



TEKS Vertical Alignment for STAAR Alternate 2

Science

Pre-kindergarten through End-of-Course

Updated September 2018

Matter and Energy

Physical science skills. The student learns to explore properties of materials, positions, and motion of objects through investigations which allow him or her to notice the attributes (Pre-K.VI.A).

Matter and energy. The student knows that objects have properties and patterns (K.5; 1.5). The student knows that matter has physical properties and those properties determine how it is described, classified, changed, and used (2.5). The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used (3.5; 4.5; 5.5). The student knows the differences between elements and compounds (6.5). The student knows matter has physical properties that can be used for classification (6.6). The student knows that some of Earth's energy resources are available on a nearly perpetual basis, while others can be renewed over a relatively short period of time. Some energy resources, once depleted, are essentially nonrenewable (6.7). The student knows that interactions occur between matter and energy (7.5).

The student knows that matter has physical and chemical properties and can undergo physical and chemical changes (7.6). The student knows that matter is composed of atoms and has chemical and physical properties (8.5). The student is expected to

Characteristics and Properties of Matter

- observe, investigate, describe, and discuss properties and characteristics of common objects (Pre-K)
- observe and record properties of objects, including bigger or smaller, heavier or lighter, shape, color, and texture (K)
- observe, record, and discuss how materials can be changed by heating or cooling (K)
- classify objects by observable properties such as larger and smaller, heavier and lighter, shape, color, and texture (1)
- predict and identify changes in materials caused by heating and cooling (1)
- classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid (2)
- compare changes in materials caused by heating and cooling (2)
- demonstrate that things can be done to materials such as cutting, folding, sanding, and melting to change their physical properties (2)
- combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties (2)
- measure, test, and record physical properties of matter, including temperature, mass, magnetism, and the ability to sink or float (3)
- describe and classify samples of matter as solids, liquids, and gases and demonstrate that solids have a definite shape and that liquids and gases take the shape of their container (3)
- predict, observe, and record changes in the state of matter caused by heating or cooling such as ice becoming liquid water, condensation forming on the outside of a glass of ice water, or liquid water being heated to the point of becoming water vapor (3)
- explore and recognize that a mixture is created when two materials are combined such as gravel and sand or metal and plastic paper clips (3)
- measure, compare, and contrast physical properties of matter, including mass, volume, states (solid, liquid, gas), temperature, magnetism, and the ability to sink or float (4)
- compare and contrast a variety of mixtures, including solutions (4)
- classify matter based on measurable, testable, and observable physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating using water as a reference point), solubility in water, and the ability to conduct or insulate thermal energy or electric energy (5)
- demonstrate that some mixtures maintain physical properties of their ingredients such as iron filings and sand and sand and water (5)

- identify changes that can occur in the physical properties of the ingredients of solutions such as dissolving salt in water or adding lemon juice to water (5)
- know that an element is a pure substance represented by a chemical symbol and that a compound is a pure substance represented by a chemical formula. (6)
- recognize that a limited number of the many known elements comprise the largest portion of solid Earth, living matter, oceans, and the atmosphere (6)
- identify the formation of a new substance by using the evidence of a possible chemical change such as production of a gas, change in temperature, production of a precipitate, or color change (6)
- compare metals, nonmetals, and metalloids using physical properties such as luster, conductivity, or malleability (6)
- calculate density to identify an unknown substance (6)
- test the physical properties of minerals, including hardness, color, luster, and streak (6)
- research and discuss the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources (6)
- recognize that radiant energy from the Sun is transformed into chemical energy through the process of photosynthesis (7)
- diagram the flow of energy through living systems, including food chains, food webs, and energy pyramids (7)
- distinguish between physical and chemical changes (7)
- interpret the arrangement of the Periodic Table, including groups and periods, to explain how properties are used to classify elements (8)

Atomic Structure and Chemical Bonding

- describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud (8)
- identify that protons determine an element's identity and valence electrons determine its chemical properties, including reactivity (8)

Chemical Reactions

- recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts (8)
- investigate how evidence of chemical reactions indicates that new substances with different properties are formed and how that relates to the law of conservation of mass (8)

Force, Motion, and Energy

Physical science skills. The student learns to explore properties of materials, positions, and motion of objects through investigations which allow him or her to notice the attributes (Pre-K.VI.A).

Force, motion, and energy. The student knows that force, motion and energy are related and are a part of everyday life (K.6; 1.6). The student knows that forces cause change and that energy exists in many forms (2.6; 3.6). The student knows that energy exists in many forms and can be observed in cycles, patterns, and systems (4.6). The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems (5.6). The student knows force and motion are related to potential and kinetic energy (6.8). The student knows that there is a relationship among force, motion, and energy (7.7). The student knows that there is a relationship between force, motion, and energy (8.6). The student is expected to

