

# STUDENT GUIDE: WEATHER WATER TANKS

## OBJECTIVES

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In this activity, you will discover:

- That temperature affects the density of fluids (liquids and gases).
- How fluids with different densities interact with each other.

## BACKGROUND

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Temperature is one factor that affects the density of a fluid (a liquid or a gas). The same fluid is less dense at a higher temperature than it is at a lower temperature. This means that there are fewer atoms or molecules in the same amount of the fluid when it is hotter. Fewer atoms or molecules mean less mass. For example, imagine that you're in a hot air balloon. All the passengers in the basket are waiting to take off, but nothing happens. At last, the pilot turns on the burner (located above your head, near the mouth of the balloon). There's a loud rushing sound and a huge flame comes from the burner. The balloon starts to rise. Up it goes, higher and higher! Why? The balloon rises because hot air is less dense than cold air. When the air in the balloon was heated by the burner, the hot air inside it became less dense than the cooler air of the atmosphere around it. Hot air (less dense air) is lighter and rises up, while heavier cool air (denser air) remains below.

## MATERIALS PER GROUP

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1 water tank  
1 beaker, containing red food color  
1 beaker, containing blue food color  
Hot and cold water  
2 droppers  
Sheet of unlined paper or cardboard (optional)  
Tape (optional)

## PROCEDURE

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1. Gather the materials listed above at your work table.
2. Add 250 mL cold water to the beaker containing blue food color.
3. Add 250 mL hot water to the beaker containing red food color.
4. Make sure that the divider in the middle of the water tank is pushed firmly to the bottom of the tank. For easier viewing, your teacher may direct you to tape a piece of unlined paper to the outside of one of the long sides of the water tank. This will be the back of the tank.
5. Have one student in your group pour 200 mL of the hot water into one side of the tank at the same time that another student in your group pours 200 mL of the cold water into the other side of the tank.

6. **Wait a few seconds until the water in the tank stops moving. Have a group member slowly and carefully remove the divider. Watch the movement of the water in the tank.**

**Describe what happened when the divider between the hot water and the cold water was pulled out. Why did this happen?**

7. **Use a clean dropper to carefully put 1-2 drops of hot red water from the beaker into the tank. Watch closely.**

**Explain what happened when hot water was dropped into the tank.**

8. **Use a clean dropper to carefully put 1-2 drops of cold blue water from the beaker into the tank. Watch closely.**

**Explain what happened when cold water was dropped into the tank.**

9. **Disturbing the water as little as possible, have each member of your group, one at a time, slide a finger slowly down into the water.**

**Describe how your finger felt when you slid it down to the bottom of the tank.**

10. Carefully put the divider back into the tank and, using the appropriate dropper, stir the water in **only one side** of the tank. Now, there is hot and cold water on one side and warm water on the other side.

Predict what will happen when the divider separating the layers of hot and cold water from the warm water is removed from the tank.

11. Slowly and carefully remove the divider from the tank. Was your prediction correct? If your prediction was not correct, describe what really happened.

12. From this activity, what can you conclude about the interactions of fluids of different densities?