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ODYSSEY Molecular Explorer

— Release 6.2 —

Correlation with the

Maine Science and Technology Standards

Grade 9 - Diploma

Maine Department of Education 2007

D. The Physical Setting

Students understand the universal nature of matter, energy, force, and motion and identify how these relationships are exhibited in Earth Systems, in the solar system, and throughout the universe.

D3 Matter and Energy

Students describe the structure, behavior, and interactions of matter at the atomic level and the relationship between matter and energy.

a. Describe the structure of atoms in terms of neutrons, protons, and electrons and the role of the atomic structure in determining chemical properties.

→ **LAB** *Atoms* "Nuclei and Electrons"

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

→ **DEMONSTRATION** *Atoms* "What does a hydrogen atom look like?"

→ **LAB** *Atoms* "Atomic Orbitals"

→ **LAB** *Atoms* "s- and p-Orbitals"

→ **LAB** *Atoms* "d-Orbitals"

b. Describe how the number and arrangement of atoms in a molecule determine a molecule's properties, including the types of bonds it makes with other molecules and its mass, and apply this to predictions about chemical reactions.

→ **LAB** *Chemical Bonding* "Exploring Ionic Interactions"

→ **DEMONSTRATION** *Atoms* "What does a hydrogen atom look like?"

→ **LAB** *Chemical Bonding* "Energetics of Covalent Bonding"

→ **LAB** *Chemical Bonding* "Polar Bonds and Molecules"

→ **LAB** *Chemical Bonding* "Classifying by Bond Polarity"

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

c. Explain the essential roles of carbon and water in life processes.

→ **LAB** *Liquids & Solids* "Structure and Dynamics of Liquid Water"

→ **LAB** *Organic Chem.* "Bonding Characteristics of Carbon"

→ **LAB** *Biochemistry* "Building a Model of a Protein"

→ **LAB** *Biochemistry* "Building a Model of DNA"

→ **MISCELLANEOUS** *Biochemistry* "Carbohydrates"

→ **LAB** *Biochemistry* "Starch"

→ **LAB** *Biochemistry* "Amino Acids"

e. Describe factors that affect the rate of chemical reactions (including concentration, pressure, temperature, and the presence of molecules that encourage interaction with other molecules).

→ **DEMONSTRATION** *Kinetics* "What does a chemical reaction look like at the molecular level?"

→ **LAB** *Kinetics* "Reactive Collisions Between Molecules"

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

f. Apply an understanding of the factors that affect the rate of chemical reaction to predictions about the rate of chemical reactions.

→ **LAB** *Kinetics* "Reactive Collisions Between Molecules"

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

i. Explain the relationship between kinetic and potential energy and apply the knowledge to solve problems.

→ **DEMONSTRATION** *Thermochemistry* "What is the energy of a vibrating diatomic molecule?"

j. Describe how in energy transformations the total amount of energy remains the same, but because of inefficiencies (heat, sound, and vibration) useful energy is often lost through radiation or conduction.

→ **DEMONSTRATION** *Chem. Thermodyn.* "Do all spontaneous processes involve a visible increase of disorder?"

l. Describe the relationship among heat, temperature, and pressure in terms of the actions of atoms, molecules, and ions.

→ **LAB** *Gases* "Gas Pressure"

→ **LAB** *Gases* "The Meaning of Temperature"

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

→ **LAB** *Thermochemistry* "Thermal Energy"