

# RTC & Content TEKS

## Detailed Connections Maps, Grades 6-8 and Biology

See the RTC & Content TEKS Connections Maps At-A-Glance starting on page 11.



**(PAT)** Patterns

**(ME)** Matter and Energy

**(CE)** Cause and Effect Relationships

**(SF)** Structure and Function

**(SPQ)** Scale, Proportion, and Quantity

**(SC)** Stability and Change

**(SYS)** Systems and System Models

## Grade 6

### Matter and Its Properties

(6) The student knows that matter is made of atoms, can be classified according to its properties, and can undergo changes. The student is expected to:

(A) compare solids, liquids, and gasses in terms of their structure, shape, volume, and kinetic energy of atoms and molecules; **(PAT)**

(B) investigate the physical properties of matter to distinguish between pure substances, homogeneous mixtures (solutions), and heterogeneous mixtures; **(ME)**

(C) identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life; **(PAT)**

(D) compare the density of substances relative to various fluids; **(SPQ)**

(E) identify the formation of a new substance by using the evidence of a possible chemical change, including the production of a gas, change in thermal energy, production of a precipitate, and color change. **(CE, SPQ, ME)**

## Force, Motion, and Energy

(7) The student knows the nature of forces and their role in systems that experience stability or change. The student is expected to:

(A) identify and explain how forces act on objects, including gravity, friction, magnetism, applied forces, and normal forces, using real-world applications; **(SC, ME, SYS, PAT)**

(B) calculate the net force on an object in a horizontal or vertical direction using diagrams and determine if the forces are balanced or unbalanced; **(SYS, SPQ, PAT)**

(C) identify simultaneous force pairs that are equal in magnitude and opposite in direction that result from the interactions between objects using Newton's Third Law of Motion. **(ME, SPQ, PAT)**

(8) The student knows that the total energy in systems is conserved through energy transfers and transformations. The student is expected to:

(A) compare and contrast gravitational, elastic, and chemical potential energies with kinetic energy; **(ME, SPQ, PAT)**

(B) describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, or photosynthesis; **(ME, SC, SYS)**

(C) explain how energy is transferred through transverse and longitudinal waves. **(ME, SC, SYS)**

## Earth and Space

(9) The student models the cyclical movements of the Sun, Earth, and Moon and describes their effects. The student is expected to:

(A) model and illustrate how the tilted Earth revolves around the Sun, causing changes in seasons; **(SYS, SC, CE, PAT, SPQ)**

(B) describe and predict how the positions of the Earth, Sun, and Moon cause daily, spring, and neap cycles of ocean tides due to gravitational forces. **(SYS, SC, CE, PAT)**

(10) The student understands the rock cycle and the structure of Earth. The student is expected to:

(A) differentiate between the biosphere, hydrosphere, atmosphere, and geosphere and identify components of each system; **(SYS, SF, SPQ)**

(B) model and describe the layers of Earth, including the inner core, outer core, mantle, and crust; **(SYS, SF, SPQ)**

(C) describe how metamorphic, igneous, and sedimentary rocks form and change through geologic processes in the rock cycle. **(SC, SYS)**

(11) The student understands how resources are managed. The student is expected to:

(A) research and describe why resource management is important in reducing global energy poverty, malnutrition, and air and water pollution; **(SC, CE)**

(B) explain how conservation, increased efficiency, and technology can help manage air, water, soil, and energy resources. **(CE, SYS, SC)**

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## Organisms and Environments

(12) The student knows that interdependence occurs between living systems and the environment. The student is expected to:

(A) investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition; **(ME, SYS, CE, SC)**

(B) describe and give examples of predatory, competitive, and symbiotic relationships between organisms, including mutualism, parasitism, and commensalism; **(SYS, PAT, CE, SF, ME)**

(C) describe the hierarchical organization of organisms, populations, and communities within an ecosystem. **(SYS, SF, ME)**

(13) The student knows that organisms have an organizational structure and variations can influence the survival of populations. The student is expected to:

(A) describe the historical development of cell theory and explain how organisms are composed of one or more cells, which come from pre-existing cells and are the basic unit of structure and function **(SYS, SC)**

(B) identify and compare the basic characteristics of organisms, including prokaryotic and eukaryotic, unicellular and multicellular, and autotrophic and heterotrophic; **(PAT, SF SPQ)**

