

What you will need:

- * 3 Beakers/Measuring Cups
- * Scale
- * Calculator
- * Water
- * Dish Soap
- * Honey
- * 3 foosballs



Sink or Float?

Enter Data in the table below

Find the Density of the Liquids:

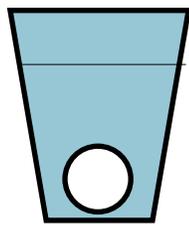
- Using the scale, measure the mass of all the beakers. If they are different, label each with tape.
- Place 150mL of each liquid in each beaker or enough to cover the foosball. Measure beaker again and subtract the mass of the empty beaker to the final mass to get the mass of the liquid
- Divide the liquid's mass by the volume, 150mL or whatever amount you have in your measuring cup. The result is the density of the fluid.

Find the Density of the foosball:

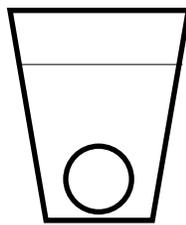
- Measure the mass of the foosball.
- Drop the foosball into the beaker of water and observe only the *difference* of the initial volume and the final volume.
- Because water has a density of 1g/mL, the *difference* in volume is equal to the volume of the foosball.
- Calculate the density with the mass of the foosball divided by the volume.

Comparing Densities: Does it Float?

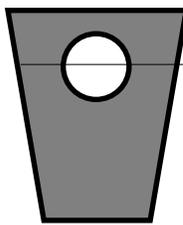
- Drop a foosball into each liquid and observe the difference in float level.
- Calculate the ratio of densities between the liquid and the foosball. Compare the calculations with your observations.



Water

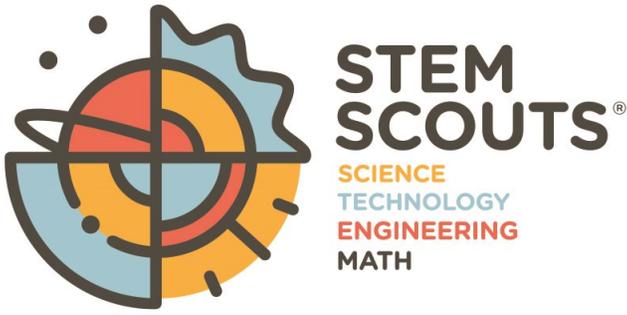


Dish Soap



Honey

Density = M/V	Ratio of densities: $\frac{\text{Density of foosball}}{\text{Density of fluid}}$	Convert to decimal: Enter the numbers from the last step into a calculator	Percent Submerged: Multiply the decimal by 100	Float or Sink
Water D: _____	$\frac{1.12 \text{ g/mL}}{1 \text{ g/mL}}$	1.12	112%	Sink
Dish Soap D: _____	_____			
Honey D: _____	_____			

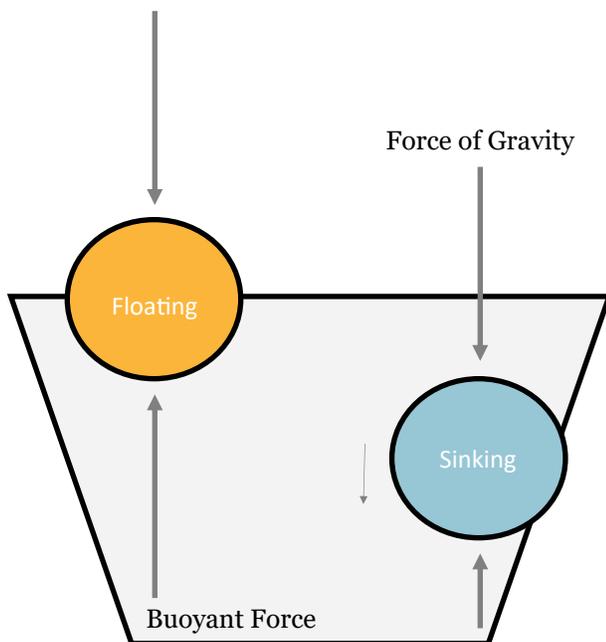


Sink or Float?

More about Density & Buoyancy:

In order for an object to float, there must be equal and opposing forces acting on the object. Buoyant force is always equal to mass of liquid displaced. The more displaced liquid you have the more buoyant force. If an object displaces more mass than what it weighs, it will float. But if it displaces less mass than the mass of the object, it will sink. Because we observe the object moving, we know the forces are unbalanced.

Large cruise ships float because the keel below the ship takes up a lot of space and displaces a lot of sea water. The sea water displaced gives a large buoyant force to offset the force of gravity pushing the boat into the water. Engineers have to be mindful of the ratio between the densities of the cruise ship and the ocean. As you add more passengers and more weight, then you have more mass per volume and could end up sinking!



Summarizing Questions:

1. What is the upward force that makes an object float?
2. What was a pattern you noticed when doing the experiment? (many patterns, be creative!)
3. How do you calculate the *exact* percent that's submerged below the surface of the fluid?
4. Pour the water on top of the honey. Which one do you think is more dense? Use your observations to explain
5. Repeat the same experiment but with different fluids or different objects you find around the house. Make predictions about the object or fluid's density based on what floats and sinks.