Chapter 121. Texas Essential Knowledge and Skills for Health Science Technology Education

Subchapter B. Scientific, High School

Statutory Authority: The provisions of this Subchapter B issued under the Texas Education Code, §28.002, unless otherwise noted.

§121.11. Implementation of Texas Essential Knowledge and Skills for Health Science Technology Education, Scientific.

The provisions of this chapter shall supersede §75.84 of this title (relating to Health Occupations Education) beginning September 1, 1998.

Source: The provisions of this §121.11 adopted to be effective September 1, 1998, 22 TexReg 5014.

§121.12. Scientific Research and Design (One Science Credit).

(a) General requirements. The prerequisite for this course is one unit of high school science. To receive credit in science, students must meet the 40% laboratory and fieldwork requirement identified in §74.3(b)(2)(C) of this title (relating to Description of a Required Secondary Curriculum). This course is recommended for students in Grade 11 or 12.

(b) Introduction.

(1) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and that science may not answer all questions.

(2) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.

(3) Investigations are used to learn about the natural world through questioning, observing and drawing conclusions. Students should understand that certain types of questions can be answered by investigations, and that conclusions and models built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and, based on new discoveries, are constantly being changed to more closely reflect the physical world.

(c) Knowledge and skills.

(1) The student conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.	The student is expected to: (A) demonstrate safe practices during laboratory investigations and fieldwork; and

		(B) make wise choices in the conservation and use of resources and the disposal of materials.
(2)	The student identifies scientific methods used during fieldwork and laboratory investigations.	The student is expected to: (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; (B) collect data by observing and measuring in various ways; (C) organize, analyze, evaluate, make inferences, and predict trends from data; and (D) communicate valid conclusions.
(3)	The student uses critical thinking and scientific problem solving to make informed decisions.	The student is expected to: (A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information; (B) make responsible choices in selecting everyday products and services using scientific information; (C) evaluate the impact of research on scientific thought, society, and the environment; and (D) gather information about future careers using a variety of sources.
(4)	The student knows how to formulate hypotheses to guide experimentation and data collection.	The student is expected to: (A) perform background research with respect to an investigative problem; and (B) examine hypotheses generated to guide a research process, evaluating the merits and feasibility of the hypotheses.
(5)	The student knows how to analyze published research.	The student is expected to: (A) identify the scientific methodology used by a researcher; (B) examine a prescribed research design and identify dependent and independent variables;

		(C) evaluate a prescribed research design to determine the purpose for each of the procedures performed; and (D) compare the relationship of the hypothesis to the conclusion.
(6)	The student knows how to develop and implement investigative designs.	The student is expected to: (A) interact and collaborate with scientific researchers and/or other members of the scientific community to complete a research project; (B) identify and manipulate relevant variables within research situations; (C) use a control in an experimental process; and (D) design procedures to test hypotheses.
(7)	The student knows how to collect, organize, and evaluate qualitative and quantitative data obtained through experimentation.	The student is expected to: (A) record observations and events as they occur within an investigation; (B) acquire, manipulate, and analyze data using equipment and technology; (C) construct data tables to organize information collected in an experiment; and (D) evaluate data using statistical methods to recognize patterns, trends, and proportional relationships.
(8)	The student knows how to synthesize valid conclusions from qualitative and quantitative data.	The student is expected to: (A) synthesize conclusions supported by research data; (B) consider and communicate alternative explanations for observations and results; and (C) identify limitations within the research process and provide recommendations for additional research.
(9)	The student knows how to communicate conclusions clearly and concisely to an audience of professionals.	The student is expected to: (A) construct charts, tables, and graphs in facilitating data analysis and in communicating experimental results clearly and effectively using technology; and

(B) suggest alternative explanations from observations or trends evident within the data or from prompts provided by a review panel.

Source: The provisions of this §121.12 adopted to be effective September 1, 1998, 22 TexReg 5014.

§121.13. Anatomy and Physiology of Human Systems (One Science Credit).

(a) General requirements. The prerequisites for this course are Biology and Chemistry. To receive credit in science, students must meet the 40% laboratory and fieldwork requirement identified in §74.3(b)(2)(C) of this title (relating to Description of a Required Secondary Curriculum). This course is recommended for students in Grade 11 or 12.

(b) Introduction.

(1) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and that science may not answer all questions.

(2) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.

(3) Investigations are used to learn about the natural world through questioning, observing and drawing conclusions. Students should understand that certain types of questions can be answered by investigations, and that conclusions and models built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and, based on new discoveries, are constantly being changed to more closely reflect the physical world.

(c) Knowledge and skills.

