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9-12

Science TEKS Transition Analysis Resources

November 2009

The State Board of Education (SBOE) adopted new K-12 science Texas Essential Knowledge and Skills (TEKS) in March 2009. The implementation date for these new science TEKS is the 2010-11 school year. These new curriculum standards are rigorous and include more specificity than previous standards. The new curriculum standards in grades 6-12 are also closely aligned with the College and Career Readiness Standards (CCRS).

As with all revised curriculum standards, teachers and other educators need time to prepare and to understand the changes in the standards. This document was prepared to show a number of important aspects to the new K-12 science TEKS, including the following:

1. New or expanded content in the 2010 science TEKS for a specific grade level or course
2. The outgoing movement of a science content from one grade level to another
3. The incoming movement of a science content from one grade level to another
4. Science content from the 1998 TEKS that are not included in the 2010 TEKS for a specific grade level or course

The Texas Education Agency (TEA) will provide professional development opportunities on the new science TEKS in spring/summer 2010.

We hope that these TEKS transition analysis resources will help educators prepare for the implementation of the new science TEKS in 2010-2011.

Elementary School TEKS Transition Analysis – Grades K-5
Middle School TEKS Transition Analysis – Grades 6-8
High School TEKS Transition Analysis – Biology, Chemistry, Physics, IPC

Science resource documents can be found in the science section of the TEA curriculum webpage:
http://www.tea.state.tx.us/index.aspx?id=3427&menu_id=720&menu_id2=785

Science TEKS – High School TEKS Transition Analysis

Biology – Chemistry – Physics – Integrated Physics and Chemistry

Biology

Please note that the Knowledge and Skills (KS) statements have been omitted from this list. It will be important for teachers to understand each Student Expectation in context of the KS statement.

New or Expanded Content for Biology Found in New 2010 Science TEKS

2A know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

2B 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 which have been tested over a wide variety of conditions are incorporated into theories;

2C 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;

2D distinguish between scientific hypotheses and scientific theories;

2E plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;

2F collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;

2H 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

3A in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

3B communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

3C draw inferences based on data related to promotional materials for products and services;

4A compare and contrast prokaryotic and eukaryotic cells;

5A 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;

5C describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation; and

5D recognize that disruptions of the cell cycle lead to diseases such as cancer.

6B recognize that components that make up the genetic code are common to all organisms;

6D recognize that gene expression is a regulated process;

6F predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non-Mendelian inheritance;

6H describe how techniques such as DNA fingerprinting, genetic modifications, and chromosomal analysis are used to study the genomes of organisms.

7A analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental;

7B analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis, and sequential nature of groups in the fossil record;

7C analyze and evaluate how natural selection produces change in populations, not individuals;

7D 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;

7E analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species;

7F analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination; and

7G analyze and evaluate scientific explanations concerning the complexity of the cell.

8A define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community;

9D analyze and evaluate the evidence regarding formation of simple organic molecules and their organization into long complex molecules having information such as the DNA molecule for self-replicating life.

10B describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants; and

10C analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.

11C summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems; and

11D describe how events and processes that occur during ecological succession can change populations and species diversity.

12B compare variations and adaptations of organisms in different ecosystems;

12E describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles; and

12F describe how environmental change can impact ecosystem stability.

1998 Biology Content NOT INCLUDED *(or partial deletions)* from 2010 TEKS – Biology

3D describe the connection between biology and future careers;

11C analyze the importance of nutrition, environmental conditions, and physical exercise on health; and

Science TEKS – High School TEKS Transition Analysis

Chemistry

Please note that the Knowledge and Skills (KS) statements have been omitted from this list. It will be important for teachers to understand each Student Expectation in context of the KS statement.

New or Expanded Content for Chemistry Found in New 2010 Science TEKS

1A demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles, and fire extinguishers;

2A know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

2B 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 which have been tested over a wide variety of conditions are incorporated into theories;

2C know that 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 may be subject to change as new areas of science and new technologies are developed;

2D distinguish between scientific hypotheses and scientific theories;

2E plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology, including graphing calculators, computers and probes, sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, safety goggles, and burettes, electronic balances, and an adequate supply of consumable chemicals;

2I communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports, and technology-based reports.

