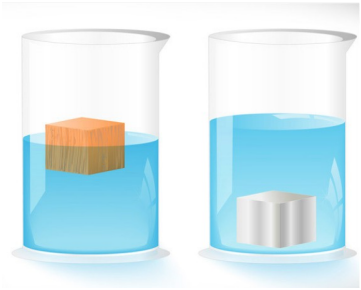
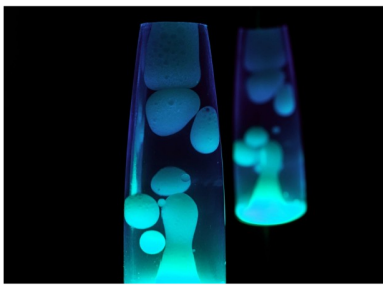
Float and Sink: Density of Fluids





- Density = mass per volume
- Objects will float if their density is lower than the fluid around them

Part 1: Make a Density Column

1. Place a plastic cup on <u>both sides</u> of the scale. Adjust the side knob to make sure the scale is balanced.

2. Use a graduated cylinder to measure 20mL of water and pour into the cup on the left.

3. Put standard masses in the cup on the right-hand side to balance the scale

4. Calculate the density of water (mass ÷ 20 mL) and fill in the table.

5. Pour out the water, dry off the cup, and reset the scale to 0.
Repeat the process to measure the density of oil and pancake syrup (wipe off cup in between)

Liquid	Mass of 20mL of liquid	Density of liquid (g/mL)
Water	20 g	1 g/mL
Vegetable oil	17 g	0.85 g/mL
Pancake syrup	25 g	1.25 g/mL

6. Make a prediction:
If you pour all of these fluids into a test tube, what order will they end up in? Which will

Bottom: ___syrup_____ Middle:____water_____ Top:____oil_____

7. Test your prediction by pouring about an inch of each into one of your test tubes. Start with the one you think will be on the bottom and end with the one you think will be on top.

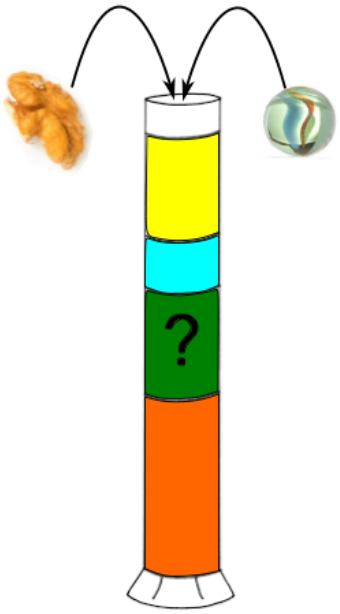
Were you right? Yes / No

8. Here is a table of densities for a few materials (measured by other scientists):

Material	Density
Glass[1]	2.5 g/mL
Plastic (acrylic)	1.2 g/mL
Wood[2]	0.6 g/mL

Make a prediction: at which layer will each of these objects settle if you put them in your test-tube?

Glass marble: bottom
Plastic marble: between syrup and water
Wooden block: top of oil



Test your prediction! Were you right?

9. Try putting a piece of walnut into your test-tube. Tap the tube a few times to let it settle.
Where does the walnut settle? between water and oil

What does this tell you about the density of the walnut kernel?

It must be **greater than** ___0.85_____g/mL
and **less than** ____**1**____ g/mL

1 Density of glass varies. This is the density of common window glass
2 Density of wood varies. This is a typical density for birch wood.

Part 2 (if you have time): Make your own Lava Lamp

1. An Alkaseltzer tablet contains **baking soda** (a base) and **citric acid** (an acid). When dissolved in water, they produce a chemical reaction.

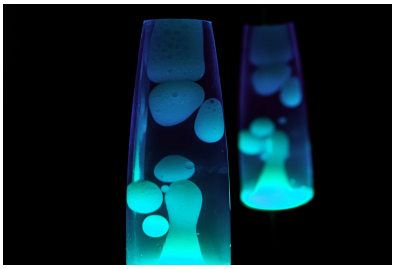
Baking soda + acid → carbon dioxide gas

Drop half a tablet into a small amount of water in the cup. What happens? Rank the following from least dense to most dense:

water Alkaseltzer tablet carbon dioxide

least dense _____carbon dioxide < water < alkaseltzer_____ most dense

Now let's make our "Lava Lamp"!



5. Pour oil through a funnel into the test tube until there is about 1 inch left.

6. Pour in some water until the tube is nearly full.

7. Add a drop of food coloring. Stir it in with a stick.

How does the density of food coloring compare to the density of oil? Of water?
It is higher than both and sinks to the bottom (though it might stay trapped by surface tension on top until you push it down). Also if it gets coated with a layer of oil, it might stay stuck at the interface and not fall further.

8. Break up an alkaseltzer tablet into small pieces and add the pieces to your test tube.

Discuss what happens and why! What do you see floating? What do you see sinking?
The alkaseltzer reacts with water to make CO_2 bubbles. These gas bubbles have a lower density than water and oil, so they float to the top, bringing some water with them. Then the gas evaporates and the droplets of water fall back down.