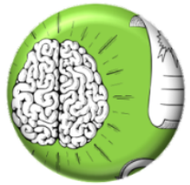

Biology
TEKS by Unit

✓ ✓	Unit 1: Biomolecules	Unit 2: Cell Structure and Processes	Unit 3: Matter Cycling and Energy Flow	Unit 4: Cell Cycle and Differentiation	Unit 5: DNA and Gene Expression	Unit 6: Mechanisms of Genetics: Inheritance	Unit 7: Biological Evolution	Unit 8: Interdependence Within Environmental Systems	Unit 9: Multicellular Organisms
(1) Scientific and engineering practices. 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:									
(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	✓	✓						✓	
(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;					✓			✓	
(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;									✓
(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;									
(E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;						✓			
(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;	✓					✓			
(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	✓		✓						

(H) distinguish among scientific hypotheses, theories, and laws.				✓			✓		
(2) Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:									
(A) identify advantages and limitations of models such as their size, scale, properties, and materials;			✓						
(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;			✓						
(C) use mathematical calculations to assess quantitative relationships in data; and									
(D) evaluate experimental and engineering designs.				✓	✓				
(3) Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:									
(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;							✓	✓	
(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	✓						✓	✓	✓
(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.	✓						✓	✓	
(4) Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:									
(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;							✓		
(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		✓		✓	✓		✓		
(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.							✓		

(5) Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. The student is expected to:									
(A) relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell;	✓								
(B) compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity;		✓							
(C) investigate homeostasis through the cellular transport of molecules; and		✓	✓						
(D) compare the structures of viruses to cells and explain how viruses spread and cause disease.		✓							
(6) Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. The student is expected to:									
(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;				✓					
(B) explain the process of cell specialization through cell differentiation, including the role of environmental factors; and				✓					
(C) relate disruptions of the cell cycle to how they lead to the development of diseases such as cancer.				✓					
(7) Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. The student is expected to:									
(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;					✓				
(B) describe the significance of gene expression and explain the process of protein synthesis using models of DNA and ribonucleic acid (RNA);					✓				
(C) identify and illustrate changes in DNA and evaluate the significance of these changes; and					✓				

(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.					✓				
(8) Science concepts--mechanisms of genetics. 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:									
(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						✓			
(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.						✓			
(9) Science concepts--biological evolution. 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:									
(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							✓		
(B) examine scientific explanations for varying rates of change such as gradualism, abrupt appearance, and stasis in the fossil record.							✓		
(10) Science concepts--biological evolution. 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:									
(A) analyze and evaluate how natural selection produces change in populations and not in individuals;							✓		
(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;							✓		
(C) analyze and evaluate how natural selection may lead to speciation; and							✓		
(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.							✓		
(11) Science concepts--biological structures, functions, and processes. The student knows the significance of matter cycling, energy flow, and enzymes in living organisms. The student is expected to:									
(A) explain how matter is conserved and energy is transferred during photosynthesis and cellular respiration using models, including the chemical equations for these processes; and			✓						

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

(1) Introduction. Biology. Students in Biology focus on patterns, processes, and relationships of living organisms through four main concepts: biological structures, functions, and processes; mechanisms of genetics; biological evolution; and interdependence within environmental systems. By the end of Grade 12, students are expected to gain sufficient knowledge of the scientific and engineering practices across the disciplines of science to make informed decisions using critical thinking and scientific problem solving.
(2) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.
(3) Scientific hypotheses and theories. Students are expected to know that:
(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.
(4) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.
(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.
(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.
(5) Science and social ethics. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).
(6) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.
(7) Statements containing the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.