

## Density Lab

### Objectives

- Science skills: measuring density, comparing different materials
- Science facts: learn how materials which have different densities behave when they are mixed together.

### Materials

Mass balance or scale  
Two 250 mL beakers  
Vegetable Oil  
Vinegar  
Stirring stick or spoon  
Two 100 mL graduated cylinders

Tip: Cheap vinegar and vegetable oil works. Balsamic Vinegar (dark colored) produces a more dramatic effect but is more costly.

Tip: Generally, all lab groups measure out oil and vinegar from one bottle. So, leave the bottles of liquids at a station, along with a 2-4 grad. cylinders for lab groups to come measure them out (under teacher supervision). Then mess stays contained. DESIGNATE some grad. cyl. for oil only and some for vinegar only!

### Pre-Lab question

- If you were given two liquids, what could you do to test which one is the most dense?
- If two materials become well mixed, will they stay mixed forever?

Tip: give these two questions as warm up, and discuss with class before starting the Lab

### Procedure

- Measure the mass of one beaker and record it in your notebook.
- Measure 75 mL of vegetable oil into the the beaker.
- Measure the mass of the beaker filled with oil.
- In your notebook, calculate the mass of oil by subtracting the mass of the empty beaker from the mass of the beaker full of oil.
- Repeat steps 1-4 for vinegar in the second beaker.
- Pour vinegar into beaker of oil. Observe and describe in lab notes.
- Use stirring stick to stir the mixture for 60 seconds. Observe and describe in lab notes.
- Wait for several minutes. Observe and describe in lab notes.

Tip: Encourage students to VIGOROUSLY stir to mix the fluids as much as possible. While they wait for fluids to separate, they can start on question 1 if they want.

### Questions

- Use the information you wrote in your lab notes to calculate the density of the oil and of the vinegar. Which material is the most dense, and which is the least dense?

Dens. Oil ~ 0.9 g/mL, Dens. of Water ~1.0 g/mL

Tip: Density = Mass/Volume. Volume is 75 mL (many students ask....)

- Could you guess during the lab which liquid was more dense before you calculated their densities in question 1?

We see in step 6 that you can tell which is more or less dense by observing which goes to the top (it is less dense) and which goes to the bottom (it is more dense)

- If you mixed three materials which had different densities together instead of two, what do you hypothesize would happen?

Suggested: Completion credit for question 3. Could discuss that in large group as well.

What happens depends on the density of the 3rd fluid, but as long as its density is not the same as the other two, 3 layers will form.