3A in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

3B communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

4A differentiate between physical and chemical changes and properties;

4B identify extensive and intensive properties;

5A explain the use of chemical and physical properties in the historical development of the Periodic Table;

5B use the Periodic Table to identify and explain the properties of chemical families, including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals; and

5C use the Periodic Table to identify and explain periodic trends, including atomic and ionic radii, electronegativity, and ionization energy.

6A understand the experimental design and conclusions used in the development of modern atomic theory, including Dalton's Postulates, Thomson's discovery of electron properties, Rutherford's nuclear atom, and Bohr's nuclear atom;

6B understand the electromagnetic spectrum and the mathematical relationships between energy, frequency, and wavelength of light;

6C **calculate** the wavelength, frequency, and energy of light using Planck's constant and the speed of light;

6D use isotopic composition to **calculate** average atomic mass of an element; and

6E express the arrangement of electrons in atoms through electron configurations and Lewis valence electron dot structures.

7A name ionic compounds containing main group or transition metals, covalent compounds, acids, and bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules;

7B write the chemical formulas of common polyatomic ions, ionic compounds containing main group or transition metals, covalent compounds, acids, and bases;

7C construct electron dot formulas to illustrate ionic and covalent bonds;

7D describe the nature of metallic bonding and apply the theory to explain metallic properties such as thermal and electrical conductivity, malleability, and ductility; and

7E predict molecular structure for molecules with linear, trigonal planar, or tetrahedral electron pair geometries using Valence Shell Electron Pair Repulsion (VSEPR) theory.

8A define and use the concept of a mole;

8B use the mole concept to **calculate** the number of atoms, ions, or molecules in a sample of material;

8C **calculate** percent composition and empirical and molecular formulas;

8E perform stoichiometric calculations, including determination of mass relationships between reactants and products, calculation of limiting reagents, and percent yield.

9A describe and **calculate** the relations between volume, pressure, number of moles, and temperature for an ideal gas as described by Boyle's law, Charles' law, Avogadro's law, Dalton's law of partial pressure, and the ideal gas law;

9B perform stoichiometric calculations, including determination of mass and volume relationships between reactants and products for reactions involving gases; and

9C describe the postulates of kinetic molecular theory.

10C **calculate** the concentration of solutions in units of molarity;

10D use molarity to **calculate** the dilutions of solutions;

10E distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions;

10G define acids and bases and distinguish between Arrhenius and Bronsted-Lowry definitions and predict products in acid base reactions that form water;

10H understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions;

10I define pH and use the hydrogen or hydroxide ion concentrations to **calculate** the pH of a solution; and

10J distinguish between degrees of dissociation for strong and weak acids and bases.

11A understand energy and its forms, including kinetic, potential, chemical, and thermal energies;

11B understand the law of conservation of energy and the processes of heat transfer;

11C use thermochemical equations to **calculate** energy changes that occur in chemical reactions and classify reactions as exothermic or endothermic;

10D perform calculations involving heat, mass, temperature change, and specific heat; and

11E use calorimetry to **calculate** the heat of a chemical process.

12A describe the characteristics of alpha, beta, and gamma radiation;

1998 Chemistry Content NOT INCLUDED *(or partial deletions)* from 2010 TEKS – Chemistry

8B investigate and compare the physical and chemical properties of ionic and covalent compounds;

8D describe the influence of intermolecular forces on the physical and chemical properties of covalent compounds.

9B investigate radioactive elements to determine half-life;

9C evaluate the commercial use of nuclear energy and medical uses of radioisotopes; and

9D evaluate environmental issues associated with the storage, containment, and disposal of nuclear wastes.

10B demonstrate and document the effects of a corrosion process and evaluate the importance of electroplating metals.

