TEXAS EDUCATOR CERTIFICATION
TExES | TExMaT | TASC/TASC-ASL
Texas Education Agency

TExES® Physical Science 6–12
Curriculum Crosswalk

	Required Course Numbers										
Test Content Categories											
Domain I — Scientific Inquiry and Processes											
Competency 001: *The teacher understands how to select and manage learning activities to ensure the safety of all students and the correct use and care of organisms, natural resources, materials, equipment and technologies*.											
A. Uses current sources of information about laboratory safety, including safety regulations and guidelines for the use of science facilities.											
B. Recognizes potential safety hazards in the laboratory and in the field and knows how to apply procedures, including basic first aid, for responding to accidents.											
C. Employs safe practices in planning, implementing and managing all instructional activities and designs and implements rules and procedures to maintain a safe learning environment.											
D. Understands procedures for selecting, maintaining and safely using chemicals, tools, technologies, materials, specimens and equipment, including procedures for the recycling, reuse and conservation of laboratory resources and for the safe handling and ethical treatment of organisms.											

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E. Knows how to use appropriate equipment and technology (e.g., Internet, spread-sheet, calculator) for gathering, organizing, displaying and communicating data in a variety of ways (e.g., charts, tables, graphs, diagrams, maps, satellite images, written reports, oral presentations).											
F. Understands how to use a variety of tools, techniques and technology to gather, organize and analyze data; how to perform calculations; and how to apply appropriate methods of statistical measures and analyses.											
G. Knows how to apply techniques to calibrate measuring devices and understands concepts of precision, accuracy and error with regard to reading and recording numerical data from scientific instruments (e.g., significant figures).											
H. Uses the International System of Units (i.e., metric system) and performs unit conversions within and across measurement systems.											
Competency 002: *The teacher understands the nature of science, the process of scientific inquiry and the unifying concepts that are common to all sciences.*											
A. Understands the nature of science, the relationship between science and technology, the predictive power of science and limitations to the scope of science (i.e., the types of questions that science can and cannot answer).											

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B. Knows the characteristics of various types of scientific investigations (e.g., descriptive studies, controlled experiments, comparative data analysis) and how and why scientists use different types of scientific investigations.											
C. Understands principles and procedures for designing and conducting a variety of scientific investigations — with emphasis on inquiry-based investigations — and how to communicate and defend scientific results.											
D. Understands how logical reasoning, verifiable observational and experimental evidence and peer review are used in the process of generating and evaluating scientific knowledge.											
E. Understands how to identify potential sources of error in an investigation, evaluate the validity of scientific data and develop and analyze different explanations for a given scientific result.											
F. Knows the characteristics and general features of systems; how properties and patterns of systems can be described in terms of space, time, energy and matter; and how system components and different systems interact.											
G. Knows how to apply and analyze the systems model (e.g., interacting parts, boundaries, input, output, feedback, subsystems) across the science disciplines.											

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H. Understands how shared themes and concepts (e.g., systems, order and organization; evidence, models and explanation; change, constancy and measurements; evolution and equilibrium; and form and function) provide a unifying framework in science.											
I. Understands the difference between a theory and a hypothesis, how models are used to represent the natural world and how to evaluate the strengths and limitations of a variety of scientific models (e.g., physical, conceptual, mathematical).											
Competency 003: *The teacher understands the history of science, how science impacts the daily lives of students and how science interacts with and influences personal and societal decisions.*											
A. Understands the historical development of science, key events in the history of science and the contributions that diverse cultures and individuals of both genders have made to scientific knowledge.											
B. Knows how to use examples from the history of science to demonstrate the changing nature of scientific theories and knowledge (i.e., that scientific theories and knowledge are always subject to revision in light of new evidence).											
C. Knows that science is a human endeavor influenced by societal, cultural and personal views of the world, and knows that decisions about the use and direction of science are based on factors such as ethical standards, economics and personal and societal biases and needs.											

