

ODYSSEY Molecular Explorer

— Release 6.2 —

Correlation with

Wisconsin's Model Academic Standards for Science Grade 12

Adopted November 2000

Standard D

Physical Science

Content Standard

Students in Wisconsin will demonstrate an understanding of the physical and chemical properties of matter, the forms and properties of energy, and the ways in which matter and energy interact.

Rationale

Knowledge of the physical and chemical properties of matter and energy is basic to an understanding of the earth and space, life and environmental, and physical sciences. The properties of matter can be explained in terms of the atomic structure of matter. Chemical reactions can be explained and predicted in terms of the atomic structure of matter. Natural events are the result of interactions of matter and energy. When students understand how matter and energy interact, they can explain and predict chemical and physical changes that occur around them.

Performance Standards Grade 12

By the end of grade twelve, students will:

STRUCTURE OF ATOMS AND MATTER

1. Describe atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions

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

→ **LAB Atoms** "s- and p-Orbitals"

→ **LAB Atoms** "d-Orbitals"

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

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

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

2. Explain the forces that hold the atom together and illustrate how nuclear interactions change the atom

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

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

3. Explain exchanges of energy in chemical interactions and exchange of mass and energy in atomic/nuclear reactions

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

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

CHEMICAL REACTIONS

4. Explain how substances, both simple and complex, interact with one another to produce new substances

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

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

→ **LAB Equilibria** "Equilibrium and Temperature"

5. Identify patterns in chemical and physical properties and use them to predict likely chemical and physical changes and interactions

→ *Many Labs*

6. Through investigations, identify the types of chemical interactions, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions

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

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

MOTIONS AND FORCES

7. Qualitatively and quantitatively analyze changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically

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

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

→ **LAB Liquids & Solids** "Molecular Motion in the States of Matter"

8. Understand the forces of gravitation, the electromagnetic force, intermolecular force, and explain their impact on the universal system

→ **LAB Liquids & Solids** "Intermolecular Forces"

→ **LAB Liquids & Solids** "Dipole-Dipole Forces"

→ **MISCELLANEOUS** *Liquids & Solids* "Elements with Hydrogen Bonding"

→ **DEMONSTRATION** *Liquids & Solids* "How different are ice and liquid water?"

9. Describe models of light, heat, and sound and through investigations describe similarities and differences in the way these energy forms behave

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

CONSERVATION OF ENERGY AND THE INCREASE IN DISORDER

10. Using the science themes, illustrate the law of conservation of energy during chemical and nuclear reactions

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

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

INTERACTIONS OF MATTER AND ENERGY

11. Using the science themes, explain common occurrences in the physical world

→ *Many Labs*

12. Using the science themes and knowledge of chemical, physical, atomic, and nuclear interactions, explain changes in materials, living things, earth's features, and stars

→ **LAB** *Biochemistry* "Starch"

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

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