

Lava Lamp

Overview: We're going to watch how density works by making a simple lava lamp that doesn't need electricity! If you like to watch blob-type shapes shift and ooze around, then this is something you're going to want to experiment with.

What to Learn: After today's experiment, you'll understand what density is, and know some cool facts about the differences between oil and water

Materials

- empty glass jar with straight sides or clean 2 liter soda bottle
- vegetable oil
- salt
- water
- food dye

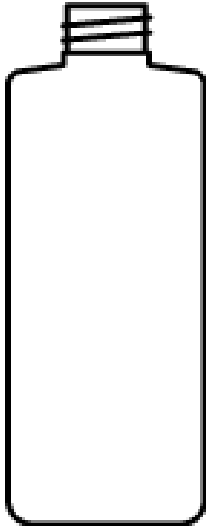
Experiment

1. Wear your gloves and put your goggles on. No exceptions!
2. Fill the container halfway with water
3. Add a layer of oil (fill about 1/3 of the way). Observe the water and oil.
4. Sprinkle salt on top and observe. Salt will combine with the oil and drop down to the bottom. Eventually the oil will break free of the salt and float back to the top.
5. Keep sprinkling salt on top.
6. Add food coloring and observe.

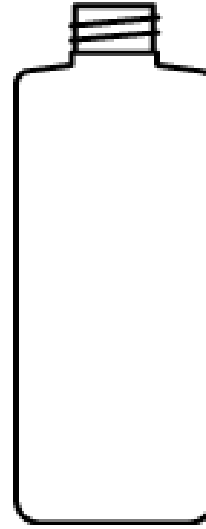
Lava Lamp Illustration

Label on the diagram:

1. Water
2. Oil



Use the following diagram to show what happens when salt is added:



Reading

Everything is made up of molecules. Density is the measure of how tightly the molecules are packed together in a solid object, liquid or gas. With some materials, such as liquids and gases, the density can be changed. With solid objects, the density can't be changed.

Oil and water are chemically very different from one another. Oil is made up of very long molecules that do not attract other molecules well. Water usually bonds well with other molecules due to its short molecules with positively and negatively charged ends that are very anxious to bond with something, almost anything. Also, oil molecules are very large and water molecules are very small. These differences are the main reasons that oil and water don't mix.

Water birds like ducks and geese are covered with feathers that soak up water like a sponge, but they can swim around in water and not drown. How is that possible? The birds have a gland on their bodies that contains oil. The birds use their beaks to transfer this oil to the feathers that will come in contact with the water. Since water and oil don't mix, the oil makes a barrier that keeps the water off the feathers.

Oil is slippery because of two main reasons. First, oil molecules are long and large. They do not bond easily with anything because they are satisfied with themselves the way they are...not looking for any company, no friends. Secondly, oil molecules have a very high surface tension. It is hard for most substances to break the surface tension of oil, so oil slides around instead of grabbing hold of anything because it....well, it just wants to be alone.

In today's experiment, students will actually be watching the salt itself fall through the oil. However, the oil sticks to the salt to form a larger object. Since the salt is heavier than water, the whole glob sinks to the bottom of the glass. At the bottom of your cup, the oil eventually breaks free of the salt and rises back up.

Exercises

1. What happened when you mixed the water and oil? Which one was on top?
2. What is denser: water or oil? How do you know?
3. Fill in the blanks to determine what happened: When I sprinkled salt on the oil and water mixture, the salt combined with the _____ and dropped to the bottom of the container. Eventually the _____ broke free and floated to the top, while the _____ stayed at the bottom.
4. What did the food coloring mix with? The oil or the water? Based on what you learned about the differences between oil and water, does this make sense?

Answers to Exercises

1. What happened when you mixed the water and oil? (They didn't mix.) Which one was on top? (oil)
2. What is denser: water or oil? How do you know? (water, because it sank to the bottom)
3. Fill in the blanks to determine what happened: When I sprinkled salt on the oil and water mixture, the salt combined with the ____ (oil) ____ and dropped to the bottom of the container. Eventually the ____ (oil) ____ broke free and floated to the top, while the ____ (salt) ____ stayed at the bottom.
4. What did the food coloring mix with? The oil or the water? (water) Based on what you learned about the differences between oil and water, does this make sense? (Yes, water easily makes bonds, while oil doesn't.)