Towering Density!

Grade: 5-6

Time: 2 hrs

Activity Overview :

Today's activity is all about chemistry! You will be exploring the behaviour of liquid substances by conducting your own experiment. You will dive into the concept of density by making 5 different liquids float on top of one another! But here's the catch: You must determine the correct order of liquids first. How will we do this?

Before you begin the experiment, think about the following question:

- How do liquid layers float on top of others?
- Have you ever tried to mix oil and water together? What happened?

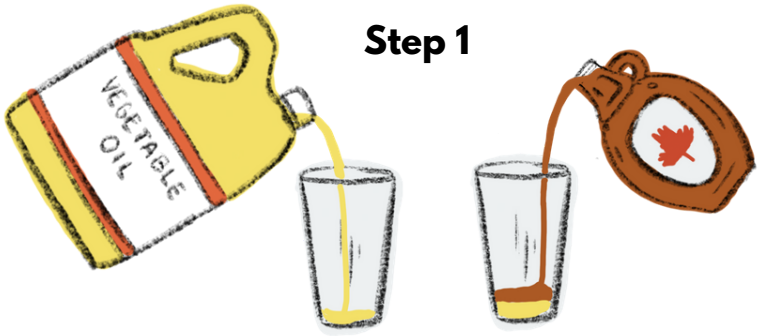
Materials:

- Clear Jar or glass cup that all 5 layers will fit in to
- 10 clear cups or glasses for density testing
- Measuring cup to ensure the same amount of each liquid is being added
- Spoon to ensure all liquids are being added carefully
- One piece of paper to record observations and results
- Corn Syrup or Honey
- Dish-soap
- Water Oil (extra virgin olive oil, vegetable oil, canola oil, corn oil, or olive oil would all work)
- Maple syrup

Don't worry if you don't have all these supplies. Experiment with other everyday items and see what you can build!

Activity:

1. Begin by experimenting with the different liquid substances in order to determine the correct order: do this by adding two different substances at a time to one clear cup and observe if they mix. If the substances mix, this is the incorrect order.



Step 1

Ensure to be adding the same amount of each substance, and add them one by one, very carefully so we do not disturb the liquid barriers. Use a measuring cup to measure out the liquids and use a spoon and directly transfer the substance from the measuring cup to the clear cup.

2. For trials that worked (substances didn't mix), label the clear cups. Once finished experimenting, record all results.

3. List your substances from highest to lowest density by using your results from your experimenting in step 1. Remember, substances that remained at the bottom of the cup had higher densities.

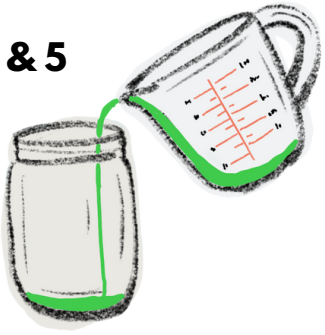
4. Begin by measuring an amount of the highest density liquid first using a measuring cup (amount does not matter, as long as all layers will fit into your glass, and all liquids are measured with the same amount).

5. Add this substance to your clear, taller jar first. This can be added directly from the measuring cup as it is the first liquid.

6. Measure the next highest density liquid also using the measuring cup.

7. Using a spoon, add the second liquid to the jar carefully. Repeat steps 6-7 until all liquids have been added.

Step 4 & 5



Step 6 & 7

Step 7

Engineering and Science Connections:

Chemistry is the study of matter and its properties. Chemists study the interactions of substances and the changes they undergo during a chemical reaction; essentially the study of all non-living things.

Density refers to an object's/substance's mass per unit volume; how much space an object/substance takes up in relation to its mass. To compare densities, substances must be added in the same volume; this being said, thicker liquid substances are typically denser than substances like water.

Liquid Barriers prevent movement of liquids from one area to another; essentially preventing a certain degree of mixing. In our case, the liquids we've experimented with had very thin barriers, and so we had to add each substance carefully to avoid breaking them and creating a mixture.

Our experiment helped us answer the following question:
How can liquid layers float on top of others?

Density! A substance's ability to float on another liquid depends on its density! We proved that substances with a higher density will typically sink. In comparison to a substance like baby oil, honey has a much higher density, and because of this, the baby oil floats.

Did you observe 5 distinct layers?
Here is the correct order from the bottom of the jar to the top:

Order	Substance	Density (g/mL)
1	Honey	1.42
2	Maple syrup	1.37
3	Dish-soap	1.06
4	Water	1.0
5	Oil	0.9

Extensions:

With our density project we can distinguish the layers of the ocean! The layers of the ocean have been divided based on how much sun reaches that layer. Different sea creatures live in different layers of the ocean. The 5 layers from top to bottom are: the sunlight zone (receives the most visible light), the twilight zone, the midnight zone, the abyss zone, and the trenches (no visible light). Pressure increases as you move down the layers.

To represent this, we can use food colouring! Add one drop of food colouring to each layer and mix before you begin to layer the substances again, by ensuring the darkest colour is used first and getting slightly lighter as you move up the column.

Share your creations!

Don't for get to share your experiments and creations with us! We would love to see what you've made. You can Email us at: esqinfo@uwaterloo.ca or send us a message/tag us on our social media!

Facebook: @uwengoutreach

Twitter: @UWEngOutreach

Instagram: @uwengoutreach

Thanks for exploring, discovering, and learning with us!

3, 2, 1 Done!

3 - Write or draw 3 things you learned from this activity

2 - Write or draw 2 things you found super interesting or cool and want to learn more about

1 - Do you have any questions about the activity? Did something make you wonder...what if? how? or why?