

Warm Water/Cold Water

Application: Density, Currents, Heat Flow

Warm water or air is less dense than cold. This is because the molecules of the warm water have more kinetic energy. This added energy help spread out the molecules, causing them to take up more space for the same amount of mass as the cold water. Warm water or air will therefore "float" on top of cold water or air. This concept is responsible for many observations we see with our weather, bodies of water, and air currents

Materials:

- Two baby food jars exactly the same size
- Food coloring
- Heat source
- Water
- Index card

Safety Precautions: The "Warm Water" needs to be quite hot for the demo to work. Caution should be used when inverting the jar. The jar will be very hot. Wear heat resistant gloves. If water spills, avoid getting it on skin.

Preparation:

Heat water to about 70 °C. Place a few drops of food coloring in one of the baby food jars. If tap water is not cold, place it in fridge for one hour prior to demo, or add ice.

Demonstration Procedure:

- 1. Fill jar with food coloring with warm water
- 2. Fill other jar with cold water
- 3. Place index card over opening of cold water jar and invert, holding card in place with hand.
- 4. Stack cold water jar opening over warm water jar opening so that the two openings are lined up with each other perfectly.
- 5. As students to predict what will happen when card separating the two jars is pulled out
- 6. Slowly slide card out.
- 7. Repeat process, only this time place warm water jar, with food coloring, on top.
- 8. Pick up two jars together and turn on their side. (Careful, this takes practice!)
- 9. Tilt jars slowly back and forth
- 10. Observe what happens in the jars.

Outcomes: Cold water jar on top: because the warm water is less dense than the cold water, the cold water will sink to bottom. This mixes the two waters and both jars will become colored. This explains the concept of cooler air sinking causing air currents and cooler water sinking, causing water currents.

Warm water jar on top: because the warm water is less dense than the cold water, the warm water will "float" on top of the cold. The food coloring will not move. Tipping the jars on their side shows how layers of warm water or air will move along the layer of cold air.

Disposal: Water goes down the sink, jars are stored for future use

References: Patti Duncan, 2006