



Thermohaline Activity

How does the density of water change as a function of temperature?

How does the density of water change as a function of dissolved salt (salinity)?

This activity can be done in the classroom, no lab facilities are needed. Done in partners or groups of 3 or 4 students.

Materials and Equipment

- 4 small clear bottles with equal sized openings (firm plastic water bottles, glass vials, etc)
- Business card, index card or glass cover slip
- Masking tape
- Permanent marker
- Table salt
- 2 containers for mixing and pouring solutions (of larger capacity than the bottles used)
- Measuring spoon
- 2 different colors of food coloring
- Tray or shallow pan
- Paper towels
- Hot and cold tap water
- Ice
- Clock
- Optional: hydrometer and thermometer

Experiment 1 Procedure

Label one bottle with masking tape and marker as “salt” and the other as “fresh” and also label the containers the same way.

Add tap water to each container.

Add salt to the "Salt" container and stir until dissolved (how much? At room temperature the maximum amount that will dissolve is 357g of salt per Liter of water)

Add nothing to the "Fresh" container

Optional: if you have a hydrometer measure the density of the salt solution and the fresh solution

Add 3 drops of food coloring in the "Fresh" container and none in the "Salt" container

Fill the small bottles with the appropriate solutions to the very top

Use the index card or cover slip to cover the opening of the bottle with "Fresh" now colored water. With a partner holding the other "Salt" non colored bottle stationary on the desk, hold the cover slip over the opening of the "Fresh" colored bottle with 2 fingers separated and invert holding the cover slip firmly over the opening not letting any liquid leak out. Place the inverted bottle on top of the stationary bottle lining up the openings with the cover slip keeping the contents from coming into contact.

While holding onto the bottles after inversion another person carefully pulls out the cover slip keeping the openings in line with each other as to not spill any water and create bubbles.

The "Fresh" colored bottle is now on top of the "Salt" non colored bottle

Observe what happens to the liquids

Carefully flip the apparatus over so that the "Fresh" bottle is now below the "Salt" bottle while keeping the openings of the bottles lined up and not losing any liquid.

Observe what happens to the liquids

Experiment 2 Procedure

Label one bottle with masking tape and marker as "Hot" and the other as "Cold" and also label the containers the same way.

Add hot tap water to the "Hot" container and cold tap water to the "Cold" container

Add 3 drops of food coloring in the "Hot" container and none in the "Cold" container

Fill the small bottles with the appropriate solutions to the very top

Invert the bottles using technique as in Experiment 1

The "Hot" colored bottle is on top of the "Cold" non colored bottle

Observe what happens to the liquids

Carefully flip the apparatus over so that the “Hot” bottle is now below the “Cold” bottle while keeping the openings of the bottles lined up and not losing any liquid.

Observe what happens to the liquids

This can also be done in combination: making warm and fresh water in the same solution and cold and salt water in the other solution. Coloring the warm fresh water and beginning with this bottle on top of the cold salt bottle.

http://www.sciencebuddies.org/science-fair-project/project_ideas/OceanSci_p002.shtml