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# *ODYSSEY* Molecular Explorer

**— Release 7.0 —**

*Correlation with*

## Texas Essential Knowledge and Skills for Science

### High School

August 2010 Update

## §112.35 Chemistry

## (c) Knowledge and skills

(4) **Science 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:

(A) differentiate between physical and chemical changes and properties;

→ **C12 Chemical Matter** "Types of Properties"

(B) identify extensive and intensive properties;

→ **C12 Chemical Matter** "Types of Properties"

(C) compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume;

→ **C6 Chemical Matter** "States of Matter"
→ **C7 Chemical Matter** "Comparing States Side-by-Side"
→ **G1 Gases** "Density of Gases and Liquids"
→ **G2 Gases** "Volume of Gases"
→ **H3 Liquids & Solids** "Compressibility"
→ **H7 Liquids & Solids** "Volume and Shape of Liquids"
→ **H9 Liquids & Solids** "Molecular Motion and Physical States"

(D) classify matter as pure substances or mixtures through investigation of their properties.

→ **C4 Chemical Matter** "Types of Compounds"
→ **C5 Chemical Matter** "Types of Mixtures"

(5) **Science concepts.** The student understands the historical development of the Periodic Table and can apply its predictive power. The student is expected to:

(B) 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;

→ **P1 Main Groups & Transition Metals** "Alkali Metals"
→ **P2 Main Groups & Transition Metals** "Alkaline Earth Metals"
→ **P10 Main Groups & Transition Metals** "Halogens"
→ **P11 Main Groups & Transition Metals** "Noble Gases"
→ **P12 Main Groups & Transition Metals** "Elements of the d- and f-Blocks"

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

→ **E2 Periodicity** "Atomic Radii"

(6) **Science concepts.** The student knows and understands the historical development of atomic theory. The student is expected to:

(A) 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;

→ **D2** **Atoms** "Distribution of Mass in Atoms"

→ **D5** **Atoms** "Electron Cloud of Argon"

(D) use isotopic composition to calculate average atomic mass of an element;

→ **D3** **Atoms** "Isotopes"

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

→ **D8 Atoms** "Atomic Orbitals"

→ **D9 Atoms** "Comparing Helium, Neon, and Argon"

→ **D14 Atoms** "Orbitals of a Krypton Atom"

(7) **Science concepts.** The student knows how atoms form ionic, metallic and covalent bonds. The student is expected to:

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

→ **C20 Chemical Matter** "Naming Compounds"

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

→ **F10 Chemical Bonding** "Polyatomic Ions"

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

→ **F14 Chemical Bonding** "VSEPR Theory"

→ **F15 Chemical Bonding** "Comparing Shapes"

(8) **Science concepts.** The student can quantify the changes that occur during chemical reactions. The student is expected to:

(C) calculate percent composition and empirical and molecular formulas;

→ **C21 Chemical Matter** "Percent Composition"

(9) **Science concepts.** The student understands the principles of ideal gas behavior, kinetic molecular theory, and the conditions that influence the behavior of gases. The student is expected to:

(A) 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.

→ **G13 Gases** "Pressure-Volume Relationship"

→ **G14 Gases** "Boyle's Law"

→ **G16 Gases** "Pressure and Temperature"

→ **G18 Gases** "Avogadro's Law"

→ **G19 Gases** "Universality of the Ideal Gas Law"

→ **G21 Gases** "Partial Pressure"

(10) **Science concepts.** The student understands and can apply the factors that influence the behavior of solutions. The student is expected to:

(A) describe the unique role of water in chemical and biological systems;

→ **H21 Liquids & Solids** "Comparing Ice and Liquid Water"

→ **I2 Solutions** "Process of Dissolving"

→ **I11 Solutions** "Energetics of Solution Formation"

(B) develop and use general rules regarding solubility through investigations with aqueous solutions;

→ **I17 Solutions** "Miscible and Nonmiscible Liquids"

(C) calculate the concentration of solutions in units of molarity;

→ **I3 Solutions** "Specifying the Molarity"

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

→ **K1 Acids & Bases** "Strong Acids"

(11) **Science concepts.** The student understands the energy changes that occur in chemical reactions. The student is expected to:

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

→ **G12 Gases** "Mean Speed and Temperature"

→ **L2 Thermochemistry** "Thermal Energy"

→ **L4 Thermochemistry** "Vibrating Diatomic Molecule"

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

→ **L4 Thermochemistry** "Vibrating Diatomic Molecule"

→ **O3 Chemical Thermodynamics** "Heat Conduction"

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

→ **M3 Kinetics** "Mechanism of a Reaction"

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

→ **L6 Thermochemistry** "Specific Heat"

(E) use calorimetry to calculate the heat of a chemical process.

→ **L6 Thermochemistry** "Specific Heat"