

# CURIOSITY AT HOME

## THUNDERSTORM IN A TUB



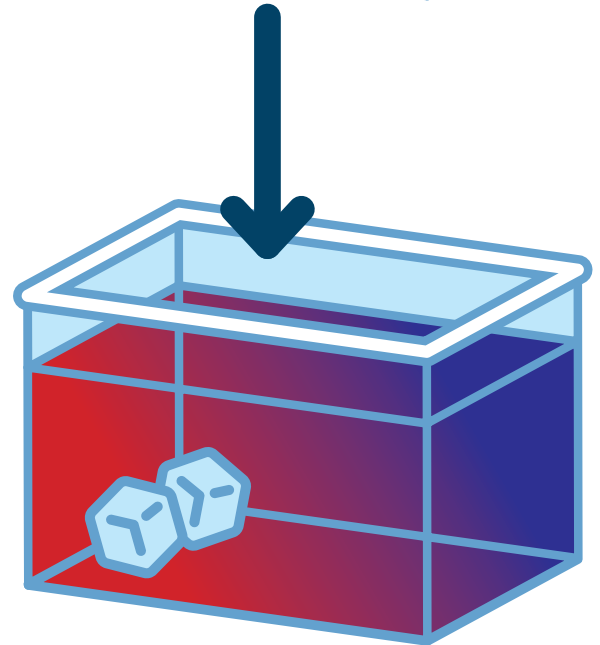
*Thunderstorms are a type of weather that usually include heavy rain, flashes of lightning, and the sounds of crashing thunder. In this experiment, you will model the beginning stages of a thunderstorm by observing the mixing of warm and cool temperatures.*

### MATERIALS

- Water
- Ice cube tray
- Liquid food coloring (or liquid watercolors)
- Clear plastic tub (size of a shoebox)
- Lukewarm water (water should warm to the touch, but not hot)
- Colored pencils, crayons or markers (optional)
- Something to write with
- Science notebook or paper

### PROCEDURE

- Freeze some ice cubes with blue dye mixed into them. You will need 2 ice cubes for each round of the activity. We recommend freezing at least 4 so you can try this twice, with the option to make more for additional rounds of the activity.
- Once your ice cubes are frozen, fill your tub with lukewarm water. The water should feel warmer than the room, but cool enough that you can keep your fingers in it.
- Add 4-5 drops of red dye into one side of the tub. Do not mix the color into the water.
- Next, place 2 blue ice cubes in the opposite side of the tub. Do not stir or disturb the water. Observe how the different colors behave over time. What do you notice? Record your observations in your science notebook.
  - **Tip:** The two colors should stay distinct and not mix to form purple water instantly. If you are getting purple water very quickly, your warm water may be too hot, melting your ice cubes too fast. Eventually it will mix and make purple water but it should be a slow process.



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### EXPLORE MORE

- Use your science notebook and some coloring utensils to sketch what you observed happening in your model. Be sure to use arrows to show the direction the different water temperatures are moving.
- Can you describe what is happening in the tub in your own words? Write down some key things that you notice and guess what those might represent in a real thunderstorm.

### WHAT'S HAPPENING?

- This is a simple model of the first stage of a thunderstorm. In your tub, the cold (blue) water sinks and pushes the warm (red) water up. The same thing happens in a real thunderstorm with cold and warm air. When colder air from higher in the atmosphere reaches warm air next to the ground, the cold air sinks to the ground in a strong wind called a **downdraft** and pushes the warmer air upwards making an **updraft**. That's why we often feel a strong cold wind before a thunderstorm, it's the downdraft!
- As hot air cools, the moisture in the air condenses, forming rain droplets. Eventually, the cloud becomes too heavy and water falls as rain droplets.



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### K-2 GRADE EXPLORATION

- Where did the red color go? What about the blue?
- Have you ever seen lightning before? What did it look like? Did you notice any sounds after seeing the lightning?
- What are some things you can do to stay safe during a thunderstorm? Draw out what you can do and talk about it with your adult.
- Thunderstorms are a type of weather. What types of weather do you see where you live?
- Scientists called **meteorologists** use scientific tools to help them predict the weather. We call these predictions **forecasts**. Ask an adult to help look up the weather forecast for the next week, and copy it into your science notebook. For the next week, observe the weather every day and record it in your science notebook. What days were the same as the forecast and what days were different?



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### 3–5 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook.

- Do you think this experiment would work if you used cold water instead of lukewarm water? Make a prediction of what would happen, then repeat the experiment with this change.
- Could you speed the mixing process up if you made the red water very hot? Why or why not? Ask an adult to help you make some hot water and try it out!
- Have you ever seen a thunderstorm? Can you list some things you observed before, during, and after the thunderstorm? List everything that you can. What are some similarities and differences between a real thunderstorm, and this model of the first stage of a thunderstorm?
- Next time you see a thunderstorm, calculate how far away the center of the storm is by counting the seconds between the lightning and the thunder. Take the number of seconds and divide by 5 to determine the number of miles away the storm is. For example if you count 10 seconds between lightning and thunder, the storm is 2 miles away.
- Learn about the conditions needed to make a thunderstorm with [this simulation tool](#)<sup>1</sup> from the Center for Science Education.
- After learning what conditions are needed for a thunderstorm, try to predict times of the year thunderstorms might be possible in your area using past weather data.
  - Visit [timeanddate.com/weather](https://timeanddate.com/weather) to find weather conditions for your area from the past year going month by month.
  - Can you find any times of year that have the conditions needed for a thunderstorm?
  - How might climate change affect the accuracy of using past weather data to make future predictions?

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<sup>1</sup> <https://scied.ucar.edu/interactive/make-thunderstorm>



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### 6–8 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook.

- Is there another way you could show the heating and cooling effects of a thunderstorm? Design another way to model this and try it out.
- How fast did the water move in your experiment? Remember, real updrafts can be up to 90mph. Why do you think storms are able to move faster than your experiment?
- Next time you see a thunderstorm, calculate how far away the center of the storm is by counting the seconds between the lightning and the thunder. Take the number of seconds and divide by 5 to determine the number of miles away the storm is. For example if you count 10 seconds between lightning and thunder, the storm is 2 miles away.
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