

Questacon at HOME

Activity Sheet – Density Column

Density Column

Background

Have you ever noticed that oil floats on water? This is because oil has a different density to water. Density refers to the mass of a substance in relation to its volume. If the density of two liquids is different enough, one will float on the other. In this experiment, you will explore the density of different household liquids by creating a column of liquids with different densities.

Materials

- A tall clear container (e.g. drinking glass)
- Various liquids, such as:
 - Water
 - Milk
 - Honey, maple syrup
 - Cooking oil, baby oil
 - Detergent
- Small solid objects, such as:
 - Ping pong balls
 - Plasticine/play doh
 - Coins

Safety

Spilled liquids can create a slip hazard, so have towels ready to clean if necessary. Avoid using any hazardous liquids.

Adult supervision is recommended at all times

Procedure

1. Starting with your most dense liquid, pour/squeeze the liquid into the bottom of the container to form a 1-2 cm layer.
2. Choose your next most dense liquid and create another layer on top of the first layer
 - Do the layers separate like you expect?
3. Repeat the process until you have a layer of each liquid in the container.
4. Try pouring the liquids into a container in the reverse order.
 - Does this change the final result?
5. Try placing small objects into your container one at a time.
 - Do they float? Do they sink? What does this tell you about their density?



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Tips and Tricks

- If you are not sure which is the denser of two liquids, you can try this in a separate container before adding to your column
- Food dye can help differentiate between layers that look similar (e.g. water and baby oil)
- Pouring the liquids gently enough to stop layers from mixing can be tricky – try pouring them down the side of the container, or over the back of a spoon.

What's the Science?

Density is the mass of a substance divided by its volume – in other words, how much ‘stuff’ is in it compared to how much space it takes up. Water has a density of roughly one kilogram per litre. Density is also affected by the temperature and state (solid, liquid or gas) of a substance. For example, ice, cold water, hot water, and steam all have very different densities.

Below is a table containing the density of various household liquids:

Liquid	Density (g/mL)
Baby oil	0.83
Vegetable oil	0.92
Water	1.00
Milk	1.03
Liquid detergent	1.06
Corn syrup	1.33
Maple syrup	1.37
Honey	1.42

If anything unexpected occurs, ask your child why they think that happened - it both confirms their understanding and can lead to extension activities. Ask your child to think of a way to test their ideas! All ideas are good ideas.

What questions should I be asking?

Before the experiment

Make predictions and form hypotheses

- Which liquid do you think will float at the top/sink to the bottom?
- What do you think will happen when we start pouring liquids on top of each other?

Co-design the experiment

- What order should the liquids be poured into the container?
- What other liquids/objects should we try?

During the experiment

- Is this liquid more or less dense than the last one? Why do you think so?

What's next?

- Explore the density of hot water, cold water or water with dissolved sugar or salt, using food colouring to tell them apart. Is the density different enough to create a density column? How else can you show that they have different densities?
- Try freezing different liquids and dropping them into the density column. Where does ice sit in this column? What about oil solidified in the freezer?

