

Texas University Interscholastic League

Contest Event: Science (Biology)

The contest challenges students to read widely in biology, to understand the significance of experiments rather than to recall obscure details, and to be alert to new discoveries and information in the areas of science. It is designed to help students gain an understanding of the basic principles as well as knowledge of the history and philosophy of science, and to foster a sense of enthusiasm about science and how it affects our daily lives.

The Texas Essential Knowledge and Skills (TEKS) are categorized by course area and grade level. The referenced Texas Essential Knowledge and Skills (TEKS) are from TEA §112.43. Biology.

The Contest Knowledge and Skills are necessarily broad in order to accommodate a wide variety of questions from contest writers. Objectives are provided as a guide, but do not comprise an all-inclusive list of terms and concepts related to the contest topic.

Each TEKS begins with the outline number for the appropriate course area.

Texas Essential Knowledge and Skills	Contest Knowledge and Skills
<p><u>Scientific Process Skills:</u></p> <p>1A. Demonstrate safe practices during field and laboratory investigations. (Biology) 2A. Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology. (Biology) 2B. Collect data and make measurements with precision. (Biology) 2C. Organize, analyze, evaluate, make inferences, and predict trends from data. (Biology) 2D. Communicate valid conclusions. (Biology) 3A. Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information. (Biology) 3E. Evaluate models according to their adequacy in representing biological objects or events. (Biology)</p>	<p><u>Scientific Process Skills:</u></p> <p>-Use critical thinking and the scientific method to evaluate scientific investigations.</p> <p>-Identify variables, constants, and controls.</p> <p>-Apply scientific measurement to problem solving and recognize appropriate instrumentation to solve a problem.</p> <p>-Perform data analysis and interpretation using experimental results.</p> <p>-Make predictions based on results.</p>
<p><u>Biological Research and Current Topics:</u></p> <p>1B. Make wise choices in the use and conservation of resources and the disposal or recycling of materials. (Biology) 3A. Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information. (Biology) 3B. Evaluate promotional claims that relate to biological issues such as product labeling and advertisements. (Biology) 3C. Evaluate the impact of research on scientific thought, society, and the environment. (Biology) 3D. Describe the connection between biology and future careers. (Biology)</p>	<p><u>Biological Research and Current Topics:</u></p> <p>-Demonstrate an awareness of historical and current biological issues and research.</p> <p>-Relate current biological study to major discoveries that have contributed to the understanding of living things.</p> <p>-Use current research findings in evaluating significant issues related to biology.</p> <p>-Recommended periodical reading list: <i>Scientific American</i> <i>Discover</i> <i>Science News</i></p>

<p>3F. Research and describe the history of biology and contributions of scientists. (Biology)</p>	
<p><u>Evolutionary Biology:</u></p> <p>7A. Identify evidence of change in species using fossils, DNA sequences, anatomical similarities, physiological similarities, and embryology. (Biology)</p> <p>7B. Illustrate the results of natural selection in speciation, diversity, phylogeny, adaptation, behavior, and extinction. (Biology)</p>	<p><u>Evolutionary Biology:</u></p> <ul style="list-style-type: none"> -Display a knowledge of the fossil record as it relates to biological evolution and phylogeny. -Identify mechanisms of evolution. -Provide evidence for evolution. -Describe evolutionary patterns and relationships.
<p><u>Classification of Organisms:</u></p> <p>8A. Collect and classify organisms at several taxonomic levels such as species, phylum, and kingdom using dichotomous keys. (Biology)</p> <p>8B. Analyze relationships among organisms and develop a model of a hierarchical classification system based on similarities and differences using taxonomic nomenclature. (Biology)</p> <p>8C. Identify characteristics of kingdoms including monerans, protists, fungi, plants, and animals. (Biology)</p>	<p><u>Classification of Organisms:</u></p> <ul style="list-style-type: none"> -Classify living things using current taxonomic levels and nomenclature. -Compare the characteristics that demonstrate diversity of life.
<p><u>Genetics and Heredity:</u></p> <p>6A. Describe components of deoxyribonucleic acid (DNA), and illustrate how information for specifying the traits of an organism is carried in the DNA. (Biology)</p> <p>6B. Explain replication, transcription, and translation using models of DNA and ribonucleic acid (RNA). (Biology)</p> <p>6C. Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes.(Biology)</p> <p>6D. Compare genetic variations observed in plants and animals. (Biology)</p> <p>6E. Compare the processes of mitosis and meiosis and their significance to sexual and asexual reproduction. (Biology)</p> <p>6F. Identify and analyze karyotypes. (Biology)</p> <p>7A. Identify evidence of change in species using fossils, DNA sequences, anatomical similarities, physiological similarities, and embryology. (Biology)</p>	<p><u>Genetics and Heredity:</u></p> <ul style="list-style-type: none"> -Apply molecular genetics to patterns of heredity and processes of biological evolution. -Identify stages of meiosis and gametogenesis. -Describe the role of chromosomes, RNA, DNA, gene regulation, and mutations in inheritance patterns. -Demonstrate awareness of current genetic technology and applications.
<p><u>Growth and Development:</u></p> <p>5B. Identify cell differentiation in the development of organisms. (Biology)</p>	<p><u>Growth and Development:</u></p> <ul style="list-style-type: none"> -Describe life cycles as related to the growth and development of organisms.

