Wavefunction, Inc.
www.wavefun.com

ODYSSEY Molecular Explorer

— Release 6.2 —

Correlation with the

Colorado Model Content Standards in Science

Adopted June 8, 1995
Amended February 8, 2007

Standard 2

Physical Science

Students know and understand common properties, forms, and changes in matter and energy.

RATIONALE

Everyone has experience with matter in a variety of forms. Such experiences help build students' understanding of similarities and differences in the properties of matter. Their personal experiences help students understand common properties such as hardness, strength, color, shapes and states of matter (solid, liquid, gas and plasma). Knowledge of observable properties of matter and its microscopic/macroscopic structure and composition is helpful in considering matter's varied uses, availability, and limitations in our world.

Energy is a central concept in science because all physical interactions involve changes in energy. Students need to understand that all physical events involve transferring energy, or changing one form of energy into another, such as when forces act on matter producing changes in motion. Knowledge of forms of energy, its transfer and transformation, is essential to interpreting, explaining, predicting, and influencing change in our world.

Interactions between matter and energy account for changes observed in everyday events that are sometimes misunderstood. Understanding how matter and energy interact and are conserved extends students' knowledge of the physical world, and allows them to monitor and explain a wide variety of changes and to predict future physical and chemical changes.

BENCHMARKS

GRADES 9-12

1. elements can be organized by their physical and chemical properties (Periodic Table)

→ **Miscellaneous** *Chemical Matter* "Examples of Chemical Elements"

→ **Miscellaneous** *Main Groups* "Alkali Metals"

→ **Miscellaneous** *Main Groups* "Alkaline Earth Metals"

→ **Miscellaneous** *Main Groups* "Boron Group"

→ **Miscellaneous** *Main Groups* "Carbon Group"

→ **Miscellaneous** *Main Groups* "Nitrogen Group"

→ **Miscellaneous** *Main Groups* "Oxygen Group"

→ **Miscellaneous** *Main Groups* "Halogens"

→ **Miscellaneous** *Main Groups* "Noble Gases"

→ **Miscellaneous** *Transition Metals* "Elements of the d- and f-Blocks"

2. the spatial configuration of atoms and the structure of the atoms in a molecule determine the chemical properties of the substance

→ **Lab** *Atoms* "Nuclei and Electrons"

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

→ **Lab** *Atoms* "s- and p-Orbitals"

→ **Lab** *Atoms* "d-Orbitals"

→ **Lab** *Chemical Bonding* "Electron Sharing in Molecules"

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

→ **Lab** *Chemical Bonding* "VSEPR Theory"

→ **Lab** *Chemical Bonding* "Comparing Conceivable Shapes for a Molecule"

3. there are observable and measurable physical and chemical properties that allow one to compare, contrast, and separate substances (*for example: pH, melting point, conductivity, magnetic attraction)*

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

4. word and chemical equations are used to relate observed changes in matter to its composition and structure (*for example: conservation of matter*)

→ **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"

5. quantitative relationships involved with thermal energy can be identified, measured, calculated and analyzed (f*or example: heat transfer in a system involving mass, specific heat, and change in temperature of matter*)

→ **Lab** *Thermochemistry* "Thermal Energy"

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

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

6. energy can be transferred through a variety of mechanisms and in any change some energy is lost as heat (*for example: conduction, convection, radiation, motion, electricity, chemical bonding changes*)

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

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

→ **Lab** *Equilibria* "Equilibrium and Pressure"

8. quantities that demonstrate conservation of mass and conservation of energy in physical interactions can be measured and calculated

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