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ODYSSEY Molecular Explorer

— Release 6 —

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;

→ **Worksheets Chemical Matter** "Chemical and Physical Properties"

(B) identify extensive and intensive properties;

→ **Worksheets Chemical Matter** "Chemical and Physical Properties"

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

→ **Worksheets Chemical Matter** "Side-by-Side Comparison"
→ **Worksheets Chemical Matter** "Comparing the States of Matter"
→ **Worksheets Gases** "The Density of Liquids and Gases"
→ **Concepts & Applications Liquids & Solids** "Compressibility"
→ **Worksheets Liquids & Solids** "Motion in the States of Matter"
→ **Demos & Visuals Liquids & Solids** "Do liquids have a definite shape?"
→ **Demos & Visuals Gases** "Do gases have a definite volume?"

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

→ **Concepts & Applications Chemical Matter** "Types of Compounds"
→ **Concepts & Applications Chemical Matter** "The 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;

→ **Concepts & Applications Main Groups** "Alkali Metals"

→ **Concepts & Applications Main Groups** "Alkaline Earth Metals"

→ **Concepts & Applications Main Groups** "Halogens"

→ **Concepts & Applications Main Groups** "Noble Gases"

→ **Concepts & Applications Transition Metals** "d- and f-Blocks"

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

→ **Worksheets 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;

→ **Worksheets Atoms** "Nuclei and Electrons"

→ **Worksheets Atoms** "The Electron Cloud of an Argon Atom"

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

→ **Worksheets Atoms** "Isotopes"

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

→ **Worksheets Atoms** "Atomic Orbitals"

→ **Worksheets Atoms** "s- and p-Orbitals"

→ **Worksheets Atoms** "d-Orbitals"

(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;

→ **Worksheets Chemical Matter** "Naming Molecular Compounds"

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

→ **Worksheets 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.

→ **Worksheets Chemical Bonding** "VSEPR Theory"

→ **Worksheets Chemical Bonding** "Comparing Shapes for a Molecule"

(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;

→ **WORKSHEETS 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.

→ **WORKSHEETS Gases** "The Pressure-Volume Relationship"

→ **DEMOS & VISUALS Gases** "What is Boyle's Law?"

→ **WORKSHEETS Gases** "The Pressure-Temperature Relationship"

→ **CONCEPTS & APPLICATIONS Gases** "Avogadro's Law"

→ **CONCEPTS & APPLICATIONS Gases** "The Ideal Gas Law"

→ **WORKSHEETS 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;

→ **DEMOS & VISUALS Liquids & Solids** "Ice vs. Liquid Water"

→ **DEMOS & VISUALS Solutions** "How do salts dissolve in water?"

→ **CONCEPTS & APPLICATIONS Solutions** "Energetics of Solutions"

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

→ **CONCEPTS & APPLICATIONS Solutions** "Miscible and Nonmiscible Liquids"

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

→ **WORKSHEETS Solutions** "Specifying the Molarity"

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

→ **WORKSHEETS 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;

→ **DEMOS & VISUALS Thermochemistry** "Energy of a Vibrating Diatomic"

→ **Worksheets Thermochemistry** "Thermal Energy"

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

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

→ **Demos & Visuals Thermochemistry** "Energy of a Vibrating Diatomic"

→ **Demos & Visuals Chem. Thermodyn.** "Spontaneity and Disorder"

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

→ **Worksheets Kinetics** "Examining a Reaction Mechanism"

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

→ **Worksheets Thermochemistry** "Specific Heat"

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

→ **Worksheets Thermochemistry** "Specific Heat"