TEKS Clarification Document

Science– Chemistry

2011 – 2012

CHEMISTRY

§112.31. Implementation of Texas Essential Knowledge and Skills for Science, High School, Beginning with School Year 2010-2011.
Source: The provisions of this §112.31 adopted to be effective August 4, 2009, 34 TexReg 5063; amended to be effective August 24, 2010, 35 TexReg 7230.

§112.35. Chemistry, Beginning with School Year 2010-2011.

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Required prerequisites: one unit of high school science and Algebra I. Suggested prerequisite: completion of or concurrent enrollment in a second year of math. This course is recommended for students in Grade 10, 11, or 12.

(b) Introduction.

(1) Chemistry. In Chemistry, students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students study a variety of topics that include characteristics of matter, use of the Periodic Table, development of atomic theory and chemical bonding, chemical stoichiometry, gas laws, solution chemistry, thermochemistry, and nuclear chemistry. Students will investigate how chemistry is an integral part of our daily lives.

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

(3) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation can be experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.

(4) Science and social ethics. Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods and ethical and social decisions that involve the application of scientific information.

(5) Scientific systems. A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

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

C.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.**
	
	Use, Analyze, Evaluate, Critique
	
	SCIENTIFIC EXPLANATIONS
	
	Including, but not limited to:
	• Using
	  • Empirical evidence
	  • Logical reasoning
	  • Experimental and observational testing
	  • Examining all sides of scientific evidence
	
	STAAR Note:
	• The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.
	
	TxCCRS Note:
	I. Nature of Science – A1 – Utilize skepticism, logic, and professional ethics in science.

C.3B	**Make responsible choices in selecting everyday products and services using scientific information.** Use, Make RESPONSIBLE CHOICES IN SELECTING EVERYDAY PRODUCTS AND SERVICES Including, but not limited to: • Promotional materials described in print, on television, and on the Internet • Services described in print, on television, and on the Internet • Evaluation for

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	• Quality • Accuracy • Completeness • Reliability of information from sources STAAR Note: • The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.
C.3C	**Draw inferences based on data related to promotional materials for products and services.** Draw INFERENCES BASED ON DATA Including, but not limited to: • Related to promotional materials for products and services STAAR Note: • The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.
C.3D	**Evaluate the impact of research on scientific thought, society, and the environment.** Evaluate IMPACT OF RESEARCH Including, but not limited to: • Read technical and scientific articles to gain understanding of the impact of research • Recognize how scientific discoveries are connected to technological innovations • Understand how scientific research and technology have an impact on ethical and legal practices • Understand how commonly held ethical beliefs affect scientific research\ STAAR Note: • The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.

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C.3E	**Describe connections between chemistry and future careers.** Describe CONNECTIONS BETWEEN CHEMISTRY AND FUTURE CAREERS Including, but not limited to: • Conduct research on careers STAAR Note: • The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.
C.3F	**Research and describe the history of chemistry and contributions of scientists.** Research, Describe HISTORY OF CHEMISTRY AND CONTRIBUTIONS OF SCIENTISTS Including, but not limited to: • Understand historical development of major theories in science STAAR Note: • The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.
C.4	***Scientific concepts. The student knows the characteristics of matter and can analyze the relationships between chemical and physical changes and properties. The student is expected to:***
C.4A	**Differentiate between physical and chemical changes and properties.** ***Readiness Standard*** Differentiate BETWEEN PHYSICAL AND CHEMICAL CHANGES AND PROPERTIES Including, but not limited to: • Chemical changes

Bold, italic black: Knowledge and Skills Statement (TEKS); **Bold black: Student Expectation (TEKS)**
Bold, italic red: Student Expectation identified by TEA as a ***Readiness Standard*** for STAAR.
Bold, italic green: Student Expectation identified by TEA as a ***Supporting Standard*** for STAAR.
Blue: Supporting Information / Clarifications from CSCOPE (Specificity)
Black text: Notes from the American Association for the Advancement of Science (AAAS) Project 2061 and the Texas college and Career Readiness Standards (CCRS)

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	• Iron rusting
	• Chemical properties
	  • Reactivity
	  • Toxicity
	  • pH
	  • Conductivity
	  • Tarnishing
	  • Fermenting
	  • Oxidation
	• Physical changes
	  • Cut paper
	• Physical properties
	  • Color
	  • Texture
	  • Malleability
	  • Ductility
	  • Solubility
	  • Mass
	  • Volume
	  • Density
	  • Viscosity
	
	TxCCRS Note:
	VII. Chemistry – A1 – Know that physical and chemical properties can be used to describe and classify matter.
	VIII. Physics – A4 – Understand the concept of density.