(C) describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change. **(SF, SC, SYS)**

## Grade 7

### Matter and Energy

(6) The student knows that matter has measurable physical properties that determine how matter is identified, classified, changed, and used. The student is expected to:

(A) compare and contrast elements and compounds in terms of atoms and molecules, chemical symbols, and chemical formulas; **(PAT)**

(B) use the periodic table to identify the atoms and the number of each kind within a chemical formula; **(PAT)**

(C) distinguish between physical and chemical changes in matter; **(CE)**

(D) describe aqueous solutions in terms of solute and solvent, concentration, and dilution; **(PAT)**

(E) investigate and model how temperature, surface area, and agitation affect the rate of dissolution of solid solutes in aqueous solutions. **(SYS, SPQ, SF)**

### Force, Motion, and Energy

(7) The student describes the cause-and-effect relationship between force and motion. The student is expected to:

(A) calculate average speed using distance and time measurements from investigations; **(CE, SPQ, SYS, ME)**

(B) distinguish between speed and velocity in linear motion in terms of distance, displacement, and direction; **(PAT)**

(C) measure, record, and interpret an object's motion using distance-time graphs; **(PAT, CE, SPQ, ME)**

(D) analyze the effect of balanced and unbalanced forces on the state of motion of an object using Newton's First Law of Motion. **(SC, CE, SYS, ME)**

(8) The student understands the behavior of thermal energy as it flows into and out of systems. The student is expected to:

(A) investigate methods of thermal energy transfer into and out of systems, including conduction, convection, and radiation; **(ME, SYS)**

(B) investigate how thermal energy moves in a predictable pattern from warmer to cooler until all substances within the system reach thermal equilibrium; **(ME, SYS, PAT)**

## Earth and Space

(9) The student understands the patterns of movement, organization, and characteristics of components of our solar system. The student is expected to:

(A) describe the physical properties, locations, and movements of the Sun, planets, moons, meteors, asteroids, comets, Kuiper belt, and Oort cloud; **(PAT, SYS, SPQ)**

(B) describe how gravity governs motion within Earth's solar system; **(CE, ME, SYS)**

(C) analyze the characteristics of Earth that allow life to exist such as the proximity of the Sun, the presence of water, and the composition of the atmosphere. **(CE, ME, SYS)**

(10) The student understands the causes and effects of plate tectonics. The student is expected to:

(A) describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition; **(CE, SPQ, SC, SYS)**

(B) describe how plate tectonics causes ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including supervolcanoes and hot spots. **(CE, SYS, SC, SF, SPQ)**

(11) The student understands how human activity can impact the hydrosphere. The student is expected to:

(A) analyze the beneficial and harmful influences of human activity on groundwater and surface water in a watershed; **(CE, SC, SYS)**

(B) describe human dependence and influence on ocean systems and explain how human activities impact these systems. **(SYS, CE, SC, SF)**

## Organisms and Environments

(12) The student understands that ecosystems are dependent upon the cycling of matter and the flow of energy. The student is expected to:

(A) diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids; **(SYS, ME, CE, PAT, SPQ)**

(B) describe how ecosystems are sustained by the continuous flow of energy and the recycling of matter and nutrients within the biosphere. **(SYS, ME, CE, PAT, SC)**

(13) The student knows how systems are organized and function to support the health of an organism and how traits are inherited. The student is expected to:

(A) identify and model the main functions of the systems of the human organism, including the circulatory, respiratory, skeletal, muscular, digestive, urinary, reproductive, integumentary, nervous, immune, and endocrine systems; **(SF, SYS)**

(B) describe the hierarchical organization of cells, tissues, organs, and organ systems within plants and animals; **(SF, SYS, CE, SPQ)**

(C) compare the results of asexual and sexual reproduction of plants and animals in relation to the diversity of offspring and the changes in the population over time; **(SC, CE, SF, PAT)**

(D) describe and give examples of how natural and artificial selection change the occurrence of traits in a population over generations. **(SC, SYS, SF)**

(14) The student knows how the taxonomic system is used to describe relationships between organisms. The student is expected to:

(A) describe the taxonomic system that categorizes organisms based on similarities and differences shared among groups; **(SF, SYS)**

