

## Chapter 112. Texas Essential Knowledge and Skills for Science

### Subchapter B. Middle School

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

#### **§112.21. Implementation of Texas Essential Knowledge and Skills for Science, Middle School.**

The provisions of this subchapter shall be implemented by school districts beginning September 1, 1998, and at that time shall supersede §75.28(g) and §75.44 of this title (relating to Science).

*Source: The provisions of this §112.21 adopted to be effective September 1, 1998, 22 TexReg 7647.*

#### **§112.22. Science, Grade 6.**

(a) Introduction.

- (1) In Grade 6, the study of science includes conducting field and laboratory investigations using scientific methods, analyzing data, making informed decisions, and using tools such as beakers, test tubes, and spring scales to collect, analyze, and record information. Students also use computers and information technology tools to support scientific investigations.
  - (2) As students learn science skills, they identify components of the solar system including the Sun, planets, moon, and asteroids and learn how seasons and the length of the day are caused by the tilt and rotation of the Earth as it orbits the Sun. Students investigate the rock cycle and identify sources of water in a watershed. In addition, students identify changes in objects including position, direction, and speed when acted upon by a force.
  - (3) Students classify substances by their chemical properties and identify the water cycle and decay of biomass as examples of the interactions between matter and energy. They identify life processes and the relationships between structure and function of organisms.
  - (4) 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.
  - (5) 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.
  - (6) 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.
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(b) Knowledge and skills.

(6.1) **Scientific processes.** The student 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.

(6.2) **Scientific processes.** The student uses scientific inquiry 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 and using equipment and technology;
- (B) collect data by observing and measuring;
- (C) analyze and interpret information to construct reasonable explanations from direct and indirect evidence;
- (D) communicate valid conclusions; and
- (E) construct graphs, tables, maps, and charts using tools including computers to organize, examine, and evaluate data.

(6.3) **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) draw inferences based on data related to promotional materials for products and services;
- (C) represent the natural world using models and identify their limitations;
- (D) evaluate the impact of research on scientific thought, society, and the environment; and
- (E) connect Grade 6 science concepts with the history of science and contributions of scientists.

(6.4) **Scientific processes.** The student knows how to use a variety of tools and methods to conduct science inquiry.

The student is expected to:

- (A) collect, analyze, and record information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, timing devices, hot plates, test tubes, safety goggles, spring scales, magnets, balances, microscopes, telescopes, thermometers, calculators, field equipment, compasses, computers, and computer probes; and
- (B) identify patterns in collected information using percent, average, range, and frequency.

(6.5) **Scientific concepts.** The student knows that systems may combine with other systems to form a larger system.

The student is expected to:

- (A) identify and describe a system that results from the combination of two or more systems such as in the solar system; and
- (B) describe how the properties of a system are different from the properties of its parts.

(6.6) **Science concepts.** The student knows that there is a relationship between force and motion.

The student is expected to:

- (A) identify and describe the changes in position, direction of motion, and speed of an object when acted upon by force;
- (B) demonstrate that changes in motion can be measured and graphically represented; and
- (C) identify forces that shape features of the Earth including uplifting, movement of water, and volcanic activity.

(6.7) **Science concepts.** The student knows that substances have physical and chemical properties.

The student is expected to:

- (A) demonstrate that new substances can be made when two or more substances are chemically combined and compare the properties of the new substances to the original substances; and
- (B) classify substances by their physical and chemical properties.

(6.8) **Science concepts.** The student knows that complex interactions occur between matter and energy.

The student is expected to:

- (A) define matter and energy;
- (B) explain and illustrate the interactions between matter and energy in the water cycle and in the decay of biomass such as in a compost bin; and
- (C) describe energy flow in living systems including food chains and food webs.

(6.9) **Science concepts.** The student knows that obtaining, transforming, and distributing energy affects the environment.

The student is expected to:

- (A) identify energy transformations occurring during the production of energy for human use such as electrical energy to heat energy or heat energy to electrical energy;
- (B) compare methods used for transforming energy in devices such as water heaters, cooling systems, or hydroelectric and wind power plants; and
- (C) research and describe energy types from their source to their use and determine if the type is renewable, non-renewable, or inexhaustible.

(6.10) **Science concepts.** The student knows the relationship between structure and function in living systems.