<p>6E. Compare the processes of mitosis and meiosis and their significance to sexual and asexual reproduction. (Biology)</p> <p>13B. Survey and identify methods of reproduction, growth, and development of various types of plants. (Biology)</p>	<p>-Compare methods of reproduction in plants and animals.</p> <p>-Identify the stages of mitosis including DNA replication processes and cellular differentiation.</p>
<p><u>Levels of Organization:</u></p> <p>5C. Sequence the levels of organization in multicellular organisms to relate the parts to each other and to the whole. (Biology)</p> <p>10A. Interpret the functions of systems in organisms including circulatory, digestive, nervous, endocrine, reproductive, integumentary, skeletal, respiratory, muscular, excretory, and immune. (Biology)</p> <p>10B. Compare the interrelationships of organ systems to each other and to the body as a whole. (Biology)</p>	<p><u>Levels of Organization:</u></p> <p>-Identify relationships between cells, tissues and organ systems including structure and function in living systems.</p>
<p><u>Energy Transfer:</u></p> <p>4B. Investigate and identify cellular processes including homeostasis, permeability, energy production, transportation of molecules, disposal of wastes, function of cellular parts, and synthesis of new molecules. (Biology)</p> <p>9B. Compare the energy flow in photosynthesis to the energy flow in cellular respiration. (Biology)</p> <p>9C. Investigate and identify the effects of enzymes on food molecules. (Biology)</p> <p>9D. Analyze the flow of matter and energy through different trophic levels and between organisms and the physical environment. (Biology)</p> <p>12A. Analyze the flow of energy through various cycles including the carbon, oxygen, nitrogen, and water cycles. (Biology)</p>	<p><u>Energy Transfer:</u></p> <p>-Relate nutrient cycles and trophic levels to the transfer of energy and matter through the environment.</p> <p>-Describe the processes of photosynthesis, cellular respiration and fermentation.</p>
<p><u>Interdependence in Nature:</u></p> <p>11C. Analyze the importance of nutrition, environmental conditions, and physical exercise on health. (Biology)</p> <p>11D. Summarize the role of microorganisms in maintaining and disrupting equilibrium including diseases in plants and animals and decay in an ecosystem. (Biology)</p> <p>12B. Interpret interactions among organisms exhibiting predation, parasitism, commensalism, and mutualism. (Biology)</p> <p>12C. Compare variations, tolerances, and adaptations of plants and animals in different</p>	<p><u>Interdependence in Nature:</u></p> <p>-Describe the interactions that occur between organisms and the environment.</p> <p>-Identify factors involved in population dynamics. Demonstrate awareness of global biological issues.</p>

