> I can describe the causes of natural selection and explain how natural selection affects populations.</p> <p><b>LT2U7NS:</b>I can describe the importance of phenotypic variation in a population.</p> <p><b>LT3U7NS:</b> I can explain the relationship between changes in the environment and evolutionary changes in the population.</p> <p><b>LT4U7NS::</b> I can explain the role of random processes in evolution and how random occurrences affect the genetic makeup of a population.</p>   |

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|  |   | <p><b>LT5U7NS:</b> I can describe the conditions under which allele and genotype frequencies will change in populations.</p> <p><b>LT6U7NS:</b> I can explain the impacts on the population if any of the conditions of Hardy- Weinberg are not met.</p> <p><b>LT7U7NS:</b> I can explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time.</p> <p><b>LT8U7NS:</b> I can describe structural and functional evidence on cellular and molecular levels that provides evidence for the common ancestry of all eukaryotes.</p> <p><b>LT9U7NS:</b> I can explain how a phylogenetic tree and/or cladogram can be used to infer evolutionary relatedness.</p> <p><b>LT10U7NS:</b> I can explain the processes and mechanisms that drive speciation.</p> <p><b>LT11U7NS:</b> I can describe the rate of evolution and speciation under different ecological conditions and the mechanisms that affect this rate.</p> <p><b>LT12U7NS:</b> I can explain the implications of extinction on an ecosystem.</p> <p><b>LT13U7NS:</b> I can explain how the genetic diversity of a species or population affects its ability to withstand environmental pressures.</p> |
| <p><b>Unit 8 Ecology</b></p> <p>18-21 days</p> <p>10-15% of the test</p> | <p><b>BIG IDEA 1 Evolution</b></p> <p>→ How does diversity among and between species in a biological system affect the evolution of species within the system?</p> <p><b>BIG IDEA 2 Energetics</b></p> <p>→ How does the acquisition of energy relate to the health of a biological system?</p> <p>→ How do communities and ecosystems change, for better or worse, due to biological disruption?</p> <p><b>BIG IDEA 3 Information Storage And Transmission</b></p> | <p><b>LT1U8Eco:</b> Explain how the behavioral and/or physiological response of an organism is related to changes in internal or external environment.</p> <p><b>LT2U8Eco:</b> Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of the population.</p> <p><b>LT3U8Eco:</b> I can Describe the strategies organisms use to acquire and use energy.</p> <p><b>LT4U8Eco:</b> I can explain how changes in energy availability affect populations and ecosystems.</p>   |

→ How does a disruption of a biological system affect genetic information storage and transmission?

**BIG IDEA 4 Systems Interactions**

→ How do species interactions affect the survival of an ecosystem?

**LT5U8Eco:** I can explain how the activities of autotrophs and heterotrophs enable the flow of energy within an ecosystem.

**LT6U8Eco:** I can describe factors that influence growth dynamics of populations.

**LT7U8Eco:** I can explain how the density of a population affects and is determined by resource availability in the environment.

**LT8U8Eco:** I can describe the structure of a community according to its species composition and diversity.

**LT9U8Eco:** I can explain how interactions within and among populations influence community structure.

**LT10U8Eco:** I can explain how community structure is related to energy availability in the environment.

**LT11U8Eco:** I can describe the relationship between ecosystem diversity and its resilience to changes in the environment.

**LT12U8Eco:** I can explain how the addition or removal of any component of an ecosystem will affect its overall short-term and long-term structure.

**LT13U8Eco:** I can explain the interaction between the environment and random or preexisting variations in populations.

**LT14U8Eco:** I can explain how invasive species affect ecosystem dynamics.

**LT15U8Eco:** I can describe human activities that lead to changes in ecosystem structure and/or dynamics.

**LT16U8Eco:** I can explain how geological and meteorological activity leads to changes in ecosystem structure and/or dynamics.