13B interpret relationships among ionic and covalent compounds, electrical conductivity, and colligative properties of water;

13C measure and compare the rates of reaction of a solid reactant in solutions of varying concentration.

14A analyze and measure common household products using a variety of indicators to classify the products as acids or bases;

14D describe effects of acids and bases on an ecological system.

15B relate the rate of a chemical reaction to temperature, concentration, surface area, and presence of a catalyst.

Science TEKS – High School TEKS Transition Analysis

Physics

Please note that the Knowledge and Skills (KS) statements have been omitted from this list. It will be important for teachers to understand each Student Expectation in context of the KS statement.

New or Expanded Content for Physics Found in New 2010 Science TEKS

2A know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

2B know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;

2C know that 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 may be subject to change as new areas of science and new technologies are developed;

2D distinguish between scientific hypotheses and scientific theories;

2E design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness;

2F demonstrate the use of course apparatus, equipment, techniques, and procedures, including multimeters (current, voltage, resistance), triple beam balances, batteries, clamps, dynamics demonstration equipment, collision apparatus, data acquisition probes, discharge tubes with power supply (H, He, Ne, Ar), hand-held visual spectroscopes, hot plates, slotted and hooked lab masses, bar magnets, horseshoe magnets, plane mirrors, convex lenses, pendulum support, power supply, ring clamps, ring stands, stopwatches, trajectory apparatus, tuning forks, carbon paper, graph paper, magnetic compasses, polarized film, prisms, protractors, resistors, friction blocks, mini lamps (bulbs) and sockets, electrostatics kits, 90-degree rod clamps, metric rulers, spring scales, knife blade switches, Celsius thermometers, meter sticks, scientific calculators, graphing technology, computers, cathode ray tubes with horseshoe magnets, ballistic carts or equivalent, resonance tubes, spools of nylon thread or string, containers of iron filings, rolls of white craft paper, copper wire, Periodic Table, electromagnetic spectrum charts, slinky springs, wave motion ropes, and laser pointers;

2G use a wide variety of additional course apparatus, equipment, techniques, materials, and procedures as appropriate such as ripple tank with wave generator, wave motion rope, micrometer, caliper, radiation monitor, computer, ballistic pendulum, electroscope, inclined plane, optics bench, optics kit, pulley with table clamp, resonance tube, ring stand screen, four inch ring, stroboscope, graduated cylinders, and ticker timer;

2H make measurements with accuracy and precision and record data using scientific notation and International System (SI) units;

2I identify and quantify causes and effects of uncertainties in measured data;

2K communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports; and

2L express and manipulate relationships among physical variables quantitatively, including the use of graphs, charts, and equations.

3A in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

3B communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

3C draw inferences based on data related to promotional materials for products and services;

3F express and interpret relationships symbolically in accordance with accepted theories to make predictions and solve problems mathematically, including problems requiring proportional reasoning and graphical vector addition.

4B describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, average velocity, instantaneous velocity, and acceleration;

4C analyze and describe accelerated motion in two dimensions using equations, including projectile and circular examples;

4D **calculate** the effect of forces on objects, including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects;

5A research and describe the historical development of the concepts of gravitational, electromagnetic, weak nuclear, and strong nuclear forces;

5B describe and **calculate** how the magnitude of the gravitational force between two objects depends on their masses and the distance between their centers;

5C describe and **calculate** how the magnitude of the electrical force between two objects depends on their charges and the distance between them;

5E characterize materials as conductors or insulators based on their electrical properties;

5F design, construct, and **calculate** in terms of current through, potential difference across, resistance of, and power used by electric circuit elements connected in both series and parallel combinations;

5G investigate and describe the relationship between electric and magnetic fields in applications such as generators, motors, and transformers; and

5H describe evidence for and effects of the strong and weak nuclear forces in nature.

