**LIQUID LAYERS LAB/**

**FLOAT A GOLF BALL DEMO**

The instructor demonstrates that not all things have the same density. This is demonstrated by pouring equal amounts of fresh water and salt water into a graduated cylinder and suspending a golf ball between the two layers of water. Campers pour equal amounts of corn syrup, water, and oil into a vial. They observe the layering of the liquids and infer which liquids are the most and least dense.

**OBJECTIVE:**

Campers learn that different liquids have different densities and that not all liquids are miscible, or capable of being mixed. The students will then go home with liquid layer pendants that demonstrate this concept.

**TERMS TO GO OVER:**

Mass – the amount of material in an object

Volume – the amount of apace an object occupies

Density – the mass of an object divided by its volume. If two objects are the same size, the heavier one, with greater mass, is denser.

Buoyancy - the upward force, caused by fluid pressure, that keeps things afloat

**PRE-LAB DEMONSTRATION MATERIALS:**

* Salt Water
* Fresh Water
* Golf Ball
* Food Coloring
* 250-ml graduated cylinder, or one large enough to contain a golf ball
* Two 100-ml graduated cylinders
* Stirring Rod

**PRE-LAB DEMONSTRATION PROCEDURE**

1. How to make Salt Water: Mix approximately 100 ml water with 1/8 cup salt to make a saturated solution
2. Pour the salt solution into the graduated cylinder
3. The golf ball should float. If it does not, add more salt to the graduated cylinder. The golf ball should be floating halfway up the cylinder.
4. Mix one drop of food coloring with another 100ml of fresh water. (This is merely to display the difference between the salt and the fresh water.)
5. Slowly add the colored water to the cylinder. Pour down the side of the cylinder to avoid mixing the water with the salt solution
6. The golf ball should be suspended between the two layers of water

**WHAT IS HAPPENING?**

The bottom half of the cylinder contains a concentrated solution of salt. This salt solution has a greater density than the golf ball, so the ball floats on this layer.

The top half of the cylinder contains colored water. The colored water is less dense than the salt solution, so it floats on top of the salt solution. The golf ball is denser than the colored water, so it sinks in this layer.

**LAB 1 MATERIALS:**

* 5 small Ziploc bags (smaller than sandwich)
* Equal amounts of vegetable oil, fresh water, salt water, corn syrup, and alcohol
* Balancing scale

**LAB 1 PROCEDURE:**

Pour equal amounts of the different liquids (10 ml works well) into separate bags (i.e. one bag for oil, one for alcohol, etc.). Explain to the campers that while each bag contains the same volume of liquid, the bags do not weigh the same because they have different *densities.* Encourage the campers to make educated guesses as to the density of each liquid in comparison to the rest.

Have the campers carry out the experiment by allowing them to compare one liquid to another on the scale. Each liquid has a different density, so their mass should be easily compared on a balance scale. As the students discover which liquids are the most and least dense, have them create a spectrum of density by lining them up from heaviest to the least heavy. This will show the campers the order in which they need to add their liquids into their pendants.

**WHAT IS HAPPENING?**

Less-dense objects and liquids float, while more-dense objects and liquids sink. For example, less-dense oil floats on more-dense water.

**LAB 2 MATERIALS:**

* Glass Vials (one for each camper)
* String
* Super Glue
* Corn syrup
* Vegetable Oil
* Fresh Water
* Salt Water
* Ethyl Alcohol
* Pipettes/Eye droppers
* 12 Cups (minimum)
* Food Coloring

**LAB 2 SETUP PROCEDURE**

1. Set up the twelve cups in groups of four. Pour corn syrup into four cups, water into four cups, and oil into the remaining four cups. (The amount of water, syrup, and oil needed will be determined by the number of campers present and the size of the glass vials.)
2. Add different shades of food coloring to the cups with corn syrup and water. While this step isn’t necessary, it allows the campers to have a variety among their pendants. (Because food coloring is water based, the oil cannot be dyed.)
3. Put at least one pipette into each of the cups. Because corn syrup is rather thick, it may be necessary to have a larger pipette for the corn syrup.
4. Gather the rest of the materials and set them aside.

**LAB 2 PROCEDURE**

Have the campers predict which layer will sink to the bottom and which one will float to the top.

Essentially, all the students need to do is put equal amounts of corn syrup, water, and oil (in that order) into their vials, and when they are done, the lids are super glued on. If the campers choose to, they may have a piece of string tied around their vials to create a ‘Liquid Layers’ pendant.