

LAB

Reaction Rates

LAB A

Background

Many people believe that you cannot perform chemical reactions without expensive equipment or costly chemicals. But this isn't true; chemical reactions happen everywhere. All you need is a food store to find many substances that can produce exciting chemical reactions.

Question

What factors determine how much product is produced in a chemical reaction or how fast a reaction occurs?

Materials

water	balloons (3)
baking soda	test tube
plastic 0.5-liter soft-drink bottles (3)	150-mL beakers (2)
marker	500-mL beaker
stop watch, or clock with second hand	100-mL graduated cylinder
vinegar solution	tape

Objectives

- Evaluate the effect of concentration on the rate of a reaction.
- Examine the effect of temperature on the rate of a chemical reaction.

Safety Precautions



Procedure

1. Read the procedure and safety information, and complete the lab form.
2. Make data tables similar to those shown on the following page.
3. Prepare a 50% vinegar solution by mixing 30 mL of vinegar with 30 mL of water.
4. Prepare a 30% vinegar solution by mixing 30 mL of vinegar with 70 mL of water.
5. Prepare a 10% vinegar solution by mixing 30 mL of vinegar with 270 mL of water.
6. Pour the vinegar solutions into three 0.5-L plastic bottles labeled A, B, and C.
7. Mark a small test tube about 1–2 cm from its bottom. Fill the test tube to the line with baking soda. Pour the baking soda into one balloon.
8. Repeat step 7 with two more balloons. Be sure the amount of baking soda in each balloon is the same.
9. Place the mouth of one balloon over the mouth of one 0.5-L bottle. Do not let any of baking soda fall into the vinegar solution.
10. Repeat step 9 with the other two balloons and the remaining bottles.
11. Lift each balloon to allow the baking soda to fall into each vinegar solution. Time how long it takes for the reaction to finish. Measure how much each balloon inflates. Record your observations in your Concentration data table.
12. Carefully remove the balloons from the bottles.
13. Rinse the plastic bottles with water.
14. Prepare a 30% vinegar solution by mixing 30 mL of vinegar with 70 mL of cold water.
15. Prepare two more similar solutions with room-temperature water and hot water.
16. Place the three solutions in the three 0.5-L plastic bottles.
17. Repeat steps 7 and 8 to refill the balloons with baking soda.
18. Place the balloons back on the bottles, repeating steps 9 and 10.
19. Repeat step 11. Time how long it takes for the reaction to finish.
20. Measure how much each balloon inflates. Record your observations in your Temperature data table.

LAB

(continued)

LAB A**Concentration Data Table**

Vinegar Concentration	50%	30%	10%
Observations			

Temperature Data Table

Solution Temperature	Cold	Room Temperature	Hot
Observations			

Analyze Your Data

1. Describe how increasing the concentration of a solution affects the rate of a chemical reaction.

2. Summarize how temperature affects the rate of a chemical reaction.

3. Explain why the balloons become inflated.

Conclude and Apply

4. Infer why the vinegar solutions in steps 3, 4, and 5 were different volumes. Why couldn't the volumes be the same?

5. Predict what factors might affect the amount of product that is produced. What factors affect the rate at which products are produced?

Communicate Your Data

Draw a diagram that visually represents your observations. Compare your diagram to those of your classmates.