Georgia Science

Biology

Adopted 2016

Obtain, evaluate, and communicate information to analyze the nature of the relationships between structures and functions in living cells. SB1	**a.** 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. SB1.A
	b. Develop and use models to explain the role of cellular reproduction (including binary fission, mitosis, and meiosis) in maintaining genetic continuity. SB1.B
	c. 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. SB1.C
	d. Plan and carry out investigations to determine the role of cellular transport (e.g., active, passive, and osmosis) in maintaining homeostasis. SB1.D
	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). SB1.E
Obtain, evaluate, and communicate information to analyze how genetic information is expressed in cells. 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. SB2.A
	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). SB2.B
	c. Ask questions to gather and communicate information about the use and ethical considerations of biotechnology in forensics, medicine, and agriculture. SB2.C
Obtain, evaluate, and communicate information to analyze ho pa ge	**a.** Use Mendel's laws (segregation and independent assortment) to ask questions and define problems that explain the role of meiosis in reproductive variability. SB3.A
	Use mathematical models to predict and explain patterns of inheritance. SB3.B

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	c. Construct an argument to support a claim about the relative advantages and disadvantages of sexual and asexual reproduction. SB3.C
Obtain, evaluate, and communicate information to illustrate the organization of interacting systems within single-celled and multi-celled organisms. 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 SB4.A
	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. SB4.B
	c. Construct an argument supported by empirical evidence to compare and contrast the characteristics of viruses and organisms. SB4.C
Obtain, evaluate, and communicate information to assess the interdependence of all organisms on one another and their environment. SB5	**a.** Plan and carry out investigations and analyze data to support explanations about factors affecting biodiversity and populations in ecosystems. SB5.A
	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). SB5.B
	c. Construct an argument to predict the impact of environmental change on the stability of an ecosystem. SB5.C
	d. Design a solution to reduce the impact of a human activity on the environment. SB5.D
	e. Construct explanations that predict an organism's ability to survive within changing environmental limits (e.g., temperature, pH, drought, fire). SB5.E
Obtain, evaluate, and communicate information to assess the theory of evolution. 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. SB6.A
	b. Analyze and interpret data to explain patterns in biodiversity that result from speciation. SB6.B
	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. SB6.C

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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.** SB6.D

e. **Develop a model to explain the role natural selection plays in causing biological resistance (e.g., pesticides, antibiotic resistance, and influenza vaccines).** SB6.E