6C **calculate** the mechanical energy of, power generated within, impulse applied to, and momentum of a physical system;

6E describe how the macroscopic properties of a thermodynamic system such as temperature, specific heat, and pressure are related to the molecular level of matter, including kinetic or potential energy of atoms;

7A examine and describe oscillatory motion and wave propagation in various types of media;

7B investigate and analyze characteristics of waves, including velocity, frequency, amplitude, and wavelength, and **calculate** using the relationship between wavespeed, frequency, and wavelength;

7D investigate behaviors of waves, including reflection, refraction, diffraction, interference, resonance, and the Doppler effect;

7E describe and predict image formation as a consequence of reflection from a plane mirror and refraction through a thin convex lens; and

8A describe the photoelectric effect and the dual nature of light;

8C describe the significance of mass-energy equivalence and apply it in explanations of phenomena such as nuclear stability, fission, and fusion; and

8D give examples of applications of atomic and nuclear phenomena such as radiation therapy, diagnostic imaging, and nuclear power and examples of applications of quantum phenomena such as digital cameras.

1998 Physics Content NOT INCLUDED in 2010 TEKS – Physics

3E research and describe the history of physics and contributions of scientists.

Science TEKS – High School TEKS Transition Analysis

Integrated Physics and Chemistry (IPC)

Please note that the Knowledge and Skills (KS) statements have been omitted from this list. It will be important for teachers to understand each Student Expectation in context of the KS statement.

New or Expanded Content for IPC Found in New 2010 Science TEKS

2A know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

3A in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

3B communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

4B measure and graph distance and speed as a function of time using moving toys;

4D assess the relationship between force, mass, and acceleration, noting the relationship is independent of the nature of the force, using equipment such as dynamic carts, moving toys, vehicles, and falling objects;

4F describe the gravitational attraction between objects of different masses at different distances, including satellites; and

4G examine electrical force as a universal force between any two charged objects and compare the relative strength of the electrical force and gravitational force.

5A recognize and demonstrate that objects and substances in motion have kinetic energy such as vibration of atoms, water flowing down a stream moving pebbles, and bowling balls knocking down pins;

5B demonstrate common forms of potential energy, including gravitational, elastic, and chemical, such as a ball on an inclined plane, springs, and batteries;

5C demonstrate that moving electric charges produce magnetic forces and moving magnets produce electric forces;

5F evaluate the transfer of electrical energy in series and parallel circuits and conductive materials;

5H analyze energy conversions such as those from radiant, nuclear, and geothermal sources; fossil fuels such as coal, gas, oil; and the movement of water or wind; and

6A examine differences in physical properties of solids, liquids, and gases as explained by the arrangement and motion of atoms, ions, or molecules of the substances and the strength of the forces of attraction between those particles;

6B relate chemical properties of substances to the arrangement of their atoms or molecules;

6C analyze physical and chemical properties of elements and compounds such as color, density, viscosity, buoyancy, boiling point, freezing point, conductivity, and reactivity;

6E relate the structure of water to its function as a solvent and investigate the properties of solutions and factors affecting gas and solid solubility, including nature of solute, temperature, pressure, pH, and concentration.

7A investigate changes of state as it relates to the arrangement of particles of matter and energy transfer;

7B recognize that chemical changes can occur when substances react to form different substances and that these interactions are largely determined by the valence electrons;

7C demonstrate that mass is conserved when substances undergo chemical change and that the number and kind of atoms are the same in the reactants and products;

1998 IPC Content NOT INCLUDED *(or partial deletions)* from 2010 TEKS – IPC

4D investigate and demonstrate mechanical advantage and efficiency of various machines such as levers, motors, wheels and axles, pulleys, and ramps.

5C identify uses of electromagnetic waves in various technological applications such as fiber optics, optical scanners, and microwaves; and

5D demonstrate the application of acoustic principles such as in echolocation, musical instruments, noise pollution, and sonograms.

7B research and describe the historical development of the atomic theory;

7C identify constituents of various materials or objects such as metal salts, light sources, fireworks displays, and stars using spectral-analysis techniques;

8A distinguish between physical and chemical changes in matter such as oxidation, digestion, changes in states, and stages in the rock cycle;

9B relate the concentration of ions in a solution to physical and chemical properties such as pH, electrolytic behavior, and reactivity;