

5th Grade - Lesson 3.4

Chemical Reactions and Color Change

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 see that citric acid turns red cabbage indicator pinkish and that laundry detergent turns the indicator greenish. Students develop an understanding that the ability to change an indicator to a particular color is a characteristic property of a substance 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 when citric acid and laundry detergent are added to red cabbage indicator. A change in color is an indication that something new has formed. In this case, the “new” substance is a change in the indicator that makes it appear a different color.

Science and Engineering Practices

Developing and Using Models

- Develop a model to describe phenomena.

Students use molecular model animations to help explain the interaction between the citric acid and the indicator and between the laundry detergent and the indicator which result in a color change.

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 a base (laundry detergent) to an acidic solution to attempt to neutralize it. They also add an acid (citric acid) to a basic solution to attempt to neutralize it. Students discover that acids and bases are like chemical opposites that can be used to neutralize one another. 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 molecules in an acid and a base interact with the molecules of the indicator to produce a color change that students can see. Students see that their macroscopic observations of a color change 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 molecules in an acid and a base interact with the molecules of the indicator to cause a color change.