Lava Lamp

Materials:

1. An empty, clear 8 oz bottle
2. Alka-Seltzer tablet
3. Vegetable oil
4. Food coloring/dye
5. Water

Procedure:

1. Fill the bottle ¾ full of oil (6 oz)
2. Add water up until the neck of the bottle (you can always add more)
3. Add no more than 10 drops of food coloring
4. Break an Alka-Seltzer tablet in half and drop a piece in
5. Shine a flashlight under the base of the clear bottle to get the lava lamp effect
6. When the bubbling stops, place the bottle cap back on and shake. Observe what happens

The Science behind it:

Oil and water mixture – Oil, a hydrophobic compound, and water, a hydrophilic compound, do not mix, due to "intermolecular polarity."

Intermolecular polarity – water molecules are attracted to other water molecules and can loosely bond together (and form drops). The same is true for oil molecules, but the polarities of these two molecules are not lopsided electrical charges, so opposites do not attract, meaning they do not mix.

Acid-base reaction – A chemical reaction between two substances where one is an acid and one is a base.

Hydrophobic compound – A 'scared of water' compound that do not dissolve easily in water.

Hydrophilic compound – A 'water loving' compound that easily bonds with water.

Real lava lamps use a polar and non-polar liquid just like our homemade one did. In a real one, however, the densities of the liquids are much closer together than vegetable oil and water. The denser liquid sinks to the bottom, but the lava lamp light heats it up until it expands and becomes less dense, causing it to rise upward. As it gets farther from the light, it cools down, becoming more dense again until it sinks; then the cycle starts all over.

Instead of using a light, in our homemade lava lamp we used alka-seltzer to power the lamp. The alka-seltzer reacts with the water to produce carbon dioxide gas bubbles. These stick to the water droplets. The water/gas combo is less dense than the oil, so they rise to the top of the flask. At the top, the gas bubbles pop and escape into the air, allowing the dense water to sink back to the bottom again.

Questions:

1. Does the temperature of the water affect the reaction?
2. Does the size of the bottle affect how many blobs are produced?
3. Does the effect still work if the cap is put on the bottle?
4. Does the size of the tablet pieces affect the number of blobs created?
5. What happens when you add water to the plastic bottle? Why do you think this occurs?
6. What happens when you add the food coloring to the bottle? Why do you think this occurs?
7. What happens when you add the Alka-Seltzer to the bottle? Why do you think this occurs?
8. What experiments did you perform on the closed soda bottle (twisting, shaking, etc.)? What did you notice during each trial?
9. Why don't the oil and water mix?

More info:

- https://www.homesciencetools.com/article/how-to-make-a-homemade-lava-lamp-science-project/
- https://kids.nationalgeographic.com/explore/science/make-a-groovy-lava-lamp/
- https://sciencebob.com/blobs-in-a-bottle-2/
- https://www.education.com/science-fair/article/make-your-own-lava-lamp/