

**Chemistry Fall 2014**

**Alignments to Middle School Next Generation Science Standards**

**Topic: Water Labs**

**MS-PS1 Matter and Its Interactions**

Students who demonstrate understanding can:

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction had occurred.

Science and Engineering Practices

* Develop a model to predict and/or describe phenomena.
* Analyze and interpret data to determine similarities and differences in findings.

Connections to Nature of Science

* Science knowledge is based upon logical and conceptual connections between evidence and explanations.

Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**

* Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
* Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.

**PS1.B: Chemical Reactions**

* Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

**ETS1.B: Developing Possible Solutions**

* A solution needs to be tested and then modified on the basis of the test results, in order to improve it.

Crosscutting Concepts

Patterns – Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

Scale, Proportion, and Quantity – Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

**Topic: Matter and Energy Labs**

**MS-PS1 Matter and Its Interactions**

Students who demonstrate understanding can:

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Science and Engineering Practices

* Develop a model to predict and/or describe phenomena.
* Analyze and interpret data to determine similarities and differences in findings.

Connections to Nature of Science

* Science knowledge is based upon logical and conceptual connections between evidence and explanations.

Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**

* Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
* Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
* Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
* In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
* The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.

**PS3.A: Definitions of Energy**

* The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects.
* The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material) The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system’s total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.

Crosscutting Concepts

Cause and Effect – Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Scale, Proportion, and Quantity – Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.