SCIENCE TEXAS ESSENTIAL KNOWLEDGE AND SKILLS (TEKS) SUMMARY

About The Science TEKS:

The Science TEKS K-8 are divided into three parts: the Introduction, the Scientific Processes, and the Scientific Concepts.

Introduction:

The Introduction in each grade level informs key stakeholders of the pervading themes in science such as a conceptual understanding of cycles and systems, properties, patterns and models, form and function, and constancy and change. These themes also include the nature of science allowing students to use critical thinking skills in asking questions; gathering information, communicating findings, and making informed decisions.

Scientific Processes:

The first three TEKS at each grade level are processes essential for scientific investigation: safety in the classroom, field and laboratory experiences, scientific methods, and critical thinking. The fourth TEKS specifically lists the tools necessary for such investigations at the K-8 grade levels.

Scientific Concepts:

The scientific concepts include major strands that vertically align and build the basis of science literacy. They provide the foundation for further science learning in the high school curriculum. The major strands include life, physical, and earth/space sciences.

Kindergarten:

Kindergarten students describe and observe properties and patterns of organisms, objects and events around them. They sort, record, identify, and manipulate parts of systems such as plants, animals, and simple toys. They observe and record changes in weather, and life cycles of organisms in their natural environment. They observe and identify the basic needs of organisms. They also identify, describe and observe rocks, soil and water and how these are useful as resources for life.

Grade 1:

First grade students sort objects and events to form patterns including identification, prediction, and the creation of patterns in charts, graphs, and numerical representation. Students investigate systems to understand how parts within these systems interact. They continue to observe, describe, and record changes in the environment such as weather, seasons, and life cycles of organisms. They compare and give examples of the ways living organisms depend on each other for their basic needs. Earth science concepts include sources of water, rocks, soil, and how these are recycled.

Grade 2:

Second grade students classify and sequence organisms, objects, and events to identify patterns. Systems are manipulated to observe how parts (essential and non-essential) within systems can interact. Changes are identified, analyzed, and recorded to explain

force and motion, evaporation, weather, the night sky, and seasons. The water cycle, gases of the atmosphere, rocks and soil, and uses of other natural resources are also studied.

Grade 3:
Third grade students continue their observations of simple systems and describe the role of various parts within the system such as germination of seeds and simple toys. They observe, measure, and record forces causing changes in objects and changes on the Earth (such as weathering, subsidence and earthquakes). They learn how matter has physical properties such as temperature and magnetism and they identify matter as solids, liquids, and gases. They observe and describe habitats and ecosystems and how environmental changes affect the objects and organisms within those ecosystems. Students also begin to identify species and adaptations within those species for survival and simple concepts related to reproduction.

Grade 4:
Fourth grade students identify and describe complex systems and predict what happens when parts of a system are removed. They identify patterns of change such as weather, metamorphosis, symmetry, and objects in the night sky. Matter and its physical properties are tested, comparing data about states of matter, conduction, density, and buoyancy. Students learn how adaptations may increase survival in past and present species. They observe likenesses and differences within offspring to distinguish between inherited traits and learned characteristics. They identify that certain past events affect present and future events using fossils, and changes in growth, erosion, dissolving, weathering and flow. They test properties of soils and summarize the effects of the oceans on land. Students also identify the Sun as the major source of energy for the Earth.

Grade 5:
Fifth grade students continue to know how a system is a collection of processes that interact. They identify and describe examples of daily, weekly, lunar, and seasonal cycles including life cycles of plants and animals. They identify the significance of water, carbon, and nitrogen cycles. They continue to study the physical properties of matter, the conduction and insulation of heat, electricity, and the production of sound. They observe and measure constant properties of everyday substances such as boiling points and melting points. They differentiate among forms of light, heat, electrical, and solar energy. They study reflection and refraction of light. They continue to learn about adaptation and the unique niche of some organisms in an ecosystem. They identify traits that are inherited in plants and animals. Students now interpret how landforms are the result of a combination of constructive and destructive forces. Past and present events that affect the future help students understand the formation of Earth's renewable, non-renewable, and inexhaustible resources. Gravity, gravitational forces in the solar system, and the physical characteristics of the Earth, are also identified and compared.