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D. Understands the application of scientific ethics to the conducting, analyzing and publishing of scientific investigations.											
E. Applies scientific principles to analyze factors (e.g., diet, exercise, personal behavior) that influence personal and societal choices concerning fitness and health (e.g., physiological and psychological effects and risks associated with the use of substances and substance abuse).											
F. Applies scientific principles, the theory of probability and risk/benefit analysis to analyze the advantages of, disadvantages of or alternatives to a given decision or course of action.											
G. Understands the role science can play in helping resolve personal, societal and global issues (e.g., recycling, population growth, disease prevention, resource use, evaluating product claims).											
Domain II — Physics											
Competency 004: *The teacher understands the description of motion in one and two dimensions.*											
A. Generates, analyzes and interprets graphs describing the motion of a particle.											
B. Applies vector concepts to displacement, velocity and acceleration in order to analyze and describe the motion of a particle.											

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C. Solves problems involving uniform and accelerated motion using scalar (e.g., speed) and vector (e.g., velocity) quantities.											
D. Analyzes and solves problems involving projectile motion.											
E. Analyzes and solves problems involving uniform circular and rotary motion.											
F. Understands motion of fluids.											
G. Understands motion in terms of frames of reference and relativity concepts.											
Competency 005: *The teacher understands the laws of motion*.											
A. Identifies and analyzes the forces acting in a given situation and constructs a free-body diagram.											
B. Solves problems involving the vector nature of force (e.g., resolving forces into components, analyzing static or dynamic equilibrium of a particle).											
C. Identifies and applies Newton's laws to analyze and solve a variety of practical problems (e.g., properties of frictional forces, acceleration of a particle on an inclined plane, displacement of a mass on a spring, forces on a pendulum).											

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Competency 006: *The teacher understands the concepts of gravitational and electromagnetic forces in nature.*											
A. Applies the law of universal gravitation to solve a variety of problems (e.g., determining the gravitational fields of the planets, analyzing properties of satellite orbits).											
B. Calculates electrostatic forces, fields and potentials.											
C. Understands the properties of magnetic materials and the molecular theory of magnetism.											
D. Identifies the source of the magnetic field and calculates the magnetic field for various simple current distributions.											
E. Analyzes the magnetic force on charged particles and current-carrying conductors.											
F. Understands induced electric and magnetic fields and analyzes the relationship between electricity and magnetism.											
G. Understands the electromagnetic spectrum and the production of electromagnetic waves.											

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Competency 007: *The teacher understands applications of electricity and magnetism.*											
A. Analyzes common examples of electrostatics (e.g., a charged balloon attached to a wall, behavior of an electroscope, charging by induction).											
B. Understands electric current, resistance and resistivity, potential difference, capacitance and electromotive force in conductors and circuits.											
C. Analyzes series and parallel DC circuits in terms of current, resistance, voltage and power.											
D. Identifies basic components and characteristics of AC circuits.											
E. Understands the operation of an electromagnet.											
F. Understands the operation of electric meters, motors, generators and transformers.											
Competency 008: *The teacher understands the conservation of energy and momentum*.											
A. Understands the concept of work.											
B. Understands the relationships among work, energy and power.											
C. Solves problems using the conservation of mechanical energy in a physical system (e.g., determining potential energy for conservative forces, conversion of potential to kinetic energy, analyzing the motion of a pendulum).											

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D. Applies the work-energy theorem to analyze and solve a variety of practical problems (e.g., finding the speed of an object given its potential energy, determining the work done by frictional forces on a decelerating car).											
E. Understands linear and angular momentum.											
F. Solves a variety of problems (e.g., collisions) using the conservation of linear and angular momentum.											
Competency 009: *The teacher understands the laws of thermodynamics*.											
A. Understands methods of heat transfer (i.e., convection, conduction, radiation).											
B. Understands the molecular interpretation of temperature and heat.											
C. Solves problems involving thermal expansion, heat capacity and the relationship between heat and other forms of energy.											
D. Applies the first law of thermodynamics to analyze energy transformations in a variety of everyday situations (e.g., electric light bulb, power-generating plant).											
E. Understands the concept of entropy and its relationship to the second law of thermodynamics.											

