

Water Density Experiments:

A) Rainbow Straw and B) Floating Water

A. Materials Needed for the Rainbow Straw Experiment:

- 4 glass or plastic cups
- Warm Water
- 4 colors of food coloring
- Salt
- Teaspoon
- Clear straw
- Large baking pan or container to prevent spills

A. Rainbow Straw Experiment - Control

1. Fill 4 glasses with warm water. Add 5 drops of food coloring, a different color in each cup.
2. Place the 4 cups in a line.
3. Now, from left to right, stick the bottom of the straw about 1 inch into the first cup. Put your finger over the other end of the straw. Take the straw out of the cup. You should have a little water inside the straw!
4. Keep your finger over the end of the straw. Hold it straight up and down. Stick it 2 inches into the second cup. Slowly remove your finger from the end. Then put your finger back over the end of the straw. Take the straw out of the cup. Now you should have another layer of water.
5. Remove the straw and stick it 3 inches into the third cup. Slowly remove your finger. Put your finger back over the end of the straw. Take the straw out of the cup. You should have another layer of water in the straw.
6. Remove the straw and stick it 4 inches into the fourth cup. Slowly remove your finger. Put your finger back over the end of the straw. Pull the straw out. What do you see?

A. Rainbow Straw Experiment - Variation

1. Leave the 4 cups in a line. Always add the salt from left to right!
Add:
 - 1 teaspoon of salt to the first cup.
 - 2 teaspoons of salt to the second cup.
 - 3 teaspoons of salt to the third cup
 - 4 teaspoons of salt to the fourth cup

2. Stir each cup until the salt dissolves. It will take the cup with more salt longer to dissolve, maybe 5 minutes!
3. Again, from left to right, stick the bottom of the straw about 1 inch into the first cup. Put your finger over the other end of the straw. Take the straw out of the cup. You should have a little water inside the straw!
4. Keep your finger over the end of the straw. Hold it straight up and down. Stick it 2 inches into the second cup. Slowly remove your finger from the end. Then put your finger back over the end of the straw. Take the straw out of the cup. Now you should have another layer of water.
5. Remove the straw and stick it 3 inches into the third cup. Slowly remove your finger. Put your finger back over the end of the straw. Take the straw out of the cup. You should have another layer of water in the straw.
6. Remove the straw and stick it 4 inches into the fourth cup. Slowly remove your finger. Put your finger back over the end of the straw. Pull the straw out. Now what do you see? Hopefully you have 4 separate colors of water showing in the straw, like a rainbow.

Science: So why did we get muddy water the first time and a rainbow the second time? When scientists do experiments, they always like to do what they call a “controlled” version. Then they do another version where they change just one thing. This lets them compare the results. Then they know for sure that the changes they see are caused by the one thing they did differently. In this experiment, the only thing we did differently was to add salt to the cups. So we know for sure that the only reason we got a rainbow instead of dirty water is because of the salt!

When you add salt to water, you increase its density. **Density** affects how much the water floats or sinks. The water that has the least salt floats at the top. The water that has the most salt stays at the bottom. So the 4 colors of water, each with a different density, stack in the straw without mixing!

B. Materials needed for the Floating Water Experiment:

2 identical small glass jars

Water

Yellow and blue food coloring

Salt

Teaspoon

Index card or cardstock

Large baking pan or other container to prevent spills

B. Floating Water Experiment - Control

1. Fill the two jars almost full with warm water.
2. Add 10 drops of yellow food coloring to one jar. Add 10 drops of blue food coloring to the other.
3. Put the jars in the baking pan, just in case of spills! Add more water to the jars so that they are completely full.
4. Place the index card over the yellow jar. Hold it there as you turn the jar upside down.
5. Set the yellow jar on top of the blue jar keeping the index card between them. Line up the jar rims.
6. Have a helper hold the jars. Slowly pull the index card out from between them.

B. Floating Water Experiment - Variation

1. Fill the two jars almost full with water.
2. Add 5 drops of yellow food coloring to one jar. Add 5 drops of blue food coloring to the other.
3. Here comes the part where we do something different: Add 1 teaspoon of salt to the yellow jar. Add 2 teaspoons of salt to the blue jar. Stir each jar until the salt dissolves.
4. Put the jars in the baking pan, just in case of spills! Add more water to the jars so that they are completely full.
5. Place a new, dry index card over the yellow jar. Hold it there as you turn the jar upside down.
6. Set the yellow jar on top of the blue jar keeping the index card between them. Line up the jar rims.
7. Have a helper hold the jars. Slowly pull the index card out from between them. Did it work? Hopefully the colors don't mix!

Science: Just like the Rainbow Straw Experiment, this experiment is about water density. When we did the control part of the experiment, without any salt, both colors have water of the same density, so the colors mix and blend. But when we do it with the salt, the yellow water has less salt than the blue, so the yellow water should float on top without mixing with the blue. Since the blue water has more salt, it should stay at the bottom! And since the only thing we changed between the two parts of the experiment was the salt, we know it was the reason for the floating water!

Experiment on your own: What if you used sugar instead of salt? Does sugar change the density of water? Try changing the water temperature. Can you think of other kitchen items you could mix in water to see if they change the water's density?