



Understanding Density of Liquids

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Question or Scientific Phenomena

My experiment has two parts

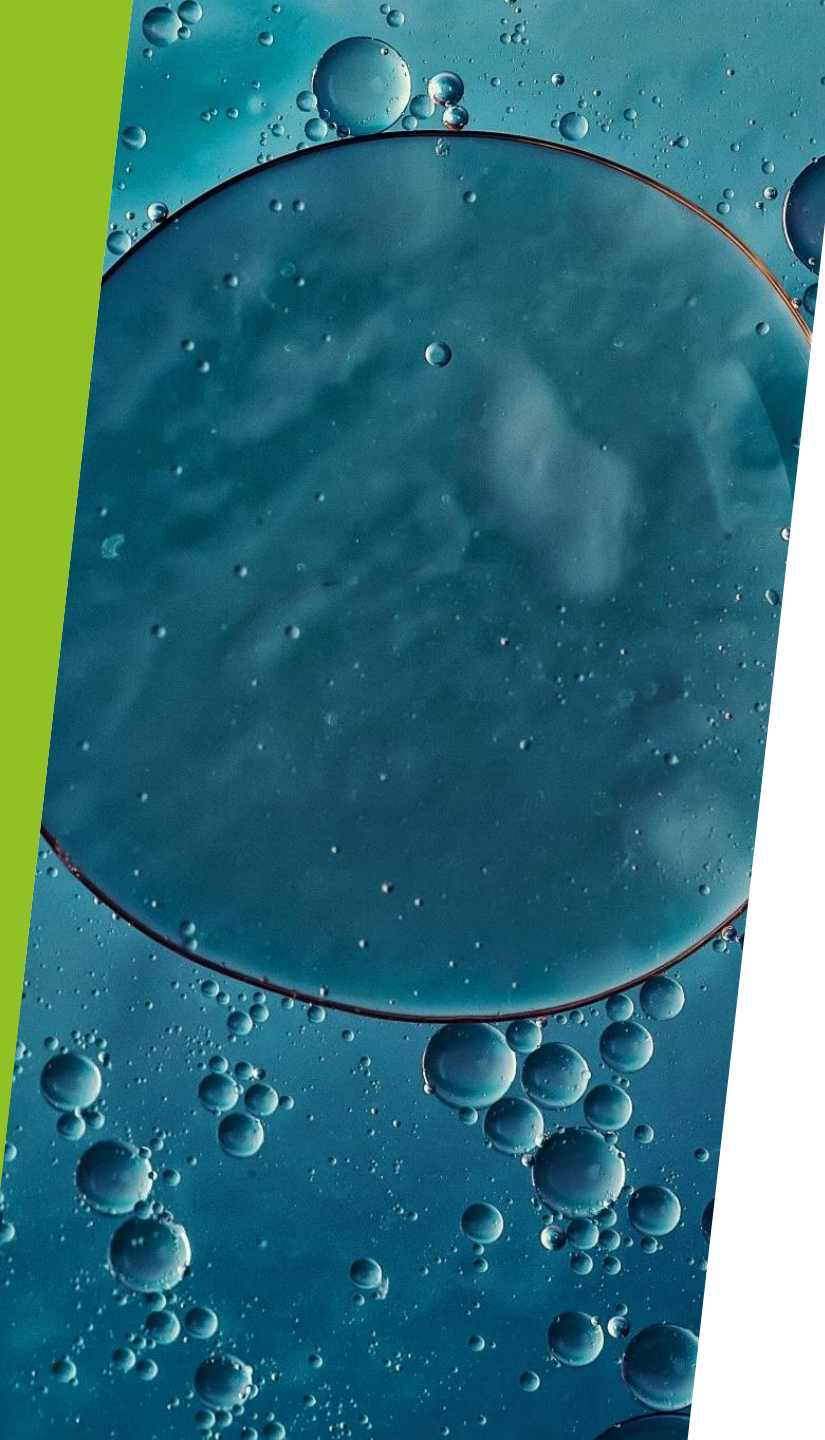
In my first experiment we are trying to learn what happens when fluids of different density get mixed together.

In my second experiment I want to figure out if dissolveing sugar in water will raise the density of the water or not.

Hypothesis

I have several different hypothesis

- ▶ When mixing olive oil, vegetable oil, maple syrup, and water, I think that there will be two separate layers. At the bottom there will be maple syrup mixed with water, and at the top the oils will settle in.
- ▶ The heavier liquids will go to the bottom and the lighter liquids would go to the top.
- ▶ Sugar will dissolve in the water making no difference in the volume but will increase the weight.