<p>biomes. (Biology) 12D. Identify and illustrate that long-term survival of species is dependent on a resource base that may be limited. (Biology) 12E. Investigate and explain the interactions in an ecosystem including food chains, food webs, and food pyramids. (Biology)</p>	
<p><u>Regulation and Homeostasis:</u></p> <p>4B. Investigate and identify cellular processes including homeostasis, permeability, energy production, transportation of molecules, disposal of wastes, function of cellular parts, and synthesis of new molecules. (Biology) 11A. Identify and describe the relationships between internal feedback mechanisms in the maintenance of homeostasis. (Biology) 11B. Investigate and identify how organisms, including humans, respond to external stimuli. (Biology) 11C. Analyze the importance of nutrition, environmental conditions, and physical exercise on health. (Biology)</p>	<p><u>Regulation and Homeostasis:</u></p> <p>-Describe methods of maintaining homeostasis in living systems including feedback mechanisms and responses to environmental stimuli.</p>
<p><u>Chemistry of Life:</u></p> <p>4B. Investigate and identify cellular processes including homeostasis, permeability, energy production, transportation of molecules, disposal of wastes, function of cellular parts, and synthesis of new molecules. (Biology) 9A. Compare the structures and functions of different types of biomolecules such as carbohydrates, lipids, proteins, and nucleic acids. (Biology) 9B. Compare the energy flow in photosynthesis to the energy flow in cellular respiration. (Biology) 9C. Investigate and identify the effects of enzymes on food molecules. (Biology)</p>	<p><u>Chemistry of Life:</u></p> <p>-Analyze metabolic pathways and cycles, such as photosynthesis, cellular respiration, and fermentation. -Identify common biochemical reactions and organic molecules. -Recognize the role of enzymes and vitamins in living systems.</p>
<p><u>Human Systems:</u></p> <p>10A. Interpret the functions of systems in organisms including circulatory, digestive, nervous, endocrine, reproductive, integumentary, skeletal, respiratory, muscular, excretory, and immune. (Biology)</p>	<p><u>Human Systems:</u></p> <p>-Demonstrate knowledge of human anatomy and physiology.</p>
<p><u>Cellular Biology:</u></p> <p>4A. Identify the parts of prokaryotic and eukaryotic cells. (Biology)</p>	<p><u>Cellular Biology:</u></p> <p>-Relate the structure and function of cells. -Compare the characteristics of prokaryotic and</p>

<p>4B. Investigate and identify cellular processes including homeostasis, permeability, energy production, transportation of molecules, disposal of wastes, function of cellular parts, and synthesis of new molecules. (Biology)</p> <p>5A. Compare cells from different parts of plants and animals including roots, stems, leaves, epithelia, muscles, and bones to show specialization of structure and function. (Biology)</p>	<p>eukaryotic cells.</p> <ul style="list-style-type: none"> -Identify subcellular organization and processes. -Describe the cell cycle and methods of cellular regulation.
<p><u>Structure and Function:</u></p> <p>5A. Compare cells from different parts of plants and animals including roots, stems, leaves, epithelia, muscles, and bones to show specialization of structure and function. (Biology)</p> <p>10A. Interpret the functions of systems in organisms including circulatory, digestive, nervous, endocrine, reproductive, integumentary, skeletal, respiratory, muscular, excretory, and immune. (Biology)</p> <p>10B. Compare the interrelationships of organ systems to each other and to the body as a whole. (Biology)</p> <p>10C. Analyze and identify characteristics of plant systems and subsystems. (Biology)</p> <p>13A. Evaluate the significance of structural and physiological adaptations of plants to their environments. (Biology)</p>	<p><u>Structure and Function:</u></p> <ul style="list-style-type: none"> -Compare the structure and function of plant and animal systems. -Identify plant and animal structures and functions. -Apply comparative anatomy and physiology to the analysis of living systems.
<p><u>Pathology:</u></p> <p>4C. Compare the structures and functions of viruses to cells and describe the role of viruses in causing diseases and conditions such as acquired immune deficiency syndrome, common colds, smallpox, influenza, and warts. (Biology)</p> <p>4D. Identify and describe the role of bacteria in maintaining health such as in digestion and in causing diseases such as in streptococcus infections and diphtheria. (Biology)</p> <p>11D. Summarize the role of microorganisms in maintaining and disrupting equilibrium including diseases in plants and animals and decay in an ecosystem. (Biology)</p>	<p><u>Pathology:</u></p> <ul style="list-style-type: none"> -Compare viruses to cells. -Relate common diseases to causative agents including common viral, bacterial, and protozoal diseases. -Identify viral structures and replication processes. -Demonstrate an awareness of virus technology.