C.4B	**Identify extensive and intensive properties.** ***Supporting Standard***

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	Identify EXTENSIVE AND INTENSIVE PROPERTIES Including, but not limited to: • Extensive properties • Intensive properties

C.4C	**Compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume.**
	
	Supporting Standard
	
	Compare
	
	SOLIDS, LIQUIDS, AND GASES
	
	Including, but not limited to:
	• Compressibility
	• Structure and arrangement of particles
	• Motion of particles
	• Shape
	• Volume
	• Kinetic molecular theory as it relates to the states of matter
	• Kinetic molecular theory to explain phase changes
	• Relationship of the densities among the three states of matter
	  • Floating
	  • Sinking
	  • Suspension
	  • Density = mass/volume
	  • D = m/v
	
	TxCCRS Note:

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	VII. Chemistry – I1 – Understand the behavior of matter in its various states of solid, liquid, gas. VII. Chemistry – I5 – Know the properties of liquids and solids. VII. Chemistry – I6 – Understand the effect of vapor pressure on changes in state; explain heating curves and phase diagrams. VIII. Physics – A2 – Understand states of matter and their characteristics.

C.4D	**Classify matter as pure substances or mixtures through investigation of their properties.**
	
	Readiness Standard
	
	Classify
	
	MATTER
	
	Including, but not limited to:
	• Pure substances
	  • Elements
	  • Compounds
	  • Molecules
	• Mixtures
	
	TxCCRS Note:
	VII. Chemistry – A1 – Know that physical and chemical properties can be used to describe and classify matter.
	VII. Chemistry – A2 – Recognize and classify pure substances (elements, compounds) and mixtures.

C.5	***Scientific concepts. The student understands the historical development of the periodic table and can apply its predictive power. The student is expected to:***
C.5A	**Explain the use of chemical and physical properties in the historical development of the periodic table.** ***Supporting Standard*** Understand, Explain THE USE OF CHEMICAL AND PHYSICAL PROPERTIES IN THE HISTORICAL DEVELOPMENT OF THE PERIODIC TABLE Including, but not limited to:

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	• The periodic tables of Mendeleev and Mosley and compare to modern periodic table
	• The periodic table with respect to atomic number and observed patterns
	• Rows (periods)
	• Columns (groups/families)
	• Number of valence electrons
	• Metals vs. non-metals
	• Use of the periodic table to predict
	• Oxidation numbers
	• Types of bonding
	  • Ionic
	  • Covalent
	
	TxCCRS Note:
	VII. Chemistry – A1 – Know that physical and chemical properties can be used to describe and classify matter.
	VII. Chemistry – C1 – Know the organization of the periodic table.

C.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.**
	
	Readiness Standard
	
	Use
	
	THE PERIODIC TABLE TO IDENTIFY AND EXPLAIN THE PROPERTIES OF CHEMICAL FAMILIES
	
	Including, but not limited to:
	• Chemical families
	  • Alkali metals
	  • Alkaline earth metals
	  • Halogens
	  • Noble gases
	  • Transition metals

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	TxCCRS Note: VII. Chemistry – C1 – Know the organization of the periodic table. VII. Chemistry – C2 – Recognize the trends in physical and chemical properties as one moves across a period or vertically through a group.
C.5C	**Use the periodic table to identify and explain periodic trends, including atomic and ionic radii, electronegativity, and ionization energy.** ***Readiness Standard*** Use THE PERIODIC TABLE TO IDENTIFY AND EXPLAIN PERIODIC TRENDS Including, but not limited to: • Atomic radius • Ionic radius • Electronegativity • Electron affinity • Ionization energy TxCCRS Note: I. Nature of Science – A2 – Use creativity and insight to recognize and describe patterns in natural phenomena. VII. Chemistry – C1 – Know the organization of the periodic table. VII. Chemistry – C2 – Recognize the trends in physical and chemical properties as one moves across a period or vertically through a group.
C.6	***Scientific concepts. The student knows and understands the historical development of atomic theory. The student is expected to:***
C.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.** ***Supporting Standard*** Understand MODERN ATOMIC THEORY