

# Separating Hot & Cold Water

**One of those terrific science investigations that you're absolutely certain will just not work out.... and then get to be surprised and thrilled when it does!**

**Ages: 7 - 11**

**Under 30 minutes**

Through this simple experiment, we can start to understand how even small temperature differences can lead to larger environmental changes - just like what's happening with our climate.

## MATERIALS

- Food coloring (red and blue)
- Small jars
- Scissors
- Pan
- Index card paper

## STEP-BY-STEP TUTORIAL

1

### Step 1

First, prep the index cards by cutting them about 2" (5.1 cm) larger than our wide-mouthed jars. Easy enough!



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## Step 2

Next, have a practice run... best to do it intentionally rather than by accident! Fill up a jar with water, put it in a safety pan, then over-fill it so it bulges on top a bit.



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## Step 3

Take a cut piece of an index card and carefully lay it on top of your jar. Then, lightly tap it a few times to seal it to the jar. Next, pick up the jar and quickly turn it completely upside down - make sure to flip it all the way! If it's angled, it might spill.



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## Step 4

It's time to move on to the real experiment. Start by filling one jar with very hot water and the other with cold water. Then, add a couple of drops of food coloring - red for hot water and blue for cold. If you don't have food coloring, liquid watercolor paints will work just as well!



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**5** **Step 5**  
Pay close attention to how the colors behave in each jar. Watch as the blue moves slowly, taking its time, while the red will mix much more quickly. This happens because the hot water molecules will be very active and moving fast! Keep observing to see how the temperatures affect the movement of the colors.



**6** **Step 6**  
Next, fill the cold water jar to the brim, allowing the water to bulge slightly over the top. Carefully lay the index card on top of the jar and tape it down securely. Make sure the seal is tight to avoid any spills during the next step!



**7** **Step 7**  
Now comes the tricky part. Carefully set the cold water jar on top of the hot one, making sure their mouths line up evenly. While holding the jars steady, gently pull out the index card. What will happen next? Watch closely as the magic of science unfolds!



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## Step 8

This part may not be surprising to some, but others may find the quick mixing of colors fascinating. As the card is removed, the two colors will rapidly blend into one, leaving a single uniform color in the water – demonstrating how quickly the mixing occurs.



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## Step 9

Now, repeat the process, but this time with the blue (cold) water on the bottom and the red (hot) water on top. Be sure to overfill the top jar, then tap the index card to seal it. Turn the jar upside down, carefully pull out the index card from between them while keeping the jars aligned and observe what happens next.



Watch closely as the hot and cold water are layered and stay completely separate! Even after five minutes, the two layers remain distinct. Why? Well, the hot molecules are more active, making the hot water less dense and lighter than the cold water. So, the hot water stays on top without mixing. It's a fascinating example of density in action.



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## LEARN MORE

This experiment can be directly connected to climate change and global warming through the concept of thermal stratification in our oceans and atmosphere. Just like the hot water staying on top of the cold water due to differences in density, our oceans are experiencing a similar phenomenon. As global temperatures rise, the surface of the oceans heats up, making the warm water less dense. This causes it to stay on top, reducing the mixing between warm surface water and cooler, nutrient-rich water below. This lack of mixing has significant consequences. It affects marine life, disrupts ecosystems, and can even intensify the impacts of climate change. Warmer ocean surfaces also absorb less carbon dioxide, meaning more of the greenhouse gases remain in our atmosphere, accelerating global warming.

## SOURCE

<https://www.kiwico.com/diy/stem/quick-easy-experiments/separating-hot-cold-water>

KiwiCo was founded to nurture children's creativity and problem-solving skills through hands-on projects, making it easier for parents to provide enriching activities. The company simplifies the process of building, exploring, and creating together by designing fun and educational experiences that foster creative confidence. With a growing team of designers, experts, and kid testers, KiwiCo aims to equip children with the skills they need to face future challenges. Founder and CEO Sandra, an engineer and mother of three, created KiwiCo to inspire curiosity and exploration in families.