The student is expected to:

- (A) differentiate between structure and function;
- (B) determine that all organisms are composed of cells that carry on functions to sustain life; and
- (C) identify how structure complements function at different levels of organization including organs, organ systems, organisms, and populations.

(6.11) **Science concepts.** The student knows that traits of species can change through generations and that the instructions for traits are contained in the genetic material of the organisms.

The student is expected to:

- (A) identify some changes in traits that can occur over several generations through natural occurrence and selective breeding;
- (B) identify cells as structures containing genetic material; and
- (C) interpret the role of genes in inheritance.

- (6.12) **Science concepts.** The student knows that the responses of organisms are caused by internal or external stimuli.
- The student is expected to:
- (A) identify responses in organisms to internal stimuli such as hunger or thirst;
  - (B) identify responses in organisms to external stimuli such as the presence or absence of heat or light; and
  - (C) identify components of an ecosystem to which organisms may respond.
- (6.13) **Science concepts.** The student knows components of our solar system.
- The student is expected to:
- (A) identify characteristics of objects in our solar system including the Sun, planets, meteorites, comets, asteroids, and moons; and
  - (B) describe types of equipment and transportation needed for space travel.
- (6.14) **Science concepts.** The student knows the structures and functions of Earth systems.
- The student is expected to:
- (A) summarize the rock cycle;
  - (B) identify relationships between groundwater and surface water in a watershed; and
  - (C) describe components of the atmosphere, including oxygen, nitrogen, and water vapor, and identify the role of atmospheric movement in weather change.

*Source: The provisions of this §112.22 adopted to be effective September 1, 1998, 22 TexReg 7647.*

**§112.23. Science, Grade 7.**

- (a) Introduction.
- (1) In Grade 7, the study of science includes conducting field and laboratory investigations using scientific methods, critical-thinking, problem-solving, and using tools such as weather instruments and calculators to collect and analyze information to explain a phenomenon. Students also use computers and information technology tools to support scientific investigations.
  - (2) As students learn science skills, they identify gravity and phases of the moon as components of the solar system and explore the effects of events such as hurricanes on the Earth. Students use pulleys and levers to understand the relationship between force and motion. Students then relate the concept to processes in the human organism such as the movement of blood. In addition, students study chemical and physical properties of substances by examining the tarnishing of metal or burning of wood as examples of chemical processes, and by identifying physical properties used to place elements on the periodic table.

- (3) Students learn about kinetic and potential energy and identify photosynthesis as an example of the transformation of radiant energy from the Sun into chemical energy for use by plants. Students investigate systems in humans to identify their structures and functions. Student compare asexual and sexual reproduction to illustrate that genetic materials are responsible for both dominant and recessive traits in organisms.
- (4) 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.
- (5) 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.
- (6) 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.

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(b) Knowledge and skills.

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| (7.1) <b>Scientific processes.</b> The student conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. | The student is expected to: <ul style="list-style-type: none"><li>(A) demonstrate safe practices during field and laboratory investigations; and</li><li>(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.</li></ul>  |
| (7.2) <b>Scientific processes.</b> The student uses scientific inquiry methods during field and laboratory investigations.                                  | The student is expected to: <ul style="list-style-type: none"><li>(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting and using equipment and technology;</li><li>(B) collect data by observing and measuring;</li><li>(C) organize, analyze, make inferences, and predict trends from direct and indirect evidence;</li><li>(D) communicate valid conclusions; and</li><li>(E) construct graphs, tables, maps, and charts using tools including computers to organize, examine, and evaluate data.</li></ul> |

(7.3) **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) draw inferences based on data related to promotional materials for products and services;
- (C) represent the natural world using models and identify their limitations;
- (D) evaluate the impact of research on scientific thought, society, and the environment; and
- (F) connect Grade 7 science concepts with the history of science and contributions of scientists.

(7.4) **Scientific processes.** The student knows how to use tools and methods to conduct science inquiry.

The student is expected to:

- (A) collect, analyze, and record information to explain a phenomenon using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, hot plates, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, calculators, field equipment, computers, computer probes, timing devices, magnets, and compasses; and
- (B) collect and analyze information to recognize patterns such as rates of change.

(7.5) **Science concepts.** The student knows that an equilibrium of a system may change.

The student is expected to:

- (A) describe how systems may reach an equilibrium such as when a volcano erupts; and
- (B) observe and describe the role of ecological succession in maintaining an equilibrium in an ecosystem.