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Competency 010: *The teacher understands the characteristics and behavior of waves*.											
A. Understands interrelationships among wave characteristics such as velocity, frequency, wavelength and amplitude and relates them to properties of sound and light (e.g., pitch, color).											
B. Compares and contrasts transverse and longitudinal waves.											
C. Describes how various waves are propagated through different media.											
D. Applies properties of reflection and refraction to analyze optical phenomena (e.g., mirrors, lenses, fiber-optic cable).											
E. Applies principles of wave interference to analyze wave phenomena, including acoustical (e.g., harmonics) and optical phenomena (e.g., patterns created by thin films and diffraction gratings).											
F. Identifies and interprets how wave characteristics and behaviors are used in medical, industrial and other real-world applications.											
Competency 011: *The teacher understands the fundamental concepts of quantum physics*.											
A. Interprets wave-particle duality.											
B. Identifies examples and consequences of the uncertainty principle.											
C. Understands the photoelectric effect.											

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D. Uses the quantum model of the atom to describe and analyze absorption and emission spectra (e.g., line spectra, blackbody radiation).											
E. Explores real-world applications of quantum phenomena (e.g., lasers, photoelectric sensors, semiconductors, superconductivity).											
Domain III — Chemistry											
Competency 012: *The teacher understands the characteristics of matter and atomic structure*.											
A. Differentiates between physical and chemical properties and changes of matter.											
B. Explains the structure and properties of solids, liquids and gases.											
C. Identifies and analyzes properties of substances (i.e., elements and compounds) and mixtures.											
D. Models the atom in terms of protons, neutrons and electron clouds.											
E. Identifies elements and isotopes by atomic number and mass number and calculates average atomic mass of an element.											
F. Understands atomic orbitals and electron configurations and describes the relationship between electron energy levels and atomic structure.											
G. Understands the nature and historical significance of the periodic table.											

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H. Applies the concept of periodicity to predict the physical properties (e.g., atomic and ionic radii) and chemical properties (e.g., electronegativity, ionization energy) of an element.											
Competency 013: *The teacher understands the properties of gases.*											
A. Understands interrelationships among temperature, number of moles, pressure and volume of gases contained within a closed system.											
B. Analyzes data obtained from investigations with gases in a closed system and determines whether the data are consistent with the ideal gas law.											
C. Applies the gas laws (e.g., Charles's law, Boyle's law, combined gas law) to describe and calculate gas properties in a variety of situations.											
D. Applies Dalton's law of partial pressure in various situations (e.g., collecting a gas over water).											
E. Understands the relationship between kinetic molecular theory and the ideal gas law.											
F. Knows how to apply the ideal gas law to analyze mass relationships between reactants and products in chemical reactions involving gases.											

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Competency 014: *The teacher understands properties and characteristics of ionic and covalent bonds.*											
A. Relates the electron configuration of an atom to its chemical reactivity.											
B. Compares and contrasts characteristics of ionic and covalent bonds.											
C. Applies the octet rule to construct Lewis structures.											
D. Identifies and describes the arrangement of atoms in molecules, ionic crystals, polymers and metallic substances.											
E. Understands the influence of bonding forces on the physical and chemical properties of ionic and covalent substances.											
F. Identifies and describes intermolecular and intramolecular forces.											
G. Uses intermolecular forces to explain the physical properties of a given substance (e.g., melting point, crystal structure).											
H. Applies the concepts of electronegativity, electron affinity and oxidation state to analyze chemical bonds.											
I. Evaluates energy changes in the formation and dissociation of chemical bonds.											
J. Understands the relationship between chemical bonding and molecular geometry.											

