Biology Pacing Guide Spring 2023

| **Unit Name** | **New** [**GSE Standard**](https://www.georgiastandards.org/Georgia-Standards/Documents/Science-Biology-Georgia-Standards.pdf)**s** | **Learning Targets**  **Common Formative** | **Days to teach unit** |
| --- | --- | --- | --- |
| Unit 1 Intro to Biology | All standards  **SB1c.** Construct arguments supported by evidence to relate the structure of macromolecules (carbohydrates, proteins, lipids, and nucleic acids) to their interactions in carrying out cellular processes. (Clarification statement: The function of proteins as enzymes is limited to a conceptual understanding.) | LT0.1 - I can describe the seven characteristics of living organisms.  LT0.2 - I can differentiate between biotic and abiotic organisms.  LT0.3: I can explain how the structures of macromolecules contribute to their function of cellular processes. | 5 days  Aug. 2-8 |
| Unit 2 Ecology | **SB4.** a. Construct an argument supported by scientific information to explain patterns in structures and function among clades of organisms, including the origin of eukaryotes by endosymbiosis. Clades should include: archaea bacteria eukaryotes fungi plants animals **SB5a.** Plan and carry out investigations and analyze data to support explanations about factors affecting biodiversity and populations in ecosystems. (Clarification statement: Factors include population size, carrying capacity, response to limiting factors, and keystone species.)  **b.** Develop and use models to analyze the cycling of matter and flow of energy within ecosystems through the processes of photosynthesis and respiration. Arranging components of a food web according to energy flow. Comparing the quantity of energy in the steps of an energy pyramid. Explaining the need for cycling of major biochemical elements (C, O, N, P, and H).  **c**. Construct an argument to predict the impact of environmental change on the stability of an ecosystem.  **d**. Design a solution to reduce the impact of a human activity on the environment. (Clarification statement: Human activities may include chemical use, natural resources consumption, introduction of non-native species, greenhouse gas production.)  **e**. Construct explanations that predict an organism’s ability to survive within changing environmental limits (e.g., temperature, pH, drought, fire). | LT1: I can explain patterns in structure and function between archaea, eubacteria, and eukaryotic domains and use those patterns to explain how viruses are different from other cells.  LT2: I can analyze data to explain how natural factors & human impact can affect biodiversity.  LT3: I can analyze data to predict/explain the stability of an ecosystem within changing environmental limits.  LT4: I can use models to analyze the flow of energy and nutrients in an ecosystem. | 16 days  Aug. 9th - Aug. 31st |
|  |  |  |  |
| Unit 3 Cells  (organelles, transport, energetics, mitosis) | **SB1a.** Construct an explanation of how cell structures and organelles (including nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, lysosome, Golgi, endoplasmic reticulum, vacuoles, ribosomes, and mitochondria) interact as a system to maintain homeostasis.  \*\*\*Top 4: Nucleus, ribosomes, chloroplasts, mitochondria to quiz on\*\*\*  b. Develop and use models to explain the role of cellular reproduction (including binary fission, mitosis, and meiosis) in maintaining genetic continuity. \*\*\*focus on mitosis\*\*\*  **d.** Plan and carry out investigations to determine the role of cellular transport (e.g., active, passive, and osmosis) in maintaining homeostasis.  **e.** Ask questions to investigate and provide explanations about the roles of photosynthesis and respiration in the cycling of matter and flow of energy within the cell (e.g., single-celled alga). (Clarification statement: Instruction should focus on understanding the inputs, outputs, and functions of photosynthesis and respiration and the functions of the major sub-processes of each including glycolysis, Krebs cycle, electron transport chain, light reactions, and Calvin cycle.) | LT1: I can explain how the structures & functions of organelles work together to maintain homeostasis.  LT2: I can analyze models to determine how cellular transport maintains homeostasis.  LT3: I can explain the inputs and outputs of photosynthesis and cellular respiration and how they are related.  LT4:I can use a model to explain how mitosis promotes asexual reproduction. | 12 days  Sept. 1st - Sept. 22nd |