Force and Motion

- observe, investigate, describe, and discuss position and motion of objects (Pre-K)
- explore interactions between magnets and various materials (K)
- observe and describe the location of an object in relation to another such as above, below, behind, in front of, and beside (K)
- observe and describe the ways that objects can move such as in a straight line, zigzag, up and down, back and forth, round and round, and fast and slow (K)
- predict and describe how a magnet can be used to push or pull an object (1)
- demonstrate and record the ways that objects can move such as in a straight line, zigzag, up and down, back and forth, round and round, and fast and slow (1)
- observe and identify how magnets are used in everyday life (2)
- trace and compare patterns of movement of objects such as sliding, rolling, and spinning over time (2)
- demonstrate and observe how position and motion can be changed by pushing and pulling objects such as swings, balls, and wagons (3)
- observe forces such as magnetism and gravity acting on objects (3)
- design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism (4)
- design a simple experimental investigation that tests the effect of force on an object (5)
- identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces (6)
- calculate average speed using distance and time measurements (6)
- measure and graph changes in motion (6)
- investigate how inclined planes can be used to change the amount of force to move an object (6)
- demonstrate and illustrate forces that affect motion in organisms such as emergence of seedlings, turgor pressure, geotropism, and circulation of blood (7)
- demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion (8)
- differentiate between speed, velocity, and acceleration (8)
- investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches (8)

Physical science skills. The student learns to explore properties of materials, positions, and motion of objects through investigations which allow him or her to notice the attributes (Pre-K.VI.A).

Force, motion, and energy. The student knows that force, motion, and energy are related and are a part of everyday life (K.6; 1.6). The student knows that forces cause change and that energy exists in many forms (2.6; 3.6). The student knows that energy exists in many forms and can be observed in cycles, patterns, and systems (4.6). The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems (5.6). The student knows force and motion are related to potential and kinetic energy (6.8). The student knows

that the Law of Conservation of Energy states that energy can neither be created nor destroyed, it just changes form (6.9). The student knows that there is a relationship among force, motion, and energy (7.7). The student is expected to

Energy in its Many Forms

- observe, investigate, describe, and discuss sources of energy including light, heat, and electricity (Pre-K)
- use the senses to explore different forms of energy such as light, thermal, and sound (K)
- identify and discuss how different forms of energy such as light, thermal, and sound are important to everyday life (1)
- investigate the effects on objects by increasing or decreasing amounts of light, heat, and sound energy such as how the color of an object appears different in dimmer light or how heat melts butter (2)
- explore different forms of energy, including mechanical, light, sound, and thermal in everyday life (3)
- differentiate among forms of energy, including mechanical, sound, electrical, light, and thermal (4)
- differentiate between conductors and insulators of thermal and electrical energy (4)
- explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy (5)
- demonstrate that light travels in a straight line until it strikes an object and is reflected or travels through one medium to another and is refracted (5)
- compare and contrast potential and kinetic energy (6)
- investigate methods of thermal energy transfer, including conduction, convection, and radiation (6)
- verify through investigations that thermal energy moves in a predictable pattern from warmer to cooler until all the substances attain the same temperature such as an ice cube melting (6)
- demonstrate energy transformations such as energy in a flashlight battery changes from chemical energy to electrical energy to light energy (6)
- illustrate the transformation of energy within an organism such as the transfer from chemical energy to thermal energy (7)

Electricity and Magnetism

- demonstrate that electricity travels in a closed path, creating an electrical circuit (4)
- demonstrate that the flow of electricity in closed circuits can produce light, heat, or sound (5)

Earth and Space

Earth and space science skills. The student learns about earth and space (Pre-K.VI.C).

Earth and space. The student learns about earth and space (Pre-K.VI.C). The student knows that the natural world includes earth materials (K.7; 2.7). The student knows that there are recognizable patterns in the natural world and among objects in the sky (K.8; 2.8; 3.8). The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems (1.7). The student knows that the natural world includes the air around us and objects in the sky (1.8). The student knows that Earth consists of natural resources and its surface is constantly changing (3.7). The student knows that Earth consists of useful resources and its surface is constantly changing (4.7). The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system (4.8; 5.8). The student knows Earth's surface is constantly changing and consists of useful resources (5.7). The student understands the structure of Earth, the rock cycle, and plate tectonics (6.10). The student knows that natural events and human activity can impact Earth systems (7.8). The student knows that natural events can impact Earth systems (8.9). The student knows that climatic interactions exist among Earth, ocean, and weather systems (8.10). The student is expected to

Earth: Seasons, Climate, and Weather

- observe and describe what happens during changes in the earth and sky (Pre-K)
- observe and describe weather changes from day to day and over seasons (K)

