## 5. Structure and Properties of Matter

### Science and Engineering Practices

**Developing and Using Models**
- Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
  - Develop a model to describe phenomena. (5-PS1-1)

**Planning and Carrying Out Investigations**
- Planning and carrying out investigations to answer questions or test solutions in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
  - Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)
  - Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

**Using Mathematics and Computational Thinking**
- Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.
  - Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

### Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**
- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model shows that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects. (5-PS1-1)
  - The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
  - Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

**PS1.B: Chemical Reactions**
- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
  - No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

### Crosscutting Concepts

**Cause and Effect**
- Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)

**Scale, Proportion, and Quantity**
- Natural objects exist from the very small to the immensely large. (5-PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5-PS1-3)

### Connections to Nature of Science

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**
- Science assumes consistent patterns in natural systems. (5-PS1-2)

### Articulation of DClS across grade-bands:

- **2.PS1.A** (5-PS1-1),(5-PS1-2),(5-PS1-3);
- **2.PS1.B** (5-PS1-2),(5-PS1-4);
- **MS.PS1.A** (5-PS1-1),(5-PS1-2),(5-PS1-3),(5-PS1-4);
- **MS.PS1.B** (5-PS1-2),(5-PS1-4)

### Common Core State Standards Connections:

**ELA/Literacy -**
- **RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)
- **W.5.7** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-3),(5-PS1-4)
- **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2),(5-PS1-3),(5-PS1-4)
- **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2),(5-PS1-3),(5-PS1-4)

**Mathematics -**
- **MP.2** Reason abstractly and quantitatively. (5-PS1-1),(5-PS1-2),(5-PS1-3)
- **MP.4** Model with mathematics. (5-PS1-1),(5-PS1-2),(5-PS1-3)
- **MP.5** Use appropriate tools strategically. (PS1-2),(PS1-3)

**S.NBT.A.1** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)

**S.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)

**S.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)

**S.MD.C.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)

**S.MD.C.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)

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

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