Materials List

- ▶ Vegetable oil(40 ml)
- ▶ Olive oil(40 ml)
- ▶ Water(160 ml)
- ▶ Maple syrup(40 ml)
- ▶ Sugar(3 teaspoon)
- ▶ Measuring cup
- ▶ Long piece of wood
- ▶ String(about two feet long)
- ▶ Food coloring(any three colors)
- ▶ Pencil
- ▶ Tape
- ▶ 7 clear cups
- ▶ One plastic bead
- ▶ Lots of time and effort

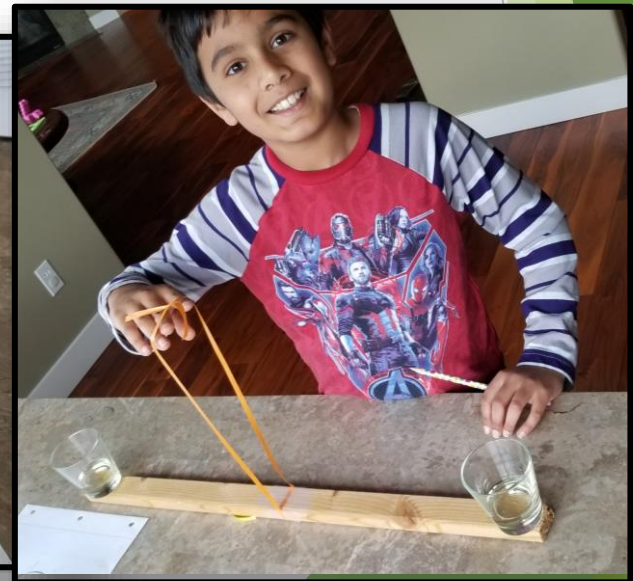
Procedure - Equi-arm Balance

Tie the string to the piece of wood and tie it in a way that both sides are of equal weight. Then put tape to hold the string in the piece of wood's center of balance. Put cups on each side and make sure it is still equal weight on each side. Next mark the position of the cups with a pencil. This makes it an equi-arm balance.



Procedure - Experiment One

Measure 40 ml of maple syrup, water, olive oil, and vegetable oil. Pour each of them in their own cup. Now with the equi-arm balance figure out the order of weight for each of the liquids. Next put all the liquids in one cup. When you are ready mix the liquids together. Now drop a plastic bead in the mixture of liquids.



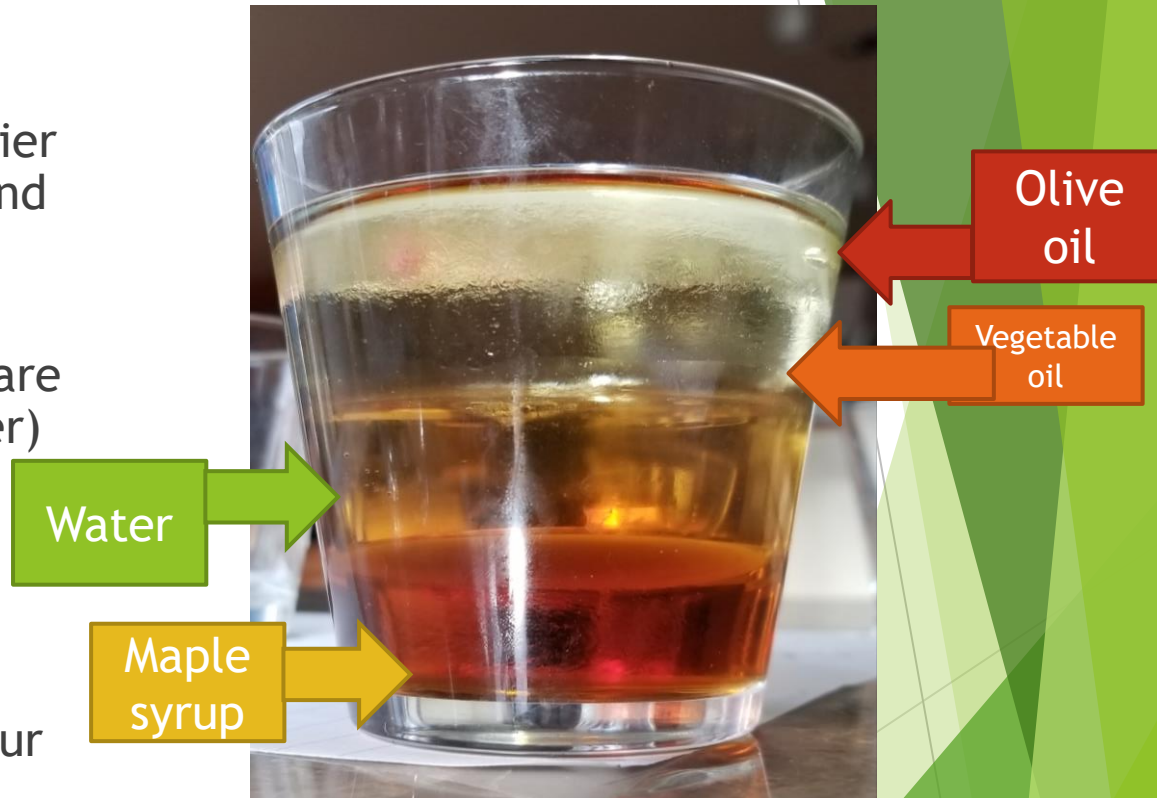
Procedure - Experiment Two

Measure 40 ml of water and pour them into cups. Now add a different amount of sugar add one spoon for the first cup two spoons in the second cup and in the last cup put none. Mix them well. Observe if the volume has changed. Then weigh them to compare their weight. Next add one drop of food coloring for each cup. Lastly carefully pour them all in one cup starting with the heaviest to the lightest.



