



## Matter and Its Interactions Concept Storyline

### ● Unit Driving Question: How does matter and its interactions affect everyday life?

#### **Lesson 1:** Pre-Assessment: Matter and Its Interactions

##### **Focus Question:** What do you know about matter?

Students perform short, simple investigations that evaluate their existing knowledge of one or more concepts related to matter and its interactions. Students make observations of pure substances and mixtures and determine if new substances are formed. Students also evaluate predictions, use evidence to support claims, and infer cause-and-effect relationships.

#### **Lesson 2:** The Nature of Matter

##### **Focus Question:** What can properties of matter help you determine?

Students observe and describe samples of matter based on their physical and chemical properties (including solubility, and reactivity). Students also identify mystery samples on the basis of their physical and chemical properties.

#### **Lesson 3:** Density Makes a Difference

##### **Focus Question:** How can density be used to identify a substance and predict how it will behave under different conditions?

Students compare the densities of different substances, including liquids and irregularly shaped objects. Students also make and test predictions about the floating of solids in liquids and use their findings to re-create the density bottle they explored in the Pre-Assessment.

#### **Lesson 4:** Just a Phase

##### **Focus Question:** How is energy related to physical changes in matter?

Students record the temperature of water as it melts, warms, and boils and then make connections with molecular-level observations in a computer simulation of the same experiment. Students also apply their understanding of the law of conservation of mass to plan and carry out investigations of the mass of water as it melts or freezes in a sealed container.

#### **Lesson 5:** Building Blocks of Matter

##### **Focus Question:** How can you use a model to describe the composition of matter?

Students rotate through stations to collect information about 16 different element samples. Next, students combine elements and create models of simple molecules using plastic atoms and computer simulations.

#### **Lesson 6:** Pure Substances and Mixtures

##### **Focus Question:** How can mixtures be separated?

Students observe and describe samples of pure substances and mixtures. Students use chromatography to separate inks, and distill flavoring from a carbonated beverage. Students apply engineering skills to design a method for removing impurities from rock salt.



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• **Lesson 7:** *Reacting Chemically*

**Focus Question:** How can the properties of matter be used to determine if a chemical reaction has occurred?

Students analyze and interpret data on the properties of substances before and after different chemical reactions. Students also use their data to support the claim that a new substance has been formed. Chemical reactions include: the electrolysis of water; formation of precipitates; and combination of sodium bicarbonate, calcium chloride, and phenol red.

**Lesson 8:** *Releasing Energy*

**Focus Question:** What is the relationship between changes in substances and changes in thermal energy?

Students investigate a physical change that releases energy (dissolving calcium chloride in water). Next, students use data from their investigation to design a device that provides heat on demand: an instant hot pack.

**Lesson 9:** *Conservation of Matter*

**Focus Question:** What happens to matter in a chemical reaction?

Students will apply their understanding of the law of conservation of matter to create models that explain situations in which matter seems to appear or disappear. Chemical reactions include dissolving an effervescent tablet in water and burning steel wool.

**Lesson 10:** *Compounds from Natural Resources*

**Focus Question:** How are synthetic compounds made and used?

Students read about and investigate natural resources that undergo chemical reactions to produce synthetic materials. Students plan and conduct an investigation to determine which solutions can be combined with sodium alginate to form a gelatinous product.

**Lesson 11:** *Assessment: Matter and Its Interactions*

**Focus Question:** How can we use our knowledge of matter and its interactions to solve problems?

The unit concludes with a two-part assessment. The first part is a Performance Assessment, in which students demonstrate their content knowledge and science and engineering skills to design a cold pack using one of five chemical compounds. Students must set up their own experiments and justify their selection based on safety for humans, safety for the environment, and cost of material per gram. In the second part, students complete a Written Assessment covering the performance expectations, disciplinary core ideas, crosscutting concepts, and science and engineering practices covered in this unit.

More resources for teachers and students found at:

[www.carolinascienceonline.com](http://www.carolinascienceonline.com)

[www.ssec.si.edu/STCMS](http://www.ssec.si.edu/STCMS)

For more information about STCMS visit:

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