- identify events that have repeating patterns, including seasons of the year and day and night (K)
- record weather information, including relative temperature such as hot or cold, clear or cloudy, calm or windy, and rainy or icy (1)
- identify characteristics of the seasons of the year and day and night (1)
- demonstrate that air is all around us and observe that wind is moving air (1)
- measure, record and graph weather information, including temperature, wind conditions, precipitation, and cloud coverage, in order to identify patterns in the data (2)
- identify the importance of weather and seasonal information to make choices in clothing, activities, and transportation (2)
- observe, measure, record, and compare day-to-day weather changes in different locations at the same time that include air temperature, wind direction, and precipitation (3)
- describe and illustrate the Sun as a star composed of gases that provides light and thermal energy (3)
- measure, record, and predict changes in weather (4)
- describe and illustrate the continuous movement of water above and on the surface of Earth through the water cycle and explain the role of the Sun as a major source of energy in this process (4)
- collect and analyze data to identify sequences and predict patterns of change in shadows, seasons, and the observable appearance of the Moon over time (4)
- differentiate between weather and climate (5)
- explain how the Sun and the ocean interact in the water cycle (5)
- recognize that the Sun provides the energy that drives convection within the atmosphere and oceans, producing winds (8)
- identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts (8)
- identify the role of the oceans in the formation of weather systems such as hurricanes (8)

Earth: Rock, Soil, and Water

- observe, investigate, describe, and discuss earth materials, and their properties and uses (Pre-K)
- demonstrate the importance of caring for our environment and our planet (Pre-K)
- observe, describe, and sort rocks by size, shape, color, and texture (K)
- observe and describe physical properties of natural sources of water, including color and clarity (K)
- give examples of ways rocks, soil, and water are useful (K)
- observe, compare, describe, and sort components of soil by size, texture, and color (1)
- identify and describe a variety of natural sources of water, including streams, lakes, and oceans (1)
- identify how rocks, soil, and water are used to make products (1)
- observe, describe, and compare rocks by size, texture, and color (2)
- identify and compare the properties of natural sources of freshwater and saltwater (2)
- distinguish between natural and manmade resources (2)
- explore the characteristics of natural resources that make them useful in products and materials such as clothing and furniture and how resources may be conserved (3)
- examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants (4)
- identify and classify Earth's renewable resources, including air, plants, water, and animals, and nonrenewable resources, including coal, oil, and natural gas, and the importance of conservation (4)
- model the effects of human activity on groundwater and surface water in a watershed (7)

Earth: Formation of Earth's Surface and Earth's Resources

- observe, investigate, describe and discuss earth materials, and their properties and uses. (Pre-K)
- explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains (3)

- investigate rapid changes in Earth’s surface such as volcanic eruptions, earthquakes, and landslides (3)
- observe and identify slow changes to Earth’s surface caused by weathering, erosion, and deposition from water, wind, and ice (4)
- explore the processes that led to the formation of sedimentary rocks and fossil fuels (5)
- recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to Earth's surface by wind, water, or ice (5)
- build a model to illustrate the compositional and mechanical layers of Earth, including the inner core, outer core, mantle, crust, asthenosphere, and lithosphere (6)
- classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation (6)
- identify the major tectonic plates, including Eurasian, African, Indo-Australian, Pacific, North American, and South American (6)
- describe how plate tectonics causes major geological events such as ocean basin formation, earthquakes, volcanic eruptions, and mountain building (6)
- predict and describe how catastrophic events such as floods, hurricanes, or tornadoes impact ecosystems (7)
- analyze the effects of weathering, erosion, and deposition on the environment in ecoregions of Texas (7)
- describe the historical development of evidence that supports plate tectonic theory (8)
- relate plate tectonics to the formation of crustal features (8)
- interpret topographic maps and satellite views to identify land and erosional features and predict how these features may be reshaped by weathering (8)

Earth and space science skills. The student learns about earth and space (Pre-K.VI.C).

Earth and space. The student knows that there are recognizable patterns in the natural world and among objects in the sky (K.8; 2.8; 3.8). The student knows that the natural world includes the air around us and objects in the sky (1.8). The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system (5.8). The student understands the organization of our solar system and the relationships among the various bodies that comprise it (6.11). The student knows components of our solar system (7.9). The student knows the effects resulting from cyclical movements of the Sun, Earth, and Moon (8.7). The student knows characteristics of the universe (8.8). The student is expected to

Space: The Solar System and the Universe

- identify, observe, and discuss objects in the sky (Pre-K)
- observe and describe what happens during changes in the earth and sky (Pre-K)
- observe, describe, and illustrate objects in the sky such as the clouds, Moon, and stars, including the Sun (K)
- observe and record changes in the appearance of objects in the sky such the Moon and stars, including the Sun (1)
- observe, describe, and record patterns of objects in the sky, including the appearance of the Moon (2)
- construct models that demonstrate the relationship of the Sun, Earth, and Moon, including orbits and positions (3)
- identify the planets in Earth’s solar system and their position in relation to the Sun (3)
- demonstrate that Earth rotates on its axis once approximately every 24 hours causing the day/night cycle and the apparent movement of the Sun across the sky (5)
- identify and compare the physical characteristics of the Sun, Earth and Moon (5)