Grade 6:

Sixth grade students combine systems to describe how the properties of a system are different than the parts within the system. Force and motion are demonstrated, measured, and graphically represented. These forces include volcanic activity, uplifting, and the movements of water. Students classify new substances that are chemically combined by physical and chemical properties. Energy transformations including photosynthesis, food chains and food webs are explained and illustrated. Structure and function in living systems such as cells are identified and differentiated. The role of genes is studied as well as the identification of natural and selective breeding. Students identify internal and external stimuli response in organisms and the components of an ecosystem to which organisms may respond such as heat or light. They now study all components of our solar system and space travel. Students learn about Earth systems including the rock cycle, surface and groundwater cycles, watersheds, components of the atmosphere (oxygen, nitrogen, and water vapor), and they also identify the role of atmospheric movement in weather changes.

Grade 7:

Seventh grade students describe equilibrium of systems and ecological succession. They demonstrate the relationship between force and motion using pulleys and levers, forces within organisms for basic processes, and the law of conservation of energy. They study the periodic table and the elements, and understand how compounds are composed of elements. They illustrate how complex interactions occur between matter and energy. Potential and kinetic energy are studied along with radiant energy sources. Systems of the body and the relationship between structure and function in all living systems are studied. Students identify how sexual reproduction produces more diverse offspring and asexual reproduction results in more uniform offspring. Dominant and recessive traits are distinguished within organisms. Internal and external stimuli are analyzed. Consumers, producers, and decomposers are studied to know that there is a relationship between organisms and the environment. The tilt of the Earth, rotation, and revolution and their consequences are studied, as well as components of the solar system, such as the moon and moon phases. The student at this grade level studies how natural events and human activity can also alter Earth systems.

Grade 8:

Eighth grade students now design and test models to show how technology and science are connected. They study systems and feedback mechanisms that maintain equilibrium of systems. They also describe interactions within ecosystems. Force and motion including wave dynamics are demonstrated and illustrated. Matter is described and known to consist of atoms. The students identify parts of atoms, their structure, mass and electrical charge. Chemical and physical properties of substances include the importance of formulas, and equations to express chemical reactions. They interpret information on the periodic table to understand how physical properties group elements. Interaction between matter and energy are illustrated using specific heat as an example. Solar, weather, and ocean systems are studied, as well as the identification, and demonstration, of loss or gain of heat energy occurring during exothermic and endothermic chemical reactions. Traits of species are identified and students make predictions about possible outcomes of various genetic combinations of inherited characteristics. Students analyze

and predict the sequence of events in lunar and rock cycles, the role of oceans in climatic changes, and the results of modifying Earth cycles including the nitrogen, water, and carbon cycles. The characteristics of the universe are studied such as stars and galaxies, and various historical scientific theories of the origin of the universe. Measurement in light years is applied to astronomical studies. Students predict land features resulting from gradual changes such as mountain building, beach erosion, land subsidence, and continental drift. Students analyze how natural or human events may have contributed to the extinction of some species and also how human activities have modified soil, water, and air quality.

***High School Courses*:**
All students in high school science courses conduct field and laboratory investigations, use scientific methods during investigations, and make informed decisions using critical-thinking and scientific problem-solving. All High School Science courses include a 40% laboratory and field requirement.

Integrated Physics and Chemistry (IPC):
IPC integrates the disciplines of physics and chemistry in the following topics: motion, waves, energy transformations, properties of matter, changes in matter, and solution chemistry. Students use mathematical formulas to calculate work, momentum, acceleration, density, and speed. Students use the Periodic Table as a tool to predict patterns in chemical bonding and balance simple chemical equations. They become familiar with factors that affect the rate of solution. Students understand the movement of heat energy through materials, and know the concept of specific heat. They understand the characteristics of waves and identify the relationships between wavelength, frequency, and amplitude.

