

# POWERHOUSE SCIENCE CENTER

3615 Auburn Blvd., Sacramento 95821 (916) 674-5000

## Topics

Chemistry

## Grades

3-5

## Duration

60 minutes

## Vocabulary

chemical, molecule, atom, physical change, chemical change,

## Next Generation

## Science Standards

### *Practices*

Asking Questions & Defining Problems

Planning & Carrying Out Investigations

Analyzing & Interpreting Data

### *Core Ideas*

PS1.A Structure of matter

PS1.B Chemical reactions

### *Crosscutting Concepts*

Patterns

Cause and Effect:  
Mechanism and Prediction

Scale, Proportion and  
Quantity

## Remarkable Reactions

### Overview

This program begins with discussion and demonstrations to introduce students to chemistry and kinds of change. Next students perform a series of hands-on experiments. Students will make and record observations. They will then use their recorded observations to make a hypothesis. A final experiment will reveal whether or not the hypothesis was correct.

### Objectives

- Students will understand that the world around them is made of chemicals and these chemicals can change.
- Students will observe that chemicals can interact with each other and result in new substances with different properties.
- Students will record descriptions of reactants and products. They will see that past observations can be used to predict future occurrences.

### Teacher Preparation

- Please arrive at Powerhouse with enough time to allow students and chaperones to use the restroom before the program begins.
- If program starts late, content will be altered to fit available time.
- The teacher is required to remain in the lab throughout the presentation.
- Students will be working with chemicals. They should wear appropriate clothing.
- Students will work in pairs. Be sure to assign pairs who will work well together.
- Students will be writing descriptions on a lab sheet. If this presents a challenge to any of your students, please be sure to inform Powerhouse in advance.

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## 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 mixing of two or more substances results in new substances.

## Vocabulary

**Chemical:** a substance consisting of matter

**Molecule:** a tiny particle that makes up most matter

**Atom:** a tiny particle that can combine to make molecules

**Physical Change:** a change that can be easily reversed

**Chemical Change:** a change that cannot be easily reversed

## Quotes

"Chemistry was my college interest. Cooking is about chemistry."

- Lidia Bastianich

"There are more atoms in a glass of water than there are glasses of water in an ocean."

- Unknown

## Remarkable Reactions

### Extended Learning Activities

#### Physical Change

This activity is a classic, and with good reason. You will need a two liter bottle of cola and a pack of Mentos candy (original flavor). Choose an outside area (this activity will make a mess!) Open the bottle of cola. Use a tube of paper (or a commercially available "Mentos tube") to quickly place as many Mentos as you can into the bottle. Step back. A fountain of foaming cola will shoot out of the bottle.

Despite the spectacular result, this reaction is not a chemical change. It is a physical change. The cola has dissolved carbon dioxide. Normally, only small amounts of the carbon dioxide are able to form bubbles, which is why cola fizzes. A Mentos candy has a very rough surface. When placed in the cola, the candy's rough surface allows large amounts of carbon dioxide bubbles to form very quickly. This is what causes the cola fountain.

#### Chemical Change

Obtain some dirty pennies. The reason they look dull is because the copper coating has combined with oxygen in the air. It is possible to cause a chemical change that cleans the pennies.

Give each student or group of students a dirty penny, a paper cup with a small amount of vinegar, and some salt. Students carefully place the penny into the vinegar and add a pinch of salt. Observe as the penny turns from dull to shiny. Vinegar and salt form a very small amount of hydrochloric acid, which removes the dull oxidized copper.

### Resources

American Chemical Society

<https://www.acs.org/content/acs/en/education/resources/k-8/science-activities.html>

National Science Teachers Association

<http://www.nsta.org/publications/freebies.aspx> (Keyword: Chemistry)

National Informal STEM Education Network

<http://www.nisenet.org/chemistry-kit>