(7.6) **Science concepts.** The student knows that there is a relationship between force and motion.

The student is expected to:

- (A) demonstrate basic relationships between force and motion using simple machines including pulleys and levers;
- (B) demonstrate that an object will remain at rest or move at a constant speed and in a straight line if it is not being subjected to an unbalanced force; and
- (C) relate forces to basic processes in living organisms including the flow of blood and the emergence of seedlings.

(7.7) **Science concepts.** The student knows that substances have physical and chemical properties.

The student is expected to:

- (A) identify and demonstrate everyday examples of chemical phenomena such as rusting and tarnishing of metals and burning of wood;
- (B) describe physical properties of elements and identify how they are used to position an element on the periodic table; and
- (C) recognize that compounds are composed of elements.

(7.8) **Science concepts.** The student knows that complex interactions occur between matter and energy.

The student is expected to:

- (A) illustrate examples of potential and kinetic energy in everyday life such as objects at rest, movement of geologic faults, and falling water; and
- (B) identify that radiant energy from the Sun is transferred into chemical energy through the process of photosynthesis.

(7.9) **Science concepts.** The student knows the relationship between structure and function in living systems.

The student is expected to:

- (A) identify the systems of the human organism and describe their functions; and
- (B) describe how organisms maintain stable internal conditions while living in changing external environments.

(7.10) **Science concepts.** The student knows that species can change through generations and that the instructions for traits are contained in the genetic material of the organisms.

The student is expected to:

- (A) identify that sexual reproduction results in more diverse offspring and asexual reproduction results in more uniform offspring;



- (7.11) **Science concepts.** The student knows that the responses of organisms are caused by internal or external stimuli.
- (B) compare traits of organisms of different species that enhance their survival and reproduction; and
  - (C) distinguish between dominant and recessive traits and recognize that inherited traits of an individual are contained in genetic material.
- The student is expected to:
- (A) analyze changes in organisms such as a fever or vomiting that may result from internal stimuli; and
  - (B) identify responses in organisms to external stimuli found in the environment such as the presence or absence of light.
- (7.12) **Science concepts.** The student knows that there is a relationship between organisms and the environment.
- The student is expected to:
- (A) identify components of an ecosystem;
  - (B) observe and describe how organisms including producers, consumers, and decomposers live together in an environment and use existing resources;
  - (C) describe how different environments support different varieties of organisms; and
  - (D) observe and describe the role of ecological succession in ecosystems.
- (7.13) **Science concepts.** The student knows components of our solar system.
- The student is expected to:
- (A) identify and illustrate how the tilt of the Earth on its axis as it rotates and revolves around the Sun causes changes in seasons and the length of a day; and
  - (B) relate the Earth's movement and the moon's orbit to the observed cyclical phases of the moon.
- (7.14) **Science concepts.** The student knows that natural events and human activity can alter Earth systems.
- The student is expected to:
- (A) describe and predict the impact of different catastrophic events on the Earth;
  - (B) analyze effects of regional erosional deposition and weathering; and

- (C) make inferences and draw conclusions about effects of human activity on Earth's renewable, non-renewable, and inexhaustible resources.

*Source: The provisions of this §112.23 adopted to be effective September 1, 1998, 22 TexReg 7647.*

**§112.24. Science, Grade 8.**

- (a) Introduction.
    - (1) In Grade 8, the study of science includes planning and conducting field and laboratory investigations using scientific methods, analyzing data, critical-thinking, scientific problem-solving, and using tools such as telescopes to collect and analyze information. Students also use computers and information technology tools to support scientific investigations.
    - (2) As students learn science skills, they identify the roles of both human activities and natural events in altering Earth systems. Students learn that stars and galaxies are part of the universe, identify light years as a way to describe distance, and learn about scientific theories of the origin of the universe. Cycles within Earth systems are studied as students learn about lunar cycles and the rock cycle.
    - (3) Students examine information on the periodic table to recognize that elements are grouped into families. In addition, students demonstrate that exothermic and endothermic chemical reactions indicate that energy is lost or gained during a chemical reaction. Interactions in matter and energy are explored in solar, weather, and ocean systems. Students identify the origin of waves and investigate their ability to travel through different media.
    - (4) Students predict possible outcomes that result from different genetic combinations and explore the extinction of some species.
    - (5) 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.
    - (6) 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.
    - (7) 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.
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(b) Knowledge and skills.