Biology:
In the Biology course students study a variety of topics that include: structures and functions of cells and viruses; growth and development of organisms; cells, tissues, and organs; nucleic acids and genetics; biological evolution; taxonomy; metabolism and energy transfers in living organisms; living systems; homeostasis; ecosystems; and plants and the environment. Students learn how nucleic acids are involved in the formation of an organism and the inheritance of traits. Students learn to use Punnett squares and probability to find possible genotypes and phenotypes. Students understand the relationship between ecology, evolution and genetic principles. They understand differences between bacteria and viruses. Food webs and the cycling of nutrients in ecosystems are learned as well as the significance of structures and adaptations of both animals and plants.

Environmental Systems:
In the Environmental Systems course students study a variety of topics that include: biotic and abiotic factors in habitats; ecosystems and biomes; interrelationships among resources and an environmental system; sources and flow of energy though an

environmental system; relationship between carrying capacity and changes in populations and ecosystems; and changes in environments.

Chemistry:
In the Chemistry course students will investigate how chemistry is an integral part of our daily lives. By studying a variety of topics that include: characteristics of matter; energy transformations during physical and chemical changes; atomic structure; the periodic table of elements; behavior of gases; bonding; nuclear fusion and nuclear fission; oxidation-reduction reactions; chemical equations; solutes; properties of solutions; acids and bases; and chemical reactions.

Aquatic Science:
In the Aquatic Science course students will investigate a variety of topics that include: components of an aquatic ecosystem; relationships among aquatic habitats and ecosystems; roles of cycles within an aquatic environment; adaptations of aquatic organisms; changes within aquatic environments; geological phenomena and fluid dynamics effects; and origin and use of water in a watershed.

Physics:
The Physics course provides students with conceptual frameworks, factual knowledge, and analytical and scientific skills. Students study a variety of topics that include laws of motion; changes within physical systems and conservation of energy and momentum; forces; thermodynamics; characteristics and behavior of waves; and quantum physics.

Astronomy:
The Astronomy course includes an in-depth study of the role of the Sun in our solar system; planets; and the orientation and placement of the Earth as well as a thorough exploration of the universe, scientific theories of the evolution of the universe; and characteristics and the life cycle of stars.

Geology, Meteorology, Oceanography (GMO):
In the GMO course students study a variety of topics that include formation, characteristics, conditions and history of the Earth. Students also learn about plate tectonics; origin and composition of minerals and rocks and the rock cycle; processes and products of weathering; natural energy resources; interactions in a watershed; characteristics of oceans and of the atmosphere; and the role of energy in weather and global climate.

Scientific Research and Design:
The Scientific Research and Design course includes the processes of science that can include content that is innovative and detailed. Students conduct in-depth guided or independent research in any of the science disciplines. Their research must be presented to an appropriate audience. This course can satisfy one of the Advanced Measures under the Distinguished Graduation Plan.

Anatomy and Physiology of Human Systems:

In the Anatomy and Physiology of Human Systems course students conduct in-depth investigations of anatomy and physiology of human systems including circulatory, nervous, endocrine, and respiratory systems. They learn environmental factors that affect the body and how the body maintains homeostasis.

Medical Microbiology:
The Medical Microbiology course allows students to learn the relationship between microbes and health, including an in-depth understanding of the role of microbes in maintaining health and in causing disease. They learn microbiology laboratory techniques and explore health careers.

Pathophysiology:
The Pathophysiology course allows students to learn in depth the processes of pathogenesis and learn about specific human diseases. Students also understand a variety of disease control techniques.

Principles of Technology I (PT1):
The PT1 course allows students to learn applied physics concepts and use a systems approach to investigate mechanical, fluid, electrical, and thermal systems. Students understand concepts of force, motion, and work. This course may be substituted for Physics on the Recommended High School Plan (RHSP).

Principles of Technology II (PT2):
In PT2 students will understand waves, vibrations and linear and angular momentum and the graphical representations of these phenomena. They also explore in-depth concepts of light and optics.