| Unit 4 DNA & Protein Synthesis | **SB2 a.** Construct an explanation of how the structures of DNA and RNA lead to the expression of information within the cell via the processes of replication, transcription, and translation.  **b.** Construct an argument based on evidence to support the claim that inheritable genetic variations may result from: new genetic combinations through meiosis (crossing over, nondisjunction); non-lethal errors occurring during replication (insertions, deletions, substitutions); and/or heritable mutations caused by environmental factors (radiation, chemicals, and viruses).  **c**. Ask questions to gather and communicate information about the use and ethical considerations of biotechnology in forensics, medicine, and agriculture. (Clarification statement: The element is intended to include advancements in technology relating to economics and society such as advancements may include Genetically Modified Organisms.) | LT1: I can explain the structures and functions of DNA and RNA.  LT2: I can use evidence to explain how genetic variation may result from mutations.  LT3: I can gather and communicate information about the ethical considerations about biotechnology. (project?) | 11 days  Sept. 25th - Oct. 4th |
| Midterm & Review |  |  | Oct. 5th-6th |
| Unit 5 Genetics & Meiosis | **SB1 b**. Develop and use models to explain the role of cellular reproduction (including binary fission, mitosis, and meiosis) in maintaining genetic continuity. \*\*\*focus on meiosis\*\*\*  **SB2 b.** Construct an argument based on evidence to support the claim that inheritable genetic variations may result from: new genetic combinations through meiosis (crossing over, nondisjunction); non-lethal errors occurring during replication (insertions, deletions, substitutions); and/or heritable mutations caused by environmental factors (radiation, chemicals, and viruses). \*\*\*Chromosome Mutations\*\*\*  **SB3a**. Use Mendel’s laws (segregation and independent assortment) to ask questions and define problems that explain the role of meiosis in reproductive variability.  **b.** Use mathematical models to predict and explain patterns of inheritance. (Clarification statement: Students should be able to use Punnett squares (monohybrid and dihybrid crosses) and/or rules of probability, to analyze the following inheritance patterns: dominance, codominance, incomplete dominance.)  **c.** Construct an argument to support a claim about the relative advantages and disadvantages of sexual and asexual reproduction. | LT1: I can use models to explain how meiosis promotes genetic variation. (segregation & law of independent assortment)  LT2: I can explain how gene mutations contribute to genetic variation.  LT3: I can use models to predict patterns of inheritance. (monohybrids and dihybrids/dominance, codominance, and incomplete dominance)  LT4: I can argue the advantages and disadvantages of asexual/sexual reproduction and how it affects a population in an ecosystem. (This will tie genetics back to ecology and populations.) | 10 days  Oct. 9th - Oct. 25th |
| Unit 6 Classification & Evolution | **SB4 b.** Analyze and interpret data to develop models (i.e.cladograms and phylogenetic trees) based on patterns of common ancestry and the theory of evolution to determine relationships among major groups of organisms.  **c.** Construct an argument supported by empirical evidence to compare and contrast the characteristics of viruses and organisms.  **SB6 a**. Construct an explanation of how new understandings of Earth’s history, the emergence of new species from pre-existing species, and our understanding of genetics have influenced our understanding of biology.  **b.** Analyze and interpret data to explain patterns in biodiversity that result from speciation.  **c.** Construct an argument using valid and reliable sources to support the claim that evidence from comparative morphology (analogous vs. homologous structures), embryology, biochemistry (protein sequence) and genetics support the theory that all living organisms are related by way of common descent.  **d.** Develop and use mathematical models to support explanations of how undirected genetic changes in natural selection and genetic drift have led to changes in populations of organisms. (Clarification statement: Element is intended to focus on basic statistical and graphic analysis. Hardy Weinberg would be an optional application to address this element.)  **e.** Develop a model to explain the role natural selection plays in causing biological resistance (e.g., pesticides, antibiotic resistance, and influenza vaccines). | LT4: I can analyze and interpret models to determine patterns of biodiversity that results from speciation. (cladograms, phylogenetic trees, fossil records, and genetics)  LT2: I can argue how organisms are related through common ancestry. (morphology, embryology, biochemistry, genetics)  LT3: I can use models to explain how undirected changes in natural selection and genetic drift have led to changes within a population. (GaDOE states focus on basic statistical analysis and graphic analysis)  LT1: I can analyze models to explain how natural selection can cause biological resistance. | 12 days  Oct. 26th - Nov. 10th |
| REVIEW | All Standards | 2 weeks - 5 days can be used throughout the semester as review days post tests if needed | Nov. 13th - Dec. 1st |
| EOC Testing | All Standards |  | Dec. 4th - 5th |