Texas Science

Biology

Adopted 2021

The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to: BIO.1

- **A.** ask questions and define problems based on observations or information from text, phenomena, models, or investigations; BIO.1.A
- **B.** apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems; BIO.1.B
- **C.** use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards; BIO.1.C
- **D.** use appropriate tools such as microscopes, slides, Petri dishes, laboratory glassware, metric rulers, digital balances, pipets, filter paper, micropipettes, gel electrophoresis and polymerase chain reaction (PCR) apparatuses, microcentrifuges, water baths, incubators, thermometers, hot plates, data collection probes, test tube holders, lab notebooks or journals, hand lenses, and models, diagrams, or samples of biological specimens or structures; BIO.1.D
- **E.** collect quantitative data using the International System of Units (SI) and qualitative data as evidence; BIO.1.E
- **F.** organize quantitative and qualitative data using scatter plots, line graphs, bar graphs, charts, data tables, digital tools, diagrams, scientific drawings, and student-prepared models; BIO.1.F
- **G.** develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and BIO.1.G
- **H.** distinguish among scientific hypotheses, theories, and laws. BIO.1.H

The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evi ar

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- **A.** identify advantages and limitations of models such as their size, scale, properties, and materials; BIO.2.A
- **B.** analyze data by identifying significant statistical features, patterns, sources of error, and limitations; BIO.2.B
- **C.** use mathematical calculations to assess quantitative relationships in data; and BIO.2.C

designs. The student is expected to: BIO.2	D. evaluate experimental and engineering designs. BIO.2.D
The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to: BIO.3	A. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories; BIO.3.A
	B. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and BIO.3.B
	C. engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence. BIO.3.C
The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to: BIO.4	A. analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student; BIO.4.A
	B. relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and BIO.4.B
	C. research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers. BIO.4.C
The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. The student is expected to: BIO.5	A. relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell; BIO.5.A
	B. compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity; BIO.5.B
	C. investigate homeostasis through the cellular transport of molecules; and BIO.5.C
	D. compare the structures of viruses to cells and explain how viruses spread and cause disease. BIO.5.D
The student knows how an organism grows and the importance of cell differentiation. The student is expected to: BIO.6	A. explain the importance of the cell cycle to the growth of organisms, including an overview of the stages of the cell cycle and deoxyribonucleic acid (DNA) replication models; BIO.6.A
	B. explain the process of cell specialization through cell differentiation, including the role of environmental factors; and BIO.6.B
	C. relate disruptions of the cell cycle to how they lead to the development of diseases such as cancer. BIO.6.C

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The student knows the role of nucleic acids in gene expression. The student is expected to: BIO.7	**A.** identify components of DNA, explain how the nucleotide sequence specifies some traits of an organism, and examine scientific explanations for the origin of DNA; BIO.7.A
	B. describe the significance of gene expression and explain the process of protein synthesis using models of DNA and ribonucleic acid (RNA); BIO.7.B
	C. identify and illustrate changes in DNA and evaluate the significance of these changes; and BIO.7.C
	D. discuss the importance of molecular technologies such as polymerase chain reaction (PCR), gel electrophoresis, and genetic engineering that are applicable in current research and engineering practices. BIO.7.D
The student knows the role of nucleic acids and the principles of inheritance and variation of traits in Mendelian and non-Mendelian genetics. The student is expected to: BIO.8	**A.** analyze the significance of chromosome reduction, independent assortment, and crossing-over during meiosis in increasing diversity in populations of organisms that reproduce sexually; and BIO.8.A
	B. predict possible outcomes of various genetic combinations using monohybrid and dihybrid crosses, including non-Mendelian traits of incomplete dominance, codominance, sex-linked traits, and multiple alleles. BIO.8.B
The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple lines of evidence. The student is expected to: BIO.9	**A.** analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental; and BIO.9.A
	B. examine scientific explanations for varying rates of change such as gradualism, abrupt appearance, and stasis in the fossil record. BIO.9.B
The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. The student is expected to: BIO.10	**A.** analyze and evaluate how natural selection produces change in populations and not in individuals; BIO.10.A
	B. analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success; BIO.10.B
	C. analyze and evaluate how natural selection may lead to speciation; and BIO.10.C
	D. analyze evolutionary mechanisms other than natural selection, including genetic drift, gene flow, mutation, and genetic recombination, and their effect on the gene pool of a population. BIO.10.D
Th sig... Skip to main content	**explain how matter is conserved and energy is transferred during photosynthesis and cellular respiration using models, including the chemical equations for these**

cycling, energy flow, and enzymes in living organisms. The student is expected to: BIO.11	processes; and BIO.11.A
	B. investigate and explain the role of enzymes in facilitating cellular processes. BIO.11.B
The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. The student is expected to: BIO.12	**A.** analyze the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals; and BIO.12.A
	B. explain how the interactions that occur among systems that perform functions of transport, reproduction, and response in plants are facilitated by their structures. BIO.12.B
The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. The student is expected to: BIO.13	**A.** investigate and evaluate how ecological relationships, including predation, parasitism, commensalism, mutualism, and competition, influence ecosystem stability; BIO.13.A
	B. analyze how ecosystem stability is affected by disruptions to the cycling of matter and flow of energy through trophic levels using models; BIO.13.B
	C. explain the significance of the carbon and nitrogen cycles to ecosystem stability and analyze the consequences of disrupting these cycles; and BIO.13.C
	D. explain how environmental change, including change due to human activity, affects biodiversity and analyze how changes in biodiversity impact ecosystem stability. BIO.13.D