

## 1. Introduction

Who we are:

What we will be learning: scientific method & density

## 2: What is the Scientific Method:

The Scientific Method is the way scientists answer questions about the things that are puzzling them in the world. They might want to find out: Why one kind of rock is harder than another or what medicine works best on a certain disease. There are 5 steps to the scientific method. (Does anyone know them?) These steps are:

**Step 1. Ask a question** --- Our question today is which liquid is more dense, water, oil or corn syrup.

**Step 2. Do some research** – lets talk about density.

a. Density is how solid something is: for example jello is less dense than this brick. We can tell this because we can stick our finger into jello, but we can't stick our finger into the brick. In easy terms, the more dense something is the more tightly the molecules that make it up are packed.

\* Try this – have your partner put their hands flat together like you would if you were clapping. Try sticking your finger between their hands. Do you see you can get your finger through? Next, have your partner interlock their fingers and squeeze tightly; try poking your finger in-between their hands. Is it easier or harder? Harder, that right. This is because there is less space. This is what it is like with molecules.

**Step 3. Make a guess (also called a Hypothesis)** -- I want you to guess which liquid is denser. Water, oil or corn syrup? Which is the least dense? Write down your guess.

**Step 4: Do experiments to test your guess** –

**Experiment 1: Using a Hydrometer to check density.** The higher the hydrometer floats in the liquid, the denser the liquid is.

*Make a hydrometer:* The first thing you need to do is take your clay and roll it into a ball. After you've made your clay ball, put your clay ball on the end of your straw. Smooth the clay around the straw so that there are no open spaces between the straw and the clay.

*Next:* Put water, oil and corn syrup each in a cup. Insert your hydrometer into water, corn syrup, and oil. When you place your hydrometer into each liquid, observe how it floats and write down how high it floats or if it sinks to the bottom. Which liquid is the densest?

### **Experiment 2: Do Liquids mix?**

1. First, pour the water from your cup into the jar. Next, pour the oil into the jar. Do you see how the oil and the water form 2 distinct layers? That's because the water is denser than the oil. They don't mix.

2. Now, take your food coloring and add 3 drops to the jar. What happens? The Food color floats in the oil. Why? The food coloring is denser than the oil so it won't mix.

3. Next, take your spoon and push the food color drops in to water. What happens? The color drops explode and mix with the water. That is because the food color and the water have the same density.

### **Experiment 3: Three Liquids Experiment:**

1. Take the cup of corn syrup and pour it into the jar with the oil and water. What's happening? You have 3 separate layers. The oil is on the top, the water in the middle and the corn syrup on the bottom. The layers tell us which is most dense.

2. The last part of the experiment is to see how solids match up with the liquids. We are going to use a cork, a penny and a grape. An object will continue to sink down until it finds a liquid that has a higher density than it. You can tell how dense an object is by which liquids it passes through.

First, drop the penny into the Jar. Where does it stop? Bottom, that's right. That means that the penny is denser than both the oil and the water.

Next drop in the grape. Where does it stop? Middle, that's right. That means that it is denser than the oil, but not denser than the water.

Finally, drop in the cork. Where does it stop? The top, that's right. That means it is the least dense of all the objects and all the liquids.

Now that we have done our experiments we can move onto our 5<sup>th</sup> step of the Scientific Method

### **Step 5: Analyze your data and interpret your results**

What did we learn from our experiments? We learned that the corn syrup is the densest liquid we worked with today. We also learned that liquids of two differing densities don't mix. Finally, we learned that an object will sink until it hits a liquid that is denser than it is.

**SO:**

Which liquid did you guess was the densest?

Was your Hypothesis (or guess) correct?

The girls from Einstein's Daughters use this Scientific Method every time they work on a robot.

Step 1: Ask a question how do we pick up all the red rings on the floor.

Step 2: Research different ways to pick things up like arms, claws and conveyor belts

Step 3: Make a guess: I think that a claw would work best

Step 4: Build a claw and try it out.

Step 5: Analyze the data. Did the claw work? Was it fast enough, accurate enough? If the answer is no, go back to step 3 and try again.