

Experiment: Modeling Thermohaline Water Flow

Materials

- Two transparent plastic cups, thin enough to be easily punctured
- Pencil
- Masking Tape
- Transparent plastic bin
- Small weights (ex. Coins, marbles, rocks)
- White paper
- Two containers to hold water
- Food coloring, blue + red
- Colored pencils, blue + red
- Fresh water
- Salt
- Electric tea kettle
- Ice bath
- Thermometer
- Towels

Procedures

Part A. Test the effect of salinity on water flow.

1. Take your two plastic cups and punch two holes in each, one above the other, with your pencil.
2. Cover the two holes with one piece of masking tape, leaving a tab on one end so it can be easily removed. If you can fit your hand in the cup, put the tape on the inside. If not, the outside is fine.
3. Put white paper underneath and behind your plastic bin to make it easier to observe the water movement.
4. Place the cups next to the plastic bin. Fill the bin with clear, room temperature water to just above the two holes on the cup, but below the rim of the cup.
5. Prepare the water samples:
 - a. Fill one container with fresh water and dye it red.
 - b. Fill another container with fresh water, add salt and dye it blue.
6. Put the plastic cups in the plastic bin and add weights until the cups are stable on the bottom. Make sure the holes on the cups are facing each other.
7. Fill one of the plastic cups with the red fresh water up to the waterline in the box. Fill the other plastic cup with the blue salt water up to the waterline in the box.
8. Carefully peel off the masking tape as quickly and smoothly as possible, doing your best not to disturb the water.

9. Observe the movement of the water from the side of the box and from the top. Use the provided **Thermohaline Circulation Lab Report** to sketch the pattern of water flow initially, after one minute and after 5 minutes.

Part B. Test the effect of temperature on water flow.

1. Follow the same set up procedure as described in Part A.
2. Prepare the water samples:
 - a. Heat fresh water in the electric tea kettle, stopping it before it boils. Test the temperature and ensure it is between 50 C and 70 C. When appropriate temperature is achieved, dye the water red.
 - b. Chill fresh water in a container in an ice bath until it is about 5 C. When appropriate temperature is achieved, dye the water blue.
3. Put the plastic cups in the plastic bin and add weights until the cups are stable on the bottom. Make sure the holes on the cups are facing each other.
4. Fill one of the plastic cups with the red hot fresh water up to the waterline in the box. Fill the other plastic cup with the blue cold fresh water up to the waterline in the box.
5. Carefully peel off the masking tape as quickly and smoothly as possible, doing your best not to disturb the water.
6. Observe the movement of the water from the side of the box and from the top. Use the provided **Thermohaline Circulation Lab Report** to sketch the pattern of water flow initially, after one minute and after 5 minutes.

Part C. Test the effect of density on water flow.

1. Follow the same set up procedure as described in Part A.
2. Prepare the water samples:
 - a. Heat fresh water in the electric tea kettle, stopping it before it boils. Test the temperature and ensure it is between 50 C and 70 C. When appropriate temperature is achieved, dye the water red.
 - b. Chill salt water in a container in an ice bath until it is about 5 C. When appropriate temperature is achieved, dye the water blue.
3. Put the plastic cups in the plastic bin and add weights until the cups are stable on the bottom. Make sure the holes on the cups are facing each other.
4. Fill one of the plastic cups with the red hot fresh water up to the waterline in the box. Fill the other plastic cup with the blue cold salt water up to the waterline in the box.
5. Carefully peel off the masking tape as quickly and smoothly as possible, doing your best not to disturb the water.
6. Observe the movement of the water from the side of the box and from the top. Use the provided **Thermohaline Circulation Lab Report** to sketch the pattern of water flow initially, after one minute and after 5 minutes.