- describe the physical properties, locations, and movements of the Sun, planets, moons, meteors, asteroids, and comets (6)
- understand that gravity is the force that governs the motion of our solar system (6)
- describe the history and future of space exploration, including the types of equipment and transportation needed for space travel (6)
- analyze the characteristics of objects in our solar system that allow life to exist such as the proximity of the Sun, presence of water, and composition of the atmosphere (7)
- identify the accommodations, considering the characteristics of our solar system, that enabled manned space exploration (7)
- model and illustrate how the tilted Earth rotates on its axis, causing day and night, and revolves around the Sun causing changes in seasons (8)
- demonstrate and predict the sequence of events in the lunar cycle (8)
- relate the positions of the Moon and Sun to their effect on ocean tides (8)
- describe components of the universe, including stars, nebulae, and galaxies, and use models such as the Hertzsprung-Russell diagram for classification (8)
- recognize that the Sun is a medium-sized star located in a spiral arm of the Milky Way galaxy and that the Sun is many thousands of times closer to Earth than any other star (8)
- identify how different wavelengths of the electromagnetic spectrum such as visible light and radio waves are used to gain information about components in the universe (8)
- research how scientific data are used as evidence to develop scientific theories to describe the origin of the universe (8)

Organisms and Environments

Organisms and environments. The student knows all organisms are classified into domains and kingdoms. Organisms within these taxonomic groups share similar characteristics that allow them to interact with the living and nonliving parts of their ecosystem (6.12). The student knows that living systems at all levels of organization demonstrate the complementary nature of structure and function (7.12). The student knows that a living organism must be able to maintain balance in stable internal conditions in response to external and internal stimuli (7.13).

Science concepts. The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells (Biology 4). The student knows how an organism grows and the importance of cell differentiation (Biology 5). The student knows that biological systems are composed of multiple levels (Biology 10). The student knows that biological systems work to achieve and maintain balance (Biology 11). The student is expected to

Organisms: Structure and Function of Living Systems

- understand that all organisms are composed of one or more cells (6)
- recognize that the presence of a nucleus is a key factor used to determine whether a cell is prokaryotic or eukaryotic (6)
- identify the main functions of the systems of the human organism, including the circulatory, respiratory, skeletal, muscular, digestive, excretory, reproductive, integumentary, nervous, and endocrine systems (7)
- recognize levels of organization in plants and animals, including cells, tissues, organs, organ systems, and organisms (7)
- differentiate between structure and function in plant and animal cell organelles, including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole (7)
- compare the functions of cell organelles to the functions of an organ system (7)

- recognize the components of cell theory (7)
- compare and contrast prokaryotic and eukaryotic cells including their complexity, and compare and contrast scientific explanations for cellular complexity (Biology)
- investigate and explain cellular processes, including homeostasis and transport of molecules (Biology)
- compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza (Biology)
- describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation (Biology)
- recognize that disruptions of the cell cycle lead to diseases such as cancer (Biology)
- describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals (Biology)
- describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants (Biology)
- analyze the levels of organization in biological systems and relate the levels to each other and to the whole system (Biology)

Environment: Organisms' Response to Their Environment

- investigate how organisms respond to external stimuli found in the environment such as phototropism and fight or flight (7)
- describe and relate responses in organisms that may result from internal stimuli such as wilting in plants and fever or vomiting in animals that allow them to maintain balance (7)
- summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems (Biology)
- describe how events and processes that occur during ecological succession can change populations and species diversity (Biology)

Organisms and environments. The student knows all organisms are classified into domains and kingdoms. Organisms within these taxonomic groups share similar characteristics that allow them to interact with the living and nonliving parts of their ecosystem (6.12). The student knows that populations and species demonstrate variation and inherit many of their unique traits through gradual processes over many generations (7.11).

Science concepts. The student knows that taxonomy is a branching classification based on the shared characteristics of organisms and can change as new discoveries are made (Biology 8). The student is expected to

Organisms: Classification of Organisms

- recognize that the broadest taxonomic classification of living organisms is divided into currently recognized domains (6)
- identify the basic characteristics of organisms, including prokaryotic or eukaryotic, unicellular or multicellular, autotrophic or heterotrophic, and mode of reproduction, that further classify them in the currently recognized kingdoms (6)
- examine organisms or their structures such as insects or leaves and use dichotomous keys for identification (7)
- define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community (Biology)
- categorize organisms using a hierarchical classification system based on similarities and differences shared among groups (Biology)
- compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals (Biology)

Life sciences skills. The student understands differences in living and non-living things (Pre-K.VI.B).

Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments (K.10; 1.10; 2.10). The student knows that organisms undergo similar life processes and have structures that help them survive within their environments (3.10). The student knows that organisms undergo similar life processes and have structures and behaviors that help them survive within their environment (4.10). The student knows that organisms have structures and behaviors that help them survive within their environments (5.10). The student is expected to

Organisms: Life Cycles

- describe life cycles of organisms (Pre-K)
- observe changes that are part of a simple life cycle of a plant: seed, seedling, plant, flower, and fruit (K)
- observe and record life cycles of animals such as a chicken, frog, or fish (1)
- investigate and record some of the unique stages that insects such as grasshoppers and butterflies undergo during their life cycle (2)
- investigate and compare how animals and plants undergo a series of orderly changes in their diverse life cycles such as tomato plants, frogs, and lady beetles (3)
- explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans (4)

Life sciences skills. The student understands differences in living and non-living things (Pre-K.VI.B).

