

I Sink Therefore I Am

Grade: «grade»
Subject: «subject»
Date: «date»

You've seen that fluids **convect** relative to their surrounding.

Fluids **hotter** than their surroundings tend to rise.

Fluids **colder** than their surroundings tend to sink.

But, *is temperature the only factor that drives convection?* In this activity, you'll test this question.

1. Obtain a clear container with water and one colored ice cube.
2. Gently place the ice cube in the water .
3. Observe what happens to the ice cube and cold water that melts away from the ice cube.
 - a. **carefully change angles for a better view of the water beneath the ice cube**, put a plain white sheet of paper behind it so you can see it better
 - b. **draw a sketch representing what you observe, and add labels, symbols and arrows to it.**
4. Write a phrase to explain what you observed. Use the terms “**more dense**” and “**less dense**” to **describe the ice cube**, the water, and **what is coming off the ice cube**.

We will do this experiment again, but this time we want to find a way to **anchor**, or hold down, the ice cube to the bottom of the container.

A Chilly Challenge:

How can you anchor an ice cube to the bottom of a clear container filled with water?



Clear container of water with ice cube anchored to bottom

1 I **predict** that when the ice cube is anchored near the bottom, the water coming off the ice cube will

2 The reason for my prediction is that....

- A ice is more dense than water
- B ice is less dense than water
- C cold meltwater is less dense than water
- D cold meltwater is more dense than water

- E I'm just guessing

Obtain a **second** container of water and **ice cube** from your teacher, with a **weight** in it or some way of keeping it at the bottom of the container.

Observe what happens to the ice cube and cold water that melts away from the ice cube.

a. carefully **change angles for a better view** of the water beneath the ice cube.

b. **draw a sketch** representing what you observe, and add **labels**, **symbols** and **arrows** to it.

Can your **observations** with the **anchored cube** be explained with the claim “**hot rises, cold sinks**”?

(hint: the water melting from the cube is colder than the water in the container).

³ *In the **1st** investigation, the cold meltwater from the ice cube was _____ (more/less) dense than the water around it, so the cold water _____ (rose/sunk)?*

4 In the **2nd** investigation, the cold meltwater from the cube was _____ (**more/less**) dense than the fluid around it, so the cold water _____ (**rose/sunk**)

What do your findings indicate about the density of water in the 2nd investigation compared with the cold water melting from the ice cube?

Homework questions:

a. Return to our original question: **Is temperature the only factor that drives convection?** How would you answer this question now?

b. In what setting on earth could both **temperature** and **saltness** have an effect on convection?