

## Structure and Properties of Matter

### Performance Expectations/CCSS:

#### MS-PS1-1.

Develop models to describe the atomic composition of simple molecules and extended structures.

[Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.]

#### MS-PS1-3.

Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

[Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

#### 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.

[Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

### CCSS:

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS1-3)
- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1), (MS-PS1-4)
- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li><b>Developing and Using Models</b></li> <li><b>Obtaining, Evaluating, and Communicating Information</b></li> </ul> <p>Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.</p>	<p><b>PS1.A: Structure and Properties of Matter</b></p> <ul style="list-style-type: none"> <li>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. (MS-PS1-1)</li> <li>Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3) <i>(Note: This Disciplinary Core Idea is also addressed by MS-PS1-2.)</i></li> </ul>	<p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)</li> </ul> <p><b>Scale, Proportion, and Quantity</b></p> <ul style="list-style-type: none"> <li>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)</li> </ul> <p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)</li> </ul>

	<ul style="list-style-type: none"> <li>• Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)</li> <li>• 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. (MS-PS1-4)</li> <li>• Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)</li> <li>• The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)</li> </ul> <p><b>PS1.B: Chemical Reactions</b></p> <ul style="list-style-type: none"> <li>• 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. (MS-PS1-3) <i>(Note: This Disciplinary Core Idea is also addressed by MS-PS1-2 and MS-PS1-5.)</i></li> </ul> <p><b>PS3.A: Definitions of Energy</b></p> <ul style="list-style-type: none"> <li>• 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. <i>(secondary to MS-PS1-4)</i></li> </ul> <p>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. <i>(secondary to MS-PS1-4)</i></p>	<p style="text-align: center;">-----</p> <p style="text-align: center;"><b>Connections to Engineering, Technology, and Applications of Science</b></p> <p><b>Interdependence of Science, Engineering, and Technology</b></p> <ul style="list-style-type: none"> <li>• Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)</li> </ul> <p><b>Influence of Science, Engineering and Technology on Society and the Natural World</b></p> <p>The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)</p>
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**Resources:**

**General Resources:**

Mastery Task Evaluation Rubric  
 Lab Conclusion Evaluation Rubric  
 Lab Procedure Evaluation Rubric  
 Lab Data Representation and Analysis Rubric



**FOSS Chemical Interactions Investigation 1 Substances**

- Part 1 Mystery Mixture
- Part 2 Mixing Substances
- Multimedia: Fossweb.com
  - Two-substance Reaction
- Reading: FOSS Chemical Interactions Resource Books
  - White Substance Information

**FOSS Chemical Interactions Investigation 2 Elements**

- Part 1 The Periodic Table
- Part 2 Elements in the world
- Alien Periodic Table Activity: Being Dimitri Mendeleev
- Atoms Family Matterville and Atomic Math Challenge
- Periodic Table Basics
- Bohr Model Activity
- Reading: Chemical Interactions Resource Books

- Elements
- Elements in the Universe

- Multimedia:
  - Interactive Periodic Table (Fossweb.com)

**FOSS Chemical Interactions Investigation 7 Phase Changes**

- Part 2 Melting Temperature
- Part 3 More Heat
- Reading: Chemical Interactions Resources Book
  - Rock Solid
- Multimedia:
  - Particles in Solid, Liquid, and Gas (fossweb.com)

**Assessments:**

Quizzes/Tests

Unit #1 Pre-test

Quiz Investigation 1

Quiz Investigation 2

Quiz Investigation 9

Unit #1 Post-Test