Try This at Home Science:
Lava Lamps

Activity Overview:
Create your own lava lamp while learning about hydrophobic and hydrophilic substances!

Materials:

- Vegetable oil
- Water
- Food coloring (optional)
- 12-16 oz. Plastic bottle
- Alka Seltzer tablet

Try this!
1. Fill the bottle approximately ¾ full of vegetable oil
2. Fill up the rest of the bottle with water. Notice that the water sinks to the bottom of the bottle, below the oil.
3. Add the drops of food coloring into your oil and water, notice that only the water's color is changed by adding the food coloring.
4. Place the cap on the bottle then try gently shaking the bottle 3-4 times. Place the bottle back on the table and watch the substances carefully.
5. Remove the cap from the bottle, then break apart the Alka Seltzer tablet into four pieces. Drop the pieces into the bottle one at a time.

What's happening?
We notice that the oil and water do not mix because of a term called intermolecular polarity! We describe oil as **hydrophobic**, meaning that it is "afraid" of water and is not able to mix with it. The food coloring is also water-based, so it is only able to mix with the water and not the oil. If you try and shake up the bottle, the oil forms small bubbles, but will not mix with the water permanently. Since water is denser than oil, it always sinks back down to the bottom.

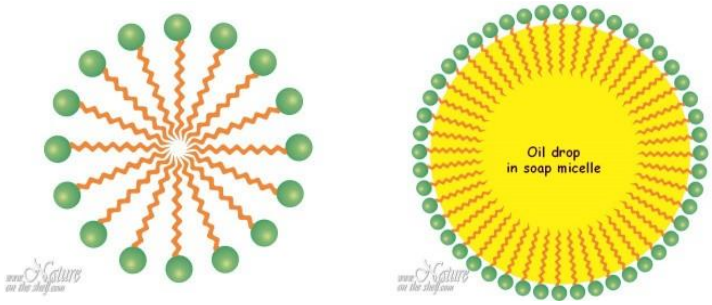
Alka-Seltzer tablets contain both an acid and a base in its solid form – citric acid (found in citrus fruits) and sodium bicarbonate (baking soda). When the tablet is dissolved in water, the acid and base mix together which generates a lot of carbon dioxide gas which you observe as bubbles.

These carbon dioxide bubbles attached themselves to the now-colored water. Since this water-gas mixture is now less dense than oil, it is able to float up to the surface. At the surface, some bubbles pop and release the carbon dioxide gas, making the water droplet again denser than oil, causing the it to sink back down to the bottom.

Since the bottle will always return to its original state after the gas is released out the top, the bottle can be capped and saved to repeat this experiment again and again. Next time you'd like to use your lava lamp, simply add more Alka Seltzer to the bottle.

How does this relate to everyday life?

Oil and water will remain separate unless an **emulsifier** is added to the mixture. An emulsifier is able to turn oil molecules into smaller droplets, called micelles, allowing them to be surrounded on all sides by water.



Emulsifiers, like soap, are able to break down the barriers between hydrophobic substances and water. This concept is what makes dish soap so effective at cleaning dirty dishes.

Now try…

- Experiment using different temperatures of water. What happens if you use boiling water (with adult supervision) or cold water?
- Experiment using different types of oils. Do they all give the same result? Why or why not? What if you did not use oil at all?
- What happens to your lava lamp if you added a small amount of dish soap to the mix? (Warning: only do this step if you do not wish to reuse your lava lamp)