(1)	The student conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.	The student is expected to: (A) demonstrate safe practices during laboratory investigations and in fieldwork; and (B) make wise choices in the conservation and use of resources and the disposal of materials.
(2)	The student uses scientific methods during fieldwork and laboratory investigations.	The student is expected to: (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; (B) make observations and measurements in collecting data in various ways;

		(C) organize, analyze, evaluate, make inferences, and predict trends from data; and
		(D) communicate valid conclusions.
(3)	The student uses critical thinking and scientific problem solving to make informed decisions.	The student is expected to:
		(A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information;
		(B) make choices in selecting everyday products using scientific research findings;
		(C) evaluate the impact of research on scientific thought, society, and the environment;
		(D) gather information about future careers using a variety of sources; and
		(E) research and describe the history of science and contributions of scientists.
(4)	The student knows the energy needs of the human body and the processes through which these needs are fulfilled.	The student is expected to:
		(A) analyze and explain the chemical reactions that provide energy for the body;
		(B) identify the means, including the structure and function of the digestive system, by which energy is processed and stored within the body; and
		(C) analyze the effects of energy deficiencies in malabsorption disorders such as diabetes, hypothyroidism, and Crohn's disease.
(5)	The student knows the responses of the human body to internal and external forces.	The student is expected to:
		(A) interpret normal and abnormal contractility conditions such as in edema, glaucoma, aneurysms, and hemorrhage;
		(B) analyze and describe the effects of pressure, movement, torque, tension, and elasticity on the human body;
		(C) conduct an investigation to determine causes and effects of force variance, and communicate findings;

		(D) survey and report the uses of various diagnostic and therapeutic technologies; and (E) explain how coordination of muscles, bones, and joints allows movement of the body.
(6)	The student knows the body processes that maintain homeostasis.	The student is expected to: (A) investigate and describe the integration of the chemical and physical processes, including equilibrium, temperature, pH balance, chemical reactions, passive and active transport, and biofeedback, that contribute to homeostasis; and (B) predict the consequences of the failure to maintain homeostasis.
(7)	The student knows the electrical conduction processes and interactions.	The student is expected to: (A) illustrate conduction systems such as nerve transmission or muscle stimulation; (B) research and describe the therapeutic uses and effects of external sources of electricity on the body system; and (C) evaluate the application of advanced technologies such as electroencephalogram (EEG), electrocardiogram (ECG), bionics, transcutaneous electrical nerve stimulation (TENS), and cardioversion.
(8)	The student knows the body's transport systems.	The student is expected to: (A) analyze the physical, chemical, and biological properties of transport systems including circulatory, respiratory, and excretory; (B) identify and describe the factors that alter the normal functions of transport systems; and (C) compare the interactions among the transport systems.

(9)	The student knows environmental factors that affect the human body.	The student is expected to: (A) identify the effects of environmental factors, such as climate, pollution, radioactivity, chemicals, electromagnetic fields, pathogens, carcinogens, and drugs on body systems; and (B) research and evaluate measures to minimize harmful environmental factors on body systems.
(10)	The student knows how to compare anatomical structures to physiological functions.	The student is expected to: (A) analyze the relationships between the anatomical structures and physiological functions of systems such as integumentary, reproductive, nervous, and digestive; (B) evaluate the cause and effect of disease, trauma and congenital defects on the structure and function of cells, tissues, organs, and systems; (C) research and evaluate technological advances and limitations in the treatment of system disorders; and (D) identify characteristics of the aging process on body systems.
(11)	The student knows the process of reproduction, growth, and development.	The student is expected to: (A) research and describe embryological development of tissues, organs, and systems; (B) identify the functions of the male and female reproductive systems; and (C) summarize the human development cycle.

Source: The provisions of this §121.13 adopted to be effective September 1, 1998, 22 TexReg 5014.

§121.14. Medical Microbiology (One-Half Science Credit).

(a) General requirements. The prerequisites are Biology and Chemistry or Biology and concurrent enrollment in Chemistry. To receive credit in science, students must meet the 40% laboratory and fieldwork requirement identified in §74.3(b)(2)(C) of this title (relating to Description of a Required Secondary Curriculum). This course is recommended for students in Grade 11 or 12.

(b) Introduction.

(1) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and that science may not answer all questions.

(2) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.

(3) Investigations are used to learn about the natural world through questioning, observing and drawing conclusions. Students should understand that certain types of questions can be answered by investigations, and that conclusions and models built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and, based on new discoveries, are constantly being changed to more closely reflect the physical world.

(c) Knowledge and skills.