(B) describe the characteristics of the recognized kingdoms and their importance in ecosystems such as bacteria aiding digestion or fungi decomposing organic matter. **(SF, SYS, SC)**

## Grade 8

### Matter and Energy

(6) The student understands that matter can be classified according to its properties and that matter is conserved in chemical changes that occur within closed systems. The student is expected to:

(A) explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures; **(SYS, PAT, SPQ)**

(B) use the periodic table to identify the atoms involved in chemical reactions; **(PAT, SC, CE, SYS)**

(C) describe the properties of cohesion, adhesion, and surface tension in water and relate to observable phenomena such as the formation of droplets, transport in plants, and insects walking on water; **(SYS, SPQ)**

(D) compare and contrast the properties of acids and bases, including pH relative to water; **(SC, CE, SYS)**

(E) investigate how mass is conserved in chemical reactions and relate the conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis. **(CE, ME, SC)**

### Force, Motion, and Energy

(7) The student understands the relationship between force and motion within systems. The student is expected to:

(A) calculate and analyze how the acceleration of an object is dependent upon the net force acting on the object and the mass of the object using Newton's Second Law of Motion; **(SPQ, CE, ME, SYS)**

(B) investigate and describe how Newton's three laws of motion act simultaneously within systems such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches. **(SYS, SPQ, CE, PAT, SC)**

(8) The student knows how energy is transferred through waves. The student is expected to:

(A) compare the characteristics of amplitude, frequency, and wavelength in transverse waves, including the electromagnetic spectrum; **(SPQ, ME, SYS)**

(B) explain the use of electromagnetic waves in applications such as radiation therapy, wireless technologies, fiber optics, microwaves, ultraviolet sterilization, astronomical observations, and X-rays. **(ME, SYS, SF)**

## Earth and Space

(9) The student describes the characteristics of the universe and the relative scale of its components. The student is expected to:

(A) describe the life cycle of stars and compare and classify stars using the Hertzsprung-Russell diagram; **(SPQ, SC)**

(B) categorize galaxies as spiral, elliptical, and irregular and locate Earth's solar system within the Milky Way galaxy; **(SPQ, PAT, SYS)**

(C) research and analyze scientific data used as evidence to develop scientific theories that describe the origin of the universe. **(SYS, CE, PAT, SPQ)**

(10) The student knows that interactions between Earth, ocean, and weather systems impact climate. The student is expected to:

(A) describe how energy from the Sun, hydrosphere, and atmosphere interact and influence weather and climate; **(ME, SYS, SC, SF, SPQ)**

(B) identify global patterns of atmospheric movement and how they influence local weather; **(PAT, SYS, CE, ME, SPQ)**

(C) describe the interactions between ocean currents and air masses that produce tropical cyclones, including typhoons and hurricanes. **(SF, SC, SYS, ME, SPQ)**

(11) The student knows that natural events and human activity can impact global climate. The student is expected to:

(A) use scientific evidence to describe how natural events, including volcanic eruptions, meteor impacts, abrupt changes in ocean currents, and the release and absorption of greenhouse gases influence climate; **(CE, SYS, SPQ, ME)**

(B) use scientific evidence to describe how human activities, including the release of greenhouse gases, deforestation, and urbanization, can influence climate; **(CE, SC, SYS, ME)**

(C) describe the carbon cycle. **(SC, SYS, ME)**

## Organisms and Environments

(12) The student understands stability and change in populations and ecosystems. The student is expected to:

(A) explain how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems; **(SC, SYS, ME, SF, CE)**

(B) describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity; **(SC, CE, SYS)**

(C) describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem. **(SC, SYS, ME, CE)**

(13) The student knows how cell functions support the health of an organism and how adaptation and variation relate to survival. The student is expected to:

(A) identify the function of the cell membrane, cell wall, nucleus, ribosomes, cytoplasm, mitochondria, chloroplasts, and vacuoles in plant or animal cells; **(SF, SYS)**

(B) describe the function of genes within chromosomes in determining inherited traits of offspring; **(SF, CE, SC)**

(C) describe how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations. **(SPQ, SF, SC, SYS, CE)**

## Biology (Suggested)

### Biological Structures, Functions, and Processes

(5) The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. The student is expected to:

(A) relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell; **(SF)**

(B) compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity; **(PAT, SPQ)**

(C) investigate homeostasis through the cellular transport of molecules; **(SYS, CE, ME)**