	Required Course Numbers										
Test Content Categories											
Competency 015: *The teacher understands and interprets chemical equations and chemical reactions.*											
A. Identifies elements, common ions and compounds using scientific nomenclature.											
B. Uses and interprets symbols, formulas and equations in describing interactions of matter and energy in chemical reactions.											
C. Understands mass relationships involving percent composition, empirical formulas and molecular formulas.											
D. Interprets and balances chemical equations using conservation of mass and charge.											
E. Understands mass relationships in chemical equations and solves problems using calculations involving moles, limiting reagents and reaction yield.											
F. Identifies factors (e.g., temperature, pressure, concentration, catalysts) that influence the rate of a chemical reaction and describes their effects.											
G. Understands principles of chemical equilibrium and solves problems involving equilibrium constants.											
H. Identifies the chemical properties of a variety of common household chemicals (e.g., baking soda, bleach, ammonia) in order to predict the potential for chemical reactivity.											

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Competency 016: *The teacher understands types and properties of solutions.*											
A. Analyzes factors that affect solubility (e.g., temperature, pressure, polarity of solvents and solutes) and rate of dissolution (e.g., surface area, agitation).											
B. Identifies characteristics of saturated, unsaturated and supersaturated solutions.											
C. Determines the molarity, molality, normality and percent composition of aqueous solutions.											
D. Analyzes precipitation reactions and derives net ionic equations.											
E. Understands the colligative properties of solutions (e.g., vapor pressure lowering, osmotic pressure changes, boiling-point elevation, freezing-point depression).											
F. Understands the properties of electrolytes and explains the relationship between concentration and electrical conductivity.											
G. Understands methods for measuring and comparing the rates of reaction in solutions of varying concentration.											
H. Analyzes models to explain the structural properties of water and evaluates the significance of water as a solvent in living organisms and the environment.											

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Competency 017: *The teacher understands energy transformations that occur in physical and chemical processes.*											
A. Analyzes the energy transformations that occur in phase transitions.											
B. Solves problems in calorimetry (e.g., determining the specific heat of a substance, finding the standard enthalpy of formation and reaction of substances).											
C. Applies the law of conservation of energy to analyze and evaluate energy exchanges that occur in exothermic and endothermic reactions.											
D. Understands thermodynamic relationships among spontaneous reactions, entropy, enthalpy, temperature and Gibbs free energy.											
Competency 018: *The teacher understands nuclear fission, nuclear fusion and nuclear reactions.*											
A. Uses models to explain radioactivity and radioactive decay (i.e., alpha, beta, gamma).											
B. Interprets and balances equations for nuclear reactions.											
C. Compares and contrasts fission and fusion reactions (e.g., relative energy released in the reactions, mass distribution of products).											
D. Knows how to use the half-life of radioactive elements to solve real-world problems (e.g., carbon dating, radioactive tracers).											

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E. Understands stable and unstable isotopes.											
F. Knows various issues associated with using nuclear energy (e.g., medical, commercial, environmental).											
Competency 019: *The teacher understands oxidation and reduction reactions.*											
A. Determines the oxidation state of ions and atoms in compounds.											
B. Identifies and balances oxidation and reduction reactions.											
C. Uses reduction potentials to determine whether a redox reaction will occur spontaneously.											
D. Explains the operation and applications of electrochemical cells.											
E. Analyzes applications of oxidation and reduction reactions from everyday life (e.g., combustion, rusting, electroplating, batteries).											
Competency 020: *The teacher understands acids, bases and their reactions.*											
A. Identifies the general properties of, and relationships among, acids, bases and salts.											
B. Identifies acids and bases by using models of Arrhenius, Brønsted-Lowry and Lewis.											
C. Differentiates between strong and weak acids and bases.											

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D. Applies the relationship between hydronium ion concentration and pH for acids and bases.											
E. Understands and analyzes acid-base equilibria and buffers.											
F. Analyzes and applies the principles of acid-base titration.											
G. Analyzes neutralization reactions based on the principles of solution concentration and stoichiometry.											
H. Describes the effects of acids and bases in the real world (e.g., acid precipitation, physiological buffering).											