(1)	The student conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.	The student is expected to: (A) demonstrate safe practices in laboratory investigations and in fieldwork, including clinical settings, while complying with standard precautions; (B) make wise choices in the conservation and use of resources and the disposal of materials; and (C) identify regulatory agencies and comply with standards and guidelines.
(2)	The student uses scientific methods in fieldwork and laboratory investigations.	The student is expected to: (A) plan and implement investigative procedures including but not limited to asking questions, formulating testable hypotheses, and selecting equipment and technology; (B) make observations and measurements in collecting data;

		(C) organize, analyze, evaluate, make inferences, and predict trends from data; and
		(D) communicate valid conclusions.
(3)	The student uses critical thinking and scientific problem solving to make informed decisions.	The student is expected to:
		(A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information;
		(B) make choices in selecting everyday products and services using scientific information;
		(C) evaluate the impact of research on scientific thought, society, and the environment;
		(D) gather information about future careers using a variety of sources;
		(E) solve calculations involving probability, dilutions, conversions, and exponential growth;
		(F) determine mass, volume, and density using measurement functions; and
		(G) research and describe the history of science and contributions of scientists.
(4)	The student knows the relationship between microbes and health maintenance.	The student is expected to:
		(A) research and describe the historical development of microbiology as it relates to health care;
		(B) identify chemical processes of microorganisms;
		(C) identify the morphology and characteristics of microorganisms using a variety of microbiological techniques;
		(D) determine the factors required for microbial reproduction and growth; and
		(E) identify beneficial microbes that colonize the human body.
(5)	The student knows the role of microbes in infectious diseases.	The student is expected to:
		(A) research and describe the infectious process;

		(B) classify microorganisms using a dichotomous key;
		(C) identify diseases caused by bacteria, fungi, viruses, protozoa, rickettsias, and helminths;
		(D) identify the body's immune response and defenses against infection; and
		(E) evaluate the effects of anti-microbial agents.

Source: The provisions of this §121.14 adopted to be effective September 1, 1998, 22 TexReg 5014.

§121.15. Pathophysiology (One-Half Science Credit).

(a) General requirements. The prerequisites for this course are Biology, Chemistry, and Anatomy, and Physiology of Human Systems. To receive credit in science, students must meet the 40% laboratory and fieldwork requirement identified in §74.3(b)(2)(C) of this title (relating to Description of a Required Secondary Curriculum). This course is recommended for students in Grade 11 or 12.

(b) Introduction.

(1) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and that science may not answer all questions.

(2) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.

(3) Investigations are used to learn about the natural world through questioning, observing and drawing conclusions. Students should understand that certain types of questions can be answered by investigations, and that conclusions and models built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and, based on new discoveries, are constantly being changed to more closely reflect the physical world.

(c) Knowledge and skills.

(1)	The student conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.	The student is expected to: (A) demonstrate safe practices during laboratory investigations and in fieldwork; and (B) make wise choices in the conservation and use of resources and the disposal of materials.
(2)	The student uses scientific methods in fieldwork and laboratory investigations.	The student is expected to:

		(A) plan and implement investigative procedures including but not limited to asking questions, formulating testable hypotheses, and selecting equipment and technology; (B) make observations and measurements in collecting data; (C) organize, analyze, evaluate, make inferences, and predict trends from data; and (D) communicate valid conclusions.
(3)	The student uses critical thinking and scientific problem solving to make informed decisions.	The student is expected to: (A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information; (B) make responsible choices in selecting everyday products and services using scientific information; (C) evaluate the impact of research on scientific thought, society, and the environment; (D) gather information about future careers using a variety of sources; and (E) research and describe the history of science and contributions of scientists.
(4)	The student knows the mechanisms of pathology.	The student is expected to: (A) identify biological and chemical processes at the cellular level; (B) analyze how the body attempts to maintain homeostasis when changes occur; (C) detect changes resulting from mutations and neoplasms by examining cells, tissues, organs, and systems; (D) identify factors that contribute to disease, such as age, gender, environment, lifestyles, and heredity; and (E) evaluate stages in the progression of disease.
(5)	The student knows the process of pathogenesis.	The student is expected to: (A) identify pathogenic organisms using technology;

		(B) illustrate the stages of pathogenesis including incubation period, symptomatic period, and exacerbation or remission; (C) analyze the body's natural defense systems against infection such as barriers, the inflammatory response, and the immune response; and (D) evaluate the effects of chemical agents, environmental pollution, and trauma on the disease process.
(6)	The student knows a variety of human diseases.	The student is expected to: (A) research and report on the nature of diseases according to etiology, signs and symptoms, diagnosis, prognosis, and treatment options; (B) research and report advanced technologies for the diagnosis and treatment of disease; (C) identify and describe congenital disorders and childhood diseases; and (D) research and explain how diseases affect multiple body systems.
(7)	The student knows the effects of disease prevention and control.	The student is expected to: (A) evaluate public-health issues related to asepsis, isolation, immunization, and quarantine; (B) analyze the effects of stress and aging on the body; (C) evaluate treatment options for diseases; (D) research and describe diseases that threaten world health and propose intervention strategies; and (E) develop a plan for personal health and wellness.

Source: The provisions of this §121.15 adopted to be effective September 1, 1998, 22 TexReg 5014.