Texas Essential Knowledge and Skills

Physics

Introduction.

(1) In Aquatic Science, students conduct field and laboratory investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students study a variety of topics that include: components of an aquatic ecosystem; relationships among aquatic habitats and ecosystems; roles of cycles within an aquatic environment; adaptations of aquatic organisms; changes within aquatic environments; geological phenomena and fluid dynamics effects; and origin and use of water in a watershed.

(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.

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 experimental procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
  (B) make quantitative observations and measurements with precision;
  (C) organize, analyze, evaluate, make inferences, and predict trends from data;
  (D) communicate valid conclusions;
  (E) graph data to observe and identify relationships between variables; and
  (F) read the scale on scientific instruments with precision.

(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) express laws symbolically and employ mathematical procedures including vector addition and right-triangle geometry to solve physical problems;
  (C) evaluate the impact of research on scientific thought, society, and the environment;
  (D) describe the connection between physics and future careers; and
  (E) research and describe the history of physics and contributions of scientists.

(4) Science concepts. The student knows the laws governing motion. The student is expected to:
  (A) generate and interpret graphs describing motion including the use of real-time technology;
  (B) analyze examples of uniform and accelerated motion including linear, projectile, and circular;
  (C) demonstrate the effects of forces on the motion of objects;
  (D) develop and interpret a free-body diagram for force analysis; and
  (E) identify and describe motion relative to different frames of reference.

(5) Science concepts. The student knows that changes occur within a physical system and recognizes that energy and momentum are conserved. The student is expected to:
  (A) interpret evidence for the work-energy theorem;
  (B) observe and describe examples of kinetic and potential energy and their transformations;
  (C) calculate the mechanical energy and momentum in a physical system such as billiards, cars, and trains; and

(D) demonstrate the conservation of energy and momentum.

(6) Science concepts. The student knows forces in nature. The student is expected to:
  (A) identify the influence of mass and distance on gravitational forces;
  (B) research and describe the historical development of the concepts of gravitational, electrical, and magnetic force;
  (C) identify and analyze the influences of charge and distance on electric forces;
  (D) demonstrate the relationship between electricity and magnetism;
  (E) design and analyze electric circuits; and
  (F) identify examples of electrical and magnetic forces in everyday life.

(7) Science concepts. The student knows the laws of thermodynamics. The student is expected to:
  (A) analyze and explain everyday examples that illustrate the laws of thermodynamics; and
  (B) evaluate different methods of heat energy transfer that result in an increasing amount of disorder.

(8) Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:
  (A) examine and describe a variety of waves propagated in various types of media and describe wave characteristics such as velocity, frequency, amplitude, and behaviors such as reflection, refraction, and interference;
  (B) identify the characteristics and behaviors of sound and electromagnetic waves; and
  (C) interpret the role of wave characteristics and behaviors found in medicinal and industrial applications.

(9) Science concepts. The student knows simple examples of quantum physics. The student is expected to:
  (A) describe the photoelectric effect; and
  (B) explain the line spectra from different gas-discharge tubes.