Personal safety and health skills. The student demonstrates an understanding of health and safety issues as it relates to their daily routines and activities (Pre-K.IX.C).

Organisms and environments. The student observes and describes the characteristics of organisms, the life cycle of organisms, and the relationship between organisms and their environments (Pre-K.VI.B). The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival (K.9). The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments (K.10; 1.10; 2.10). The student knows that the living environment is composed of relationships between organisms and the life cycles that occur (1.9). The student knows that living organisms have basic needs that must be met for them to survive within their environment (2.9). The student knows and can describe patterns, cycles, systems, and relationships within the environments (3.9). The student knows and understands that living organisms within an ecosystem interact with one another and with their environment (4.9). The student knows that there are relationships, systems, and cycles within environments (5.9). The student knows all organisms are classified into domains and kingdoms. Organisms within these taxonomic groups share similar characteristics that allow them to interact with the living and nonliving parts of their ecosystem (6.12). The student knows that there is a relationship between organisms and the environment (7.10). The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems (8.11).

Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life (Biology 7). The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms (Biology 9). The student knows that interdependence and interactions occur within an environmental system (Biology 12). The student is expected to

Environment: Identify How Organisms Meet Their Basic Needs

- observe, investigate, describe, and discuss the characteristics of organisms (Pre-K)
- practice good habits of personal health and hygiene (Pre-K)
- identify good habits of nutrition and exercise (Pre-K)
- differentiate between living and nonliving things based upon whether they have basic needs and produce offspring (K)
- examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants (K)
- sort plants and animals into groups based on physical characteristics such as color, size, body covering, or leaf shape (K)
- identify basic parts of plants and animals (K)
- sort and classify living and nonliving things based upon whether they have basic needs and produce offspring (1)
- identify and compare the parts of plants (1)
- identify the basic needs of plants and animals (2)
- identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things (2)
- observe, record, and compare how the physical characteristics and behaviors of animals help them meet their basic needs (2)
- observe, record, and compare how the physical characteristics of plants help them meet their basic needs such as stems carry water throughout the plant (2)

Environment: How Organisms Depend on Each Other and Their Environment

- observe, investigate, describe, and discuss the relationship of organisms to their environments (Pre-K)
- analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver (1)
- gather evidence of interdependence among living organisms such as energy transfer through food chains or animals using plants for shelter (1)
- compare the ways living organisms depend on each other and on their environments such as through food chains (2)
- observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem (3)
- identify and describe the flow of energy in a food chain and predict how changes in a food chain affect the ecosystem such as removal of frogs from a pond or bees from a field (3)
- describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations (3)
- investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food (4)
- describe the flow of energy through food webs, beginning with the Sun, and predict how changes in the ecosystem affect the food web (4)
- observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components (5)
- describe the flow of energy within a food web, including the roles of the Sun, producers, consumers, and decomposers (5)
- predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways (5)
- identify fossils as evidence of past living organisms and the nature of the environments at the time using models (5)
- describe biotic and abiotic parts of an ecosystem in which organisms interact (6)

- diagram the levels of organization within an ecosystem, including organism, population, community, and ecosystem (6)
- observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms (7)
- describe how biodiversity contributes to the sustainability of an ecosystem (7)
- observe, record, and describe the role of ecological succession such as in a microhabitat of a garden with weeds (7)
- investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as quantity of light, water, range of temperatures, or soil composition (8)
- recognize human dependence on ocean systems and explain how human activities such as runoff, artificial reefs, or use of resources have modified these systems (8)
- analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental (Biology)
- compare the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids (Biology)
- compare the reactants and products of photosynthesis and cellular respiration in terms of energy, energy conversions, and matter (Biology)
- identify and investigate the role of enzymes (Biology)
- interpret relationships, including predation, parasitism, commensalism, mutualism, and competition, among organisms (Biology)
- analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids (Biology)
- describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles (Biology)
- describe how environmental change can impact ecosystem stability (Biology)

Organisms and environments. The student observes and describes the characteristics and life cycle of organisms and the relationship between the organism and its environment (Pre-K.VI.B). The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments (1.10). The student knows that organisms undergo similar life processes and have structures that help them survive within their environments (3.10). The student knows that organisms undergo similar life processes and have structures and behaviors that help them survive within their environment (4.10). The student knows that organisms have structures and behaviors that help them survive within their environments (5.10). The student knows that populations and species demonstrate variation and inherit many of their unique traits through gradual processes over many generations (7.11). The student knows that living systems at all levels of organization demonstrate the complementary nature of structure and function (7.12). The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems (8.11).

Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life (Biology 7). The student knows that interdependence and interactions occur within an environmental system (Biology 12). The student is expected to

Environment: Adaptations and Biological Evolution

- observe, investigate, describe and discuss the relationship of organisms to their environments (Pre-K)
- investigate how the external characteristics of an animal are related to where it lives, how it moves, and what it eats (1)
- explore how structures and functions of plants and animals allow them to survive in a particular environment (3)

- explore how structures and functions enable organisms to survive in their environment (4)
- compare the structures and functions of different species that help them live and survive in a specific environment such as hooves on prairie animals or webbed feet in aquatic animals (5)
- explain variation within a population or species by comparing external features, behaviors, or physiology of organisms that enhance their survival such as migration, hibernation, or storage of food in a bulb (7)
- identify some changes in genetic traits that have occurred over several generations through natural selection and selective breeding such as the Galapagos Medium Ground Finch (*Geospiza fortis*) or domestic animals and hybrid plants (7)
- investigate and explain how internal structures of organisms have adaptations that allow specific functions such as gills in fish, hollow bones in birds, or xylem in plants (7)
- explore how short- and long-term environmental changes affect organisms and traits in subsequent populations (8)
- examine scientific explanations of abrupt appearance and stasis in the fossil record (Biology)
- analyze and evaluate how natural selection produces change in populations, not individuals (Biology)
- analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success (Biology)
- analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species (Biology)
- analyze other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination (Biology)
- compare variations and adaptations of organisms in different ecosystems (Biology)

Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments (K.10; 1.10). The student knows that organisms undergo similar life processes and have structures that help them survive within their environments (3.10). The student knows that organisms undergo similar life processes and have structures and behaviors that help them survive within their environment (4.10). The student knows that organisms have structures and behaviors that help them survive within their environments (5.10). The student knows that reproduction is a characteristic of living organisms and that the instructions for traits are governed in the genetic material (7.14).

Science concepts. The student knows how an organism grows and the importance of cell differentiation (Biology 5). The student knows the mechanisms of genetics such as the role of nucleic acids and the principles of Mendelian and non-Mendelian genetics (Biology 6). The student is expected to

Organisms: Inherited Traits and Learned Behaviors

- identify ways that young plants resemble the parent plant (K)
- compare ways that young animals resemble their parents (1)
- explore and describe examples of traits that are inherited from parents to offspring such as eye color and shapes of leaves and behaviors that are learned such as reading a book and a wolf pack teaching their pups to hunt effectively (4)
- differentiate between inherited traits of plants and animals such as spines on a cactus or shape of a beak and learned behaviors such as an animal learning tricks or a child riding a bicycle (5)

Organisms: Genetic Material and its Role in Inheritance

- define heredity as the passage of genetic instructions from one generation to the next generation (7)
- compare the results of uniform or diverse offspring from asexual or sexual reproduction (7)

- recognize that inherited traits of individuals are governed in the genetic material found in the genes within chromosomes in the nucleus (7)
- describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms (Biology)
- identify components of DNA, identify how information for specifying the traits of an organism is carried in the DNA, and examine scientific explanations for the origin of DNA (Biology)
- recognize that components that make up the genetic code are common to all organisms (Biology)
- explain the purpose and process of transcription and translation using models of DNA and RNA (Biology)
- recognize that gene expression is a regulated process (Biology)
- identify and illustrate changes in DNA and evaluate the significance of these changes (Biology)
- predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses, and non-Mendelian inheritance (Biology)
- recognize the significance of meiosis to sexual reproduction (Biology)

Scientific Investigation and Reasoning

Personal safety and health skills. The student demonstrates an understanding of health and safety issues as it relates to their daily routines and activities (Pre-K.IX.C).

Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and uses environmentally appropriate and responsible practices (K.1; 1.1). The student conducts classroom and outdoor investigations following home and school safety procedures (2.1). The student conducts classroom and outdoor investigations following home and school safety procedures and environmentally appropriate practices (3.1). The student knows how to use a variety of tools and methods to conduct science inquiry (3.4; 5.4). The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry (4.4). The student conducts classroom and outdoor investigations, following home and school safety procedures and environmentally appropriate and ethical practices (4.1; 5.1). The student, for at least 40% of instructional time, conducts laboratory and field investigations following safety procedures and environmentally appropriate and ethical practices (6.1; 7.1; 8.1). The student knows how to use a variety of tools and safety equipment to conduct science inquiry (6.4; 7.4; 8.4).

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

Demonstrate Home and School Safety Practices

- practice good habits of personal safety (Pre-K)
- identify, discuss, and demonstrate safe and healthy practices as outlined in Texas Education Agency-approved safety standards during classroom and outdoor investigations, including wearing safety goggles or chemical splash goggles, as appropriate, washing hands, and using materials appropriately (K-1)
- identify, describe, and demonstrate safe practices as outlined in Texas Education Agency-approved safety standards during classroom and outdoor investigations, including wearing safety goggles or chemical splash goggles, as appropriate, washing hands, and using materials appropriately (2)
- demonstrate safe practices as described in Texas Education Agency-approved safety standards during classroom and outdoor investigations using safety equipment as appropriate, including safety goggles or chemical splash goggles, as appropriate, and gloves (3)
- demonstrate safe practices and the use of safety equipment as described in Texas Education Agency-approved safety standards during classroom and outdoor investigations using safety equipment, including safety goggles or chemical splash goggles, as appropriate, and gloves, as appropriate (4)