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Test Content Categories											
Domain IV — Science Learning, Instruction and Assessment											
Competency 021: *The teacher understands research-based theoretical and practical knowledge about teaching science, how students learn science and the role of scientific inquiry in science instruction.*											
A. Knows research-based theories about how students develop scientific understanding and how developmental characteristics, prior knowledge, experience and attitudes of students influence science learning.											
B. Understands the importance of respecting student diversity by planning activities that are inclusive and selecting and adapting science curricula, content, instructional materials and activities to meet the interests, knowledge, understanding, abilities, possible career paths and experiences of all students, including English-language learners.											
C. Knows how to plan and implement strategies to encourage student self-motivation and engagement in their own learning (e.g., linking inquiry- based investigations to students' prior knowledge, focusing inquiry-based instruction on issues relevant to students, developing instructional materials using situations from students' daily lives, fostering collaboration among students).											

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D. Knows how to use a variety of instructional strategies to ensure all students comprehend content-related texts, including how to locate, retrieve and retain information from a range of texts and technologies.											
E. Understands the science teacher's role in developing the total school program by planning and implementing science instruction that incorporates school-wide objectives and the statewide curriculum as defined in the Texas Essential Knowledge and Skills (TEKS).											
F. Knows how to design and manage the learning environment (e.g., individual, small-group, whole-class settings) to focus and support student inquiries and to provide the time, space and resources for all students to participate in field, laboratory, experimental and nonexperimental scientific investigation.											
G. Understands the rationale for using active learning and inquiry methods in science instruction and how to model scientific attitudes such as curiosity, openness to new ideas and skepticism.											
H. Knows principles and procedures for designing and conducting an inquiry-based scientific investigation (e.g., making observations; generating questions; researching and reviewing current knowledge in light of existing evidence; choosing tools to gather and analyze evidence; proposing answers, explanations and predictions; communicating and defending results).											

	Required Course Numbers										
Test Content Categories											
I. Knows how to assist students with generating, refining, focusing and testing scientific questions and hypotheses.											
J. Knows strategies for assisting students in learning to identify, refine and focus scientific ideas and questions guiding an inquiry-based scientific investigation; to develop, analyze and evaluate different explanations for a given scientific result; and to identify potential sources of error in an inquiry-based scientific investigation.											
K. Understands how to implement inquiry strategies designed to promote the use of higher-level thinking skills, logical reasoning and scientific problem solving in order to move students from concrete to more abstract understanding.											
L. Knows how to guide students in making systematic observations and measurements.											
M. Knows how to sequence learning activities in a way that uncovers common misconceptions, allows students to build upon their prior knowledge and challenges them to expand their understanding of science.											

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Competency 022: *The teacher knows how to monitor and assess science learning in laboratory, field and classroom settings.*											
A. Knows how to use formal and informal assessments of student performance and products (e.g., projects, laboratory and field journals, rubrics, portfolios, student profiles, checklists) to evaluate student participation in and under-standing of inquiry-based scientific investigations.											
B. Understands the relationship between assessment and instruction in the science curriculum (e.g., designing assessments to match learning objectives, using assessment results to inform instructional practice).											
C. Knows the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis by using a variety of appropriate assessment methods (e.g., performance assessment, self-assessment, peer assessment, formal/informal assessment).											
D. Understands the purposes, characteristics and uses of various types of assessment in science, including formative and summative assessments, and the importance of limiting the use of an assessment to its intended purpose.											
E. Understands strategies for assessing students' prior knowledge and misconceptions about science and how to use those assessments to develop effective ways to address the misconceptions.											

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F. Understands characteristics of assessments, such as reliability, validity and the absence of bias, in order to evaluate assessment instruments and their results.											
G. Understands the role of assessment as a learning experience for students and strategies for engaging students in meaningful self-assessment.											
H. Recognizes the importance of selecting assessment instruments and methods that provide all students with adequate opportunities to demonstrate their achievements.											
I. Recognizes the importance of clarifying teacher expectations by sharing evaluation criteria and assessment results with students.											