

Chapter 5 Weathering, Soil, and Mass Movements

Exploration Lab

Effect of Temperature on Chemical Weathering

Water is the most important agent of chemical weathering. One way water promotes chemical weathering is by dissolving the minerals in rocks. In this lab, you will examine the effect of temperature on chemical weathering by measuring the rate at which antacid tablets dissolve in water at different temperatures. These tablets contain calcium carbonate, the mineral found in rocks such as limestone and marble.

Problem How does temperature affect the rate of chemical weathering?

Materials

- 250-mL beaker
- thermometer
- hot water (40–50°C)
- ice
- 5 antacid tablets
- stopwatch

Skills Measuring, Using Tables and Graphs, Drawing Conclusions, Inferring

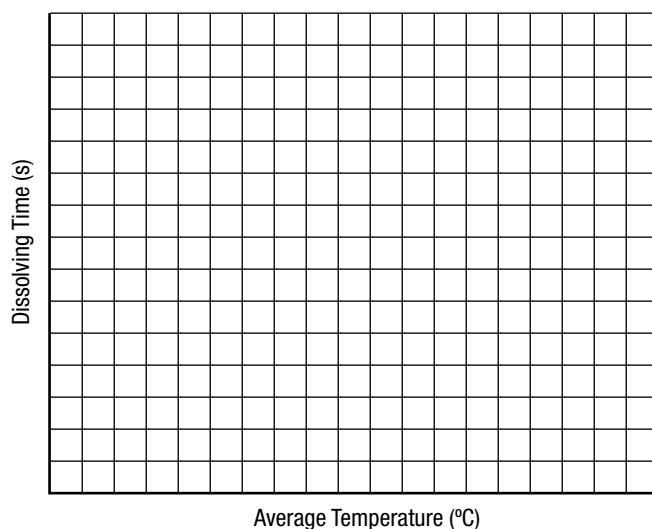
Procedure

1. Use the Data Table to record your measurements.
2. Add a mixture of hot water and ice to the beaker. Use the thermometer to measure the temperature of the mixture. Add either more hot water or more ice until the temperature is between 0°C and 10°C. The total volume of the mixture should be about 200 mL.
3. When the temperature is within the correct range, remove any remaining ice from the beaker. Record the starting temperature of the water in the Data Table. Remove the thermometer from the beaker.
4. Drop an antacid tablet into the beaker. Start the stopwatch as soon as the tablet enters the water. Stop the stopwatch when the tablet has completely dissolved and no traces of the tablet are visible. (Don't wait for the bubbling to stop.) Record the time in the Data Table.
5. Place the thermometer in the beaker and wait for the temperature of the water to stabilize. Record the final temperature of the water in the Data Table.
6. Calculate the average temperature by adding the starting and final temperatures and dividing by 2. Record the result in the Data Table.
7. Repeat Steps 2–6 four more times, once at each of the following temperature ranges: 10–20°C, 20–30°C, 30–40°C, and 40–50°C. Adjust the relative amounts of hot water and ice to produce the correct water temperatures. The total volume of water and ice should always be about 200 mL.

8. On the following graph, add labels for temperature ranges and time intervals. Then plot your data on the graph. Draw a smooth curve through the data points.

DATA TABLE

Starting Temperature (°C)	Dissolving Time (s)	Final Temperature (°C)	Average Temperature (°C)

**Analyze and Conclude**

- Analyzing Data** At which temperature did the antacid tablet dissolve most rapidly?

- Analyzing Data** At which temperature did the antacid tablet dissolve most slowly?

- Drawing Conclusions** What is the relationship between temperature and the rate at which antacid tablets dissolve in water?

- Formulating Hypotheses** Based on your observations, form a hypothesis about the relationship between temperature and the rate of chemical weathering.

5. Designing Experiments How could you test your hypothesis?

6. Predicting What would your results have been if you had ground each tablet into a fine powder before dropping it into the water? Would your conclusion be the same or different? Explain.

7. Inferring Would a limestone building weather more rapidly in Homer, Alaska, or in Honolulu, Hawaii? (Both cities receive about the same amount of precipitation in an average year.) Explain your reasoning.
