**Science and Engineering Practices**

Developing and Using Models
Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to predict and/or describe phenomena. (MS-PS1-1) (MS-PS1-4)
- Obtaining, Evaluating, and Communicating Information
  Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.
  - Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3)
  
  **Connections to Nature of Science**

Science Models, Laws, Mechanisms, and Theories
- Explain Natural Phenomena
  - Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)

**Disciplinary Core Ideas**

**PS1.A: Structure and Properties of Matter**
- Substances are made from two or more 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)
- 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) (Note: This Disciplinary Core Idea is also addressed by MS-PS1-2)
- Gases and liquids are made of or inert atoms that are moving about relative to each other. (MS-PS1-4)
- 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)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
- 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)

**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. (MS-PS1-3) (Note: This Disciplinary Core Idea is also addressed by MS-PS1-2 and MS-PS1-5)

**PS3.A: Definitions of Energy**
- The term "heat" as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and to radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. (secondary to MS-PS1-4)
- The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (secondary to MS-PS1-4)

**Crosscutting Concepts**

**Cause and Effect**
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

**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. (MS-PS1-1)

**Structure and Function**
- 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)

**Connections to Engineering, Technology, and Applications of Science**

**Interdependence of Science, Engineering, and Technology**
- 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 technologies. (MS-PS1-3)

**Influence of Science, Engineering and Technology on Society and the Natural World**
- The uses of technologies and any limitations 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)

**Common Core State Standards Connections:**

**ELA/Literacy –**

RST.6–8.1
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)

RST.6–8.7
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)

**Mathematics –**

MP.2
Reason abstractly and quantitatively. (MS-PS1-1)

MP.4
Model with mathematics. (MS-PS1-1)

6.RP.A.3
Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1)

6.NS.C.5
Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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contexts, explaining the meaning of 0 in each situation. (MS-PS1-4)
Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. (MS-PS1-1)

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