Observations/Data - Experiment One

- ▶ 40 ml maple syrup is heavier than 40 ml of the water and water is heavier than the oils.
- ▶ The oils and maple syrup are both more **viscous** (thicker) than the water.
- ▶ The weight comparism with both oils were not conclusive.
- ▶ The liquids settled into four clayers as shown in the picture.



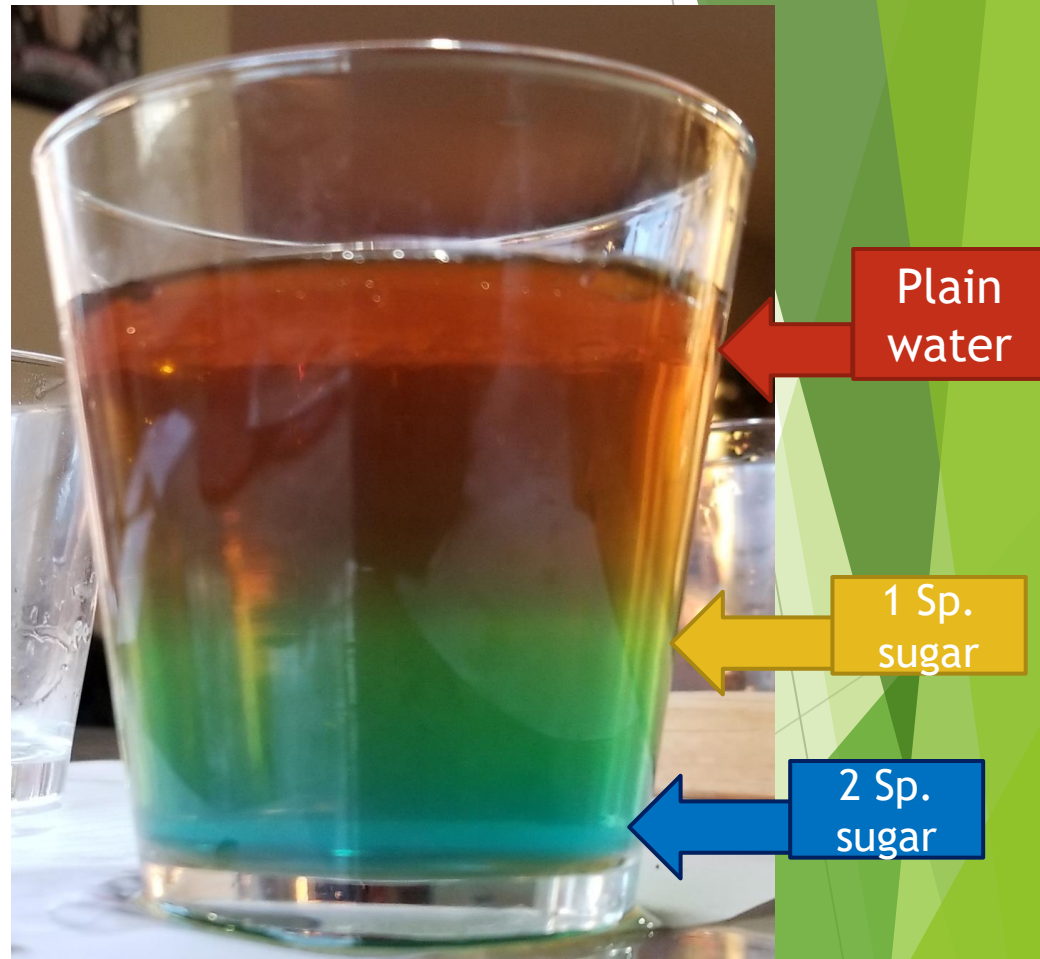
Observations/Data - Experiment One contd.

- ▶ When I mixed there was two different layers, a mixture of water and maple syrup, and a layer of oils. I observed that water and maple syrup combination just won't mix with the oils they are **immisible**.
- ▶ Once I dropped the bead it sank in the oil, but it floated on the water.



Observations/Data - Experiment Two

- ▶ Plain water (red) was lighter than the one spoon (yellow) and two spoon (blue) sugar water.
- ▶ Weight comparison of one spoon and two spoon sugar was non-conclusive.
- ▶ Contrary to my hypothesis mixing sugar increased the volume a bit.
- ▶ I observed that the yellow mixed with the blue creating green. I also observed that the color with the smaller density took up more space despite being filled with the exact same amount of water as the other colors. This is probably due to churn during pouring.





Conclusion

- ▶ Weight of liquids for a fixed volume gives their **density**. Liquids layer up by their density.
- ▶ Some liquids are **miscible** and some are not. Miscible means that they can combine. In my first experiment it shows that water and oil are not miscible.
- ▶ Though oil and maple syrup were more viscous that had no relation to their density as maple syrup was denser than water and oils were less dense than water.
- ▶ Plastic floats on water despite however the fluids are layered.
- ▶ In my second experiment it shows that mixing liquids of different density will result in many layers of different density.