§112.43. Biology.

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisites: none. This course is recommended for students in Grades 9, 10, or 11.

(b) Introduction.

(1) In Biology, students conduct field and laboratory investigations, use scientific methods during investigations, and make informed decisions using critical-thinking and scientific problem-solving. Students in Biology study a variety of topics that include: structures and functions of cells and viruses; growth and development of organisms; cells, tissues, and organs; nucleic acids and genetics; biological evolution; taxonomy; metabolism and energy transfers in living organisms; living systems; homeostasis; ecosystems; and plants and the environment.

(2) 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 also should know that science may not answer all questions.

(3) 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.

(4) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions 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 modified to more closely reflect the natural world.

(c) Knowledge and skills.

(1) Scientific processes. The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations; and

(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.

(2) Scientific processes. The student uses scientific methods during field 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 and make measurements with precision;

(C) organize, analyze, evaluate, make inferences, and predict trends from data; and

(D) communicate valid conclusions.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;

(B) evaluate promotional claims that relate to biological issues such as product labeling and advertisements;

(C) evaluate the impact of research on scientific thought, society, and the environment;

(D) describe the connection between biology and future careers;

(E) evaluate models according to their adequacy in representing biological objects or events; and

(F) research and describe the history of biology and contributions of scientists.

(4) Science concepts. The student knows that cells are the basic structures of all living things and have specialized parts that perform specific functions, and that viruses are different from cells and have different properties and functions. The student is expected to:

(A) identify the parts of prokaryotic and eukaryotic cells;

(B) 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;

(C) 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; and

(D) 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.

(5) Science concepts. The student knows how an organism grows and how specialized cells, tissues, and organs develop. The student is expected to:

(A) compare cells from different parts of plants and animals including roots, stems, leaves, epithelia, muscles, and bones to show specialization of structure and function;

(B) identify cell differentiation in the development of organisms; and

(C) sequence the levels of organization in multicellular organisms to relate the parts to each other and to the whole.

(6) Science concepts. The student knows the structures and functions of nucleic acids in the mechanisms of genetics. The student is expected to:

(A) describe components of deoxyribonucleic acid (DNA), and illustrate how information for specifying the traits of an organism is carried in the DNA;

(B) explain replication, transcription, and translation using models of DNA and ribonucleic acid (RNA);

(C) identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes;

(D) compare genetic variations observed in plants and animals;

(E) compare the processes of mitosis and meiosis and their significance to sexual and asexual reproduction; and

(F) identify and analyze karyotypes.

(7) Science concepts. The student knows the theory of biological evolution. The student is expected to:

(A) identify evidence of change in species using fossils, DNA sequences, anatomical similarities, physiological similarities, and embryology; and

(B) illustrate the results of natural selection in speciation, diversity, phylogeny, adaptation, behavior, and extinction.

(8) Science concepts. The student knows applications of taxonomy and can identify its limitations. The student is expected to:

(A) collect and classify organisms at several taxonomic levels such as species, phylum, and kingdom using dichotomous keys;

(B) analyze relationships among organisms and develop a model of a hierarchical classification system based on similarities and differences using taxonomic nomenclature; and

(C) identify characteristics of kingdoms including monerans, protists, fungi, plants, and animals.

(9) Science concepts. The student knows metabolic processes and energy transfers that occur in living organisms. The student is expected to:

(A) compare the structures and functions of different types of biomolecules such as carbohydrates, lipids, proteins, and nucleic acids;

(B) compare the energy flow in photosynthesis to the energy flow in cellular respiration;

(C) investigate and identify the effects of enzymes on food molecules; and

(D) analyze the flow of matter and energy through different trophic levels and between organisms and the physical environment.

(10) Science concepts. The student knows that, at all levels of nature, living systems are found within other living systems, each with its own boundary and limits. The student is expected to:

(A) interpret the functions of systems in organisms including circulatory, digestive, nervous, endocrine, reproductive, integumentary, skeletal, respiratory, muscular, excretory, and immune;

(B) compare the interrelationships of organ systems to each other and to the body as a whole; and

(C) analyze and identify characteristics of plant systems and subsystems.

(11) Science concepts. The student knows that organisms maintain homeostasis. The student is expected to:

(A) identify and describe the relationships between internal feedback mechanisms in the maintenance of homeostasis;

(B) investigate and identify how organisms, including humans, respond to external stimuli;

(C) analyze the importance of nutrition, environmental conditions, and physical exercise on health; and

(D) summarize the role of microorganisms in maintaining and disrupting equilibrium including diseases in plants and animals and decay in an ecosystem.

(12) Science concepts. The student knows that interdependence and interactions occur within an ecosystem. The student is expected to:

(A) analyze the flow of energy through various cycles including the carbon, oxygen, nitrogen, and water cycles;

(B) interpret interactions among organisms exhibiting predation, parasitism, commensalism, and mutualism;

(C) compare variations, tolerances, and adaptations of plants and animals in different biomes;

(D) identify and illustrate that long-term survival of species is dependent on a resource base that may be limited; and

(E) investigate and explain the interactions in an ecosystem including food chains, food webs, and food pyramids.

(13) Science concepts. The student knows the significance of plants in the environment. The student is expected to:

(A) evaluate the significance of structural and physiological adaptations of plants to their environments; and

(B) survey and identify methods of reproduction, growth, and development of various types of plants.

Source: The provisions of this §112.43 adopted to be effective September 1, 1998, 22 TexReg 7647.