- demonstrate safe practices and the use of safety equipment as outlined in Texas Education Agency-approved safety standards during classroom and outdoor investigations using safety equipment, including safety goggles or chemical splash goggles, as appropriate, and gloves, as appropriate (5)
- demonstrate safe practices during laboratory and field investigations as outlined in Texas Education Agency-approved safety standards (6–8)
- use preventative safety equipment, including chemical splash goggles, aprons, and gloves, and be prepared to use emergency safety equipment, including an eye/face wash, a fire blanket, and a fire extinguisher (6–8)
- demonstrate safe practices during laboratory and field investigations (Biology)

Use and Conservation of School Resources and Laboratory Materials

- demonstrate how to use, conserve, and dispose of natural resources and materials such as conserving water and reusing or recycling paper, plastic, and metal (K)
- identify and learn how to use natural resources and materials, including conservation and reuse or recycling of paper, plastic, and metals (1)
- identify and demonstrate how to use, conserve, and dispose of natural resources and materials such as conserving water and reuse or recycling of paper, plastic, and metal (2)
- make informed choices in the use and conservation of natural resources by recycling or reusing materials such as paper, aluminum cans, and plastics (3)
- make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans, and plastic (4)
- make informed choices in the conservation, disposal, and recycling of materials (5)
- practice appropriate use and conservation of resources, including disposal, reuse, or recycling of materials (6–8)
- demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials (Biology)

Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations (K.2; 1.2). The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations (2.2). The student uses scientific inquiry methods during laboratory and outdoor investigations (3.2; 4.2). The student uses scientific methods during laboratory and outdoor investigations (5.2). The student uses scientific inquiry methods during laboratory and field investigations (6.2; 7.2; 8.2).

Scientific processes. The student uses scientific methods and equipment during laboratory and field investigations (Biology 2). The student is expected to

Plan and Conduct Investigations

- ask questions about organisms, objects, and events observed in the natural world (K–1)
- plan and conduct simple descriptive investigations (K–1)
- ask questions about organisms, objects, and events during observations and investigations (2)
- plan and conduct descriptive investigations (2)
- plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world (3)
- plan and implement descriptive investigations, including asking well defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions (4)
- describe, plan, and implement simple experimental investigations testing one variable (5)

- ask well defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology (5)
- design and implement experimental investigations by making observations, asking well defined questions, formulating testable hypotheses, and using appropriate equipment and technology (6–7)
- plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology (6–8)
- design and implement experimental investigations by making observations, asking well defined questions, formulating testable hypotheses, and using appropriate equipment and technology (8)
- know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories (Biology)
- know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed (Biology)
- plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology (Biology)
- know the definition of science and understand that it has limitations, as specified in Chapter 112.34, Subsection (b)(2) of 19 TAC* (Biology)
- distinguish between scientific hypotheses and scientific theories (Biology)

*Chapter 112.34, Subsection (b)(2) of 19 TAC; Nature of Science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

Physical science skills. The student learns to explore properties of materials, positions, and motion of objects through investigations which allow him or her to notice the attributes (Pre-K.VI.A).

Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations (K.2; 1.2). The student uses age-appropriate tools and models to investigate the natural world (K.4; 1.4; 2.4). The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations (2.2). The student uses scientific practices during laboratory and outdoor investigations (3.2; 4.2; 5.2). The student knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions (3.3). The student knows how to use a variety of tools and methods to conduct science inquiry (3.4; 5.4). The student uses critical thinking and scientific problem solving to make informed decisions (4.3; 5.3). The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry (4.4). The student uses scientific practices during laboratory and field investigations (6.2; 7.2; 8.2). The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists (6.3; 7.3; 8.3). The student knows how to use a variety of tools and safety equipment to conduct science inquiry (6.4; 7.4; 8.4).

Scientific processes. The student uses scientific practices and equipment during laboratory and field investigations (Biology 2). The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom (Biology 3). The student is expected to

Gather Information

- use simple measuring devices to learn about objects (Pre-K)
- record and organize data and observations using pictures, numbers, and words (K)