(8.1) **Scientific processes.** The student 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.

(8.2) **Scientific processes.** The student uses scientific inquiry 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 and using equipment and technology;
- (B) collect data by observing and measuring;
- (C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;
- (D) communicate valid conclusions; and
- (E) construct graphs, tables, maps, and charts using tools including computers to organize, examine, and evaluate data.

(8.3) **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) draw inferences based on data related to promotional materials for products and services;
- (C) represent the natural world using models and identify their limitations;
- (D) evaluate the impact of research on scientific thought, society, and the environment; and
- (E) connect Grade 8 science concepts with the history of science and contributions of scientists.

(8.4) **Scientific processes.** The student knows how to use a variety of tools and methods to conduct science inquiry.

The student is expected to:

- (A) collect, record, and analyze information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, hot plates, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, calculators, field equipment, computers, computer probes, water test kits, and timing devices; and
- (B) extrapolate from collected information to make predictions.

(8.5) **Scientific processes.** The student knows that relationships exist between science and technology.

The student is expected to:

- (A) identify a design problem and propose a solution;
- (B) design and test a model to solve the problem; and
- (C) evaluate the model and make recommendations for improving the model.

(8.6) **Science concepts.** The student knows that interdependence occurs among living systems.

The student is expected to:

- (A) describe interactions among systems in the human organism;
- (B) identify feedback mechanisms that maintain equilibrium of systems such as body temperature, turgor pressure, and chemical reactions; and
- (C) describe interactions within ecosystems.

(8.7) **Science concepts.** The student knows that there is a relationship between force and motion.

The student is expected to:

- (A) demonstrate how unbalanced forces cause changes in the speed or direction of an object's motion; and
- (B) recognize that waves are generated and can travel through different media.

(8.8) **Science concepts.** The student knows that matter is composed of atoms.

The student is expected to:

- (A) describe the structure and parts of an atom; and
- (B) identify the properties of an atom including mass and electrical charge.

- (8.9) **Science concepts.** The student knows that substances have chemical and physical properties.
- The student is expected to:
- (A) demonstrate that substances may react chemically to form new substances;
  - (B) interpret information on the periodic table to understand that physical properties are used to group elements;
  - (C) recognize the importance of formulas and equations to express what happens in a chemical reaction; and
  - (D) identify that physical and chemical properties influence the development and application of everyday materials such as cooking surfaces, insulation, adhesives, and plastics.
- (8.10) **Science concepts.** The student knows that complex interactions occur between matter and energy.
- The student is expected to:
- (A) illustrate interactions between matter and energy including specific heat;
  - (B) describe interactions among solar, weather, and ocean systems; and
  - (C) identify and demonstrate that loss or gain of heat energy occurs during exothermic and endothermic chemical reactions.
- (8.11) **Science concepts.** The student knows that traits of species can change through generations and that the instructions for traits are contained in the genetic material of the organisms.
- The student is expected to:
- (A) identify that change in environmental conditions can affect the survival of individuals and of species;
  - (B) distinguish between inherited traits and other characteristics that result from interactions with the environment; and
  - (C) make predictions about possible outcomes of various genetic combinations of inherited characteristics.
- (8.12) **Science concepts.** The student knows that cycles exist in Earth systems.
- The student is expected to:
- (A) analyze and predict the sequence of events in the lunar and rock cycles;
  - (B) relate the role of oceans to climatic changes; and
  - (C) predict the results of modifying the Earth's nitrogen, water, and carbon cycles.

(8.13) **Science concepts.** The student knows characteristics of the universe.

The student is expected to:

- (A) describe characteristics of the universe such as stars and galaxies;
- (B) explain the use of light years to describe distances in the universe; and
- (C) research and describe historical scientific theories of the origin of the universe.

(8.14) **Science concepts.** The student knows that natural events and human activities can alter Earth systems.

The student is expected to:

- (A) predict land features resulting from gradual changes such as mountain building, beach erosion, land subsidence, and continental drift;
- (B) analyze how natural or human events may have contributed to the extinction of some species; and
- (C) describe how human activities have modified soil, water, and air quality.

*Source: The provisions of this §112.24 adopted to be effective September 1, 1998, 22 TexReg 7647.*