Simple Science Demonstrations That Teach Students About Matter

1. Liquid Color Magic

Concept: Cold matter sinks, warm matter rises

