

Chemistry Activity Bag

Reaction Rates: Student Activity Guide

Chemical reactions can take different amounts of time. Some things speed them up or slow them down, and one of those things is temperature. We are about to explore how much time it takes a chemical tablet and water to react at different temperatures.

These directions will get you started. Your teacher will be in contact to guide you and provide information.

Materials From The Bag

- 8 Effervescent Tablets
- 6 Small Plastic Cups
- 1 Graduated Medicine Cup
- 3 Foam Cups

You Will Supply These Materials

- Water
- Ice Cubes
- Timer or Stopwatch

Part 1: Exploration

In this part of the activity, you will observe and time a chemical reaction. The reaction starts the moment the chemical tablet and water touch each other. That's when you start the timer. You will have to figure out what you will see that tells you the reaction has ended because that's when you stop the timer.

1. Fill a small plastic cup with 60 mL of water using the small graduated medicine cup.
2. Have a timer or stopwatch and 1 effervescent tablet ready.
3. Drop the tablet into the cup of water and start the timer.
4. Observe the reaction and stop the timer when you determine the reaction to be over.
5. Record how long it took for the reaction to end and what you saw that told you the reaction had ended.

It can be difficult to know when this chemical reaction has ended. Was it when the tablet was gone or when it stopped bubbling? For the rest of this activity, **we will stop the reaction when you can no longer see the tablet, even if there are still bubbles.**

Part 2: Temperature and Reaction Rates

In this part of the activity, you will observe temperature's effect on reaction rate.

1. Get 3 foam cups and label them: **room temp**, **hot**, and **cold**. Water that sits out long enough to be the same temperature as the room it's in is called "room temperature." It usually takes about an hour of sitting.

Room Temperature Test

2. Fill the foam cup labeled **room temp** with water.
3. Once the **room temp** cup is ready, use the small graduated medicine cup to pour 60mL of room temp water into a small clear plastic cup.
4. Have a timer or stopwatch and 1 effervescent tablet ready.
5. Drop the tablet into the cup of water and start the timer.
6. Observe the reaction and stop the timer when the reaction has stopped.
7. Create a data table and record the time it took for the tablet to dissolve in room temp water.

Cold Water Test

1. Fill the foam cup labeled **cold** with water and several ice cubes.
2. Pour 60mL of cold water into a small clear plastic cup (no ice cubes in the small clear plastic cup).
3. Have a timer or stopwatch and 1 effervescent tablet ready.
4. **Before you begin the test**, predict how much time you think it will take for the reaction to finish in **cold** water. Record your prediction in your data table.
5. Drop the tablet in the cup of cold water and start the timer.
6. Observe the reaction and stop the timer when the reaction has stopped.
7. Record your results on your data table and compare them to your prediction.

Hot Water Test

1. Turn on the hot water in your tap and let it run until it gets hot. Fill the foam cup labeled **hot** with this hot water.
2. Use the small graduated medicine cup to pour 60mL of hot water into a small clear plastic cup.
3. Repeat steps 3-7 from the cold water test.

What's happening...

In general, most chemical reactions speed up as temperature increases. Hot water has more energy than cold water. This energy causes the atoms to move faster resulting in a quicker reaction.

Part 3: Graph, Analyze, Predict and Test

In this part of the activity, you will use the data you collected in part 2 to make a **bar graph** comparing reaction times at different temperatures. Leave space between the bars on the graph. *How do you think temperature affects reaction time?* Before you begin, look at the space in your graph between cold and room temperature, and between room temperature and hot. Use your graph to predict how long reactions will take at those temperatures. After you predict, you can test and compare your results to your predictions.

First Test “Cold + Room Temperature”

1. Get a cup with cold (ice) water labeled **cold**, and a cup with room temperature water labeled **room temp**.
2. Use the small graduated medicine cup to pour 30mL of **cold** water and 30mL of **room temp** water into an empty small clear plastic cup. What would you call the temperature of this water?
3. Have a timer or stopwatch and 1 effervescent tablet ready.
4. Drop the tablet into the cup of water and start the timer.
5. Observe the reaction and stop the timer when the reaction has stopped.
6. Record your results on your data table and compare them to your prediction.

Second Test “Hot + Room Temperature”

1. For this test you will need a foam cup with hot water from your tap labeled **hot** and a cup of room temperature water labeled **room temp**.
2. Use the small graduated medicine cup to pour 30mL of **hot** water and 30mL of **room temp** water from the foam cups into a small clear plastic cup. What would you call the temperature of this water?
3. Repeat steps 3-6 from cold and room temperature.

Rinse, dry, and save the graduated medicine cup for the “Physical and Chemical Changes” activity.