5th Grade - Lesson 3.5
Different Substances React Differently
NGSS Alignment

Performance Expectations

5-PS1-3: Make observations and measurements to identify materials based on their properties.

5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Measurements of a variety of properties can be used to identify materials. (5-PS1-3)

  Students combine citric acid with baking soda in a universal indicator solution. They observe a color change, production of a gas, and a decrease in temperature. Students then combine calcium chloride with baking soda in a universal indicator solution. Students observe a somewhat different color change, production of a gas, a cloudy appearance, and a slight increase in temperature. Students develop an understanding that the way citric acid and calcium chloride react with baking soda is a characteristic property of those substances and can be used to identify the substance.

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)

  Students see a color change, production of a gas, and a temperature change. All these changes are indications that something new has formed.

Science and Engineering Practices

Developing and Using Models

- Develop a model to describe phenomena.

  Students use molecular model animations to help explain that the interaction between the citric acid and baking soda is different than the interaction between calcium chloride and baking soda. The reason is because the atoms that make up the two substances and their arrangement are different.

Planning and Carrying Out Investigations

- 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 is considered.

  Students add citric acid to baking soda in a universal indicator solution and calcium chloride to baking soda in a universal indicator solution. In each case students compare equal amounts and control variables for a fair test. Multiple groups conduct the same experiment so several trials take place at the same time.

Crosscutting Concepts

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5-PS1-1)

  Students develop an understanding that the different atoms in the molecules of the reactants interact to produce a color change, a gas, and a change in temperature that students can observe. Students see that their macroscopic observations can be explained on the sub-microscopic molecular level.

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change.

  Students develop an understanding that the atoms in the molecules of the reacting substances interact to cause a color change, production of a gas, and a change in temperature.