- collect information using tools, including computing devices, hand lenses, primary balances, cups, bowls, magnets, collecting nets, and notebooks; timing devices; non-standard measuring items; weather instruments such as demonstration thermometers; and materials to support observations of habitats of organisms such as terrariums and aquariums (K)
- use the senses as a tool of observation to identify properties and patterns of organisms, objects, and events in the environment (K)
- collect data and make observations using simple tools (K–1)
- collect, record, and compare information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, notebooks, and safety goggles or chemical splash goggles, as appropriate; timing devices; non-standard measuring items; weather instruments such as classroom thermometers and wind socks; and materials to support observations of habitats of organisms such as aquariums and terrariums (1)
- measure and compare organisms and objects using non-standard units (1)
- record and organize data using pictures, numbers, and words (1–2)
- collect data from observations using scientific tools (2)
- collect, record, and compare information using tools, including computers, hand lenses, rulers, plastic beakers, magnets, collecting nets, notebooks, and safety goggles or chemical splash goggles, as appropriate; timing devices; weather instruments such as thermometers, wind vanes, and rain gauges; and materials to support observations of habitats of organisms such as terrariums and aquariums (2)
- measure and compare organisms and objects (2)
- collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data (3)
- collect, record, and analyze information using tools, including cameras, computers, hand lenses, metric rulers, Celsius thermometers, wind vanes, rain gauges, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, magnets, collecting nets, notebooks, and Sun, Earth, and Moon system models; timing devices; and materials to support observation of habitats of organisms such as terrariums and aquariums (3)
- collect and record data by observing and measuring, using the metric system, and using descriptive words and numerals such as labeled drawings, writing, and concept maps (4)
- collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, mirrors, spring scales, balances, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices; and materials to support observation of habitats of organisms such as terrariums and aquariums (4)
- collect and record information by detailed observations and accurate measuring (5)
- collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, prisms, mirrors, balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices; and materials to support observations of habitats of organisms such as terrariums and aquariums (5)
- use appropriate tools, including journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, balances, microscopes, thermometers, calculators, computers, timing devices, and other necessary equipment to collect, record, and analyze information (6)
- collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers (6–8)
- use appropriate tools, including life science models, hand lenses, stereoscopes, microscopes, beakers, Petri dishes, microscope slides, graduated cylinders, test tubes, meter sticks, metric rulers, metric tape measures, timing devices, hot plates, balances, thermometers, calculators, water test kits, computers, temperature and pH probes, collecting nets, insect traps, globes, digital cameras, journals/notebooks, and other necessary equipment to collect, record, and analyze information (7)

- use appropriate tools, including lab journals/notebooks, beakers, meter sticks, graduated cylinders, anemometers, psychrometers, hot plates, test tubes, spring scales, balances, microscopes, thermometers, calculators, computers, spectrosopes, timing devices, and other necessary equipment to collect, record, and analyze information (8)
- collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as data-collecting probes, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, balances, gel electrophoresis apparatuses, micropipettes, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures (Biology)

Organize Information

- compare results of investigations with what students and scientists know about the world (2)
- construct maps, graphic organizers, simple tables, charts, and bar graphs using tools and current technology to organize, examine, and evaluate measured data (3)
- construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data (4)
- construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information (5)
- construct tables and graphs, using repeated trials and means, to organize data and identify patterns (6–8)

Analyze Evidence and Communicate Conclusions

- communicate observations about simple descriptive investigations (K)
- communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations (1)
- communicate observations and justify explanations using student-generated data from simple descriptive investigations (2)
- analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations (3)
- communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion (3)
- demonstrate that repeated investigations may increase the reliability of results (3, 5)
- analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing (3–5)
- analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured (4)
- perform repeated investigations to increase the reliability of results (4)
- communicate valid oral and written results supported by data (4)
- analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence (5)
- communicate valid conclusions in both written and verbal forms (5)
- analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends (6–8)
- analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student (6–8; Biology)
- analyze, evaluate, make inferences, and predict trends from data (Biology)
- communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports (Biology)

Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving (K.3; 1.3). The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions (2.3). The student knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions (3.3). The student uses critical thinking and scientific problem solving to make informed decisions (4.3; 5.3). The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists (6.3; 7.3; 8.3).

Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom (Biology 3). The student is expected to

Application of Science

- identify and explain a problem such as the impact of littering and propose a solution (K)
- make predictions based on observable patterns in nature (K)
- identify and explain a problem and propose a solution (1)
- make predictions based on observable patterns (1–2)
- identify and explain a problem and propose a task and solution for the problem (2)
- communicate and apply scientific information extracted from various sources such as current events, published journal articles, and marketing materials (Biology)
- draw inferences based on data related to promotional materials for products and services (Biology)

Use Models

- represent the natural world using models such as volcanoes or the Sun, Earth, and Moon system and identify their limitations, including size, properties, and materials (3)
- represent the natural world using models such as the water cycle and stream tables and identify their limitations, including accuracy and size (4)
- draw or develop a model that represents how something that cannot be seen such as the Sun, Earth, and Moon system and formation of sedimentary rock works or looks (5)
- use models to represent aspects of the natural world such as a model of Earth's layers (6)
- identify advantages and limitations of models such as size, scale, properties, and materials (6–8)
- use models to represent aspects of the natural world such as human body systems and plant and animal cells (7)
- use models to represent aspects of the natural world such as an atom, a molecule, space, or a geologic feature (8)
- evaluate models according to their limitations in representing biological objects or events (Biology)

History and Impact of Scientific Research

- explore that scientists investigate different things in the natural world and use tools to help in their investigations (K)
- describe what scientists do (1)
- identify what a scientist is and explore what different scientists do (2)
- connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists (3–5)
- relate the impact of research on scientific thought and society, including the history of science and contributions of scientists as related to the content (6–8)
- evaluate the impact of scientific research on society and the environment (Biology)
- research and describe the history of biology and contributions of scientists (Biology)

NOTE: This document is updated according to *TEXAS Prekindergarten Guidelines* (Updated 2015) and *Streamlined Science TEKS* (Updated 2017). Texas Education Agency