(D) compare the structures of viruses to cells and explain how viruses spread and cause disease. **(CE, SF, SPQ)**

(6) The student knows how an organism grows and the importance of cell differentiation. The student is expected to:

(A) explain the importance of the cell cycle to the growth of organisms, including an overview of the stages of the cell cycle and deoxyribonucleic acid (DNA) replication models; **(PAT, SC, SF)**



(B) explain the process of cell specialization through cell differentiation, including the role of environmental factors; **(CE, SYS, SF)**

(C) relate disruptions of the cell cycle to how they lead to the development of diseases such as cancer. **(CE, PAT, SC)**

## Mechanisms of Genetics

(7) The student knows the role of nucleic acids in gene expression. The student is expected to:

(A) identify components of DNA, explain how the nucleotide sequence specifies some traits **(PAT, ME, SF, SYS)** of an organism, and examine scientific explanations for the origin of DNA; **(CE, SC, PAT)**

(B) describe the significance of gene expression and explain the process of protein synthesis using models of DNA and ribonucleic acid (RNA); **(CE, PAT, SYS, ME)**

(C) identify and illustrate changes in DNA and evaluate the significance of these changes; **(CE, PAT, SC, ME)**

(D) discuss the importance of molecular technologies such as polymerase chain reaction (PCR) gel electrophoresis **(ME)**, and genetic engineering that are applicable in current research and engineering practices. **(SF, CE, PAT, SYS)**

(8) The student knows the role of nucleic acids and the principles of inheritance and variation of traits in Mendelian and non-Mendelian genetics. The student is expected to:

(A) analyze the significance of chromosome reduction, independent assortment, and crossing over during meiosis in increasing diversity in populations of organisms that reproduce sexually; **(SF, CE, PAT, SPQ)**

(B) predict possible outcomes of various genetic combinations using monohybrid and dihybrid crosses, including non-Mendelian traits of incomplete dominance, codominance, sex-linked traits, and multiple alleles. **(PAT, CE, SPQ, SF)**

## Biological Evolution

(9) The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple lines of evidence. The student is expected to:

(A) analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental; **(PAT, SF, SC)**

(B) examine scientific explanations for varying rates of change such as gradualism, abrupt appearance, and stasis in the fossil record. **(SPQ, SC, PAT)**

(10) The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. The student is expected to:

(A) analyze and evaluate how natural selection produces change in populations and not in individuals; **(CE, SC, SF)**

(B) 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; **(PAT, CE, SYS, ME, SC, SPQ)**



(C) analyze and evaluate how natural selection may lead to speciation; **(CE, SF, SC)**

(D) analyze evolutionary mechanisms other than natural selection, including genetic drift, gene flow, mutation, and genetic recombination, and their effect on the gene pool of a population. **(PAT, CE, SC, SPQ)**

## Biological Structures, Functions, and Processes

(11) The student knows the significance of matter cycling, energy flow, and enzymes in living organisms. The student is expected to:

(A) explain how matter is conserved and energy is transferred during photosynthesis and cellular respiration using models, including the chemical equations for these processes; **(ME, SC, CE)**

(B) investigate and explain the role of enzymes in facilitating cellular processes. **(CE, SF, SYS, ME)**

(12) The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. The student is expected to:

(A) analyze the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals; **(SYS, SF, SC, ME, SPQ)**

(B) explain how the interactions that occur among systems that perform functions of transport, reproduction, and response in plants are facilitated by their structures. **(SYS, ME, SF, CE, SPQ)**

## Interdependence Within Environmental Systems

(13) The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. The student is expected to:

(A) investigate and evaluate how ecological relationships, including predation, parasitism, commensalism, mutualism, and competition influence ecosystem stability; **(SYS, SF, SC, ME, CE, SPQ)**

(B) analyze how ecosystem stability is affected by disruptions to the cycling of matter and the flow of energy through trophic levels using models; **(SC, SYS, ME, CE)**

(C) explain the significance of the carbon and nitrogen cycles to ecosystem stability and analyze the consequences of disrupting these cycles; **(SC, ME, SYS, SF, CE)**

(D) explain how environmental change, including change due to human activity, affects biodiversity and analyze how changes in biodiversity impact ecosystem stability. **(SC, CE, SYS, SPQ)**