Lab: Reaction Rate

FOR THE TEACHER

Summary
In this lab, students will explore factors that effect reaction rate and develop a general statement that describes how the factors (temperature, particle size, and concentration) effect the rate based on experimental data. This is an inquiry-based activity.

Grade Level
High or middle school

Objectives
By the end of this lesson, students should be able to
- Devise a method to measure reaction rate
- Design a controlled experiment
- Describe how temperature, particle size and concentration affect the rate of a reaction.

Chemistry Topics
This lesson supports students’ understanding of
- Reaction rates

Time
Teacher Preparation: 20 minutes
Lesson: 1 class period

Materials
- 6 Alka-Seltzer tablets
- Beakers (5)
- Graduated cylinder
- Water
- Mortar and pestle or zipper plastic bags
- Thermometer
- Baking soda
- Vinegar
- Other materials as requested by student

Safety
- Always wear safety goggles when handling chemicals in the lab.
- Students should wash their hands thoroughly before leaving the lab.

Teacher Notes
- This lab was developed with inquiry in mind. For more information about inquiry-based activities and how to plan them, watch the archived webinar “Cookbook to Inquiry.”
- It is up to the students to determine how to measure the reaction rate.

FOR THE STUDENT
Student Activity Sheet: Reaction Rates

Lesson

Background
The two main ingredients in Alka-Seltzer are citric acid and sodium bicarbonate, an acid and base. When these substances react, one of the products is carbon dioxide gas.

Procedure
Using Alka-Seltzer antacid tablets, design experiments to study how temperature, particle size, and concentration affect the rate of reaction.

Rules:
1. All procedures must be approved by your teacher.
2. Be specific about your procedures.
3. Only vary one variable.
4. Make sure all containers are clean and dry before starting the experiment.

Before you begin:
Place one Alka-Seltzer tablet in a container. Add 20 mL of water. Observe the reaction.

Observations

PART I: Temperature’s effects on reaction rate
Write a procedure to test the effect of temperature on rate using the Alka-Seltzer and water reaction you just carried out. Your teacher must approve your procedure before you can carry out the experiment.

Procedure

Prediction

Observations

Was your prediction correct?

Write a statement that describes the effect of temperature on reaction rate.

PART II: Particle size’s effect on reaction rate
Write a procedure to test the effect of particle size on rate using the Alka-Seltzer and water reaction you just carried out. Your teacher must approve your procedure before you can carry out the experiment.

Procedure

Prediction

Observations

Was your prediction correct?
Write a statement that describes the effect of particle size on reaction rate.

PART III: Concentrations effects on reaction rate
Baking soda is sodium bicarbonate. Vinegar is acetic acid in water. These chemicals react to produce carbon dioxide gas, the same product released by the Alka-Seltzer tablet in water. Place a small amount of baking soda two containers. Pour 10 mL of water in one container and 10 mL of vinegar in another container. Make observations.

Observations
Design an experiment to see how the concentration of vinegar effects the reaction rate.
Procedure
Prediction
Observations
Was your prediction correct?
Write a statement that describes the effect of concentration on reaction rate.

To clean up: Pour solutions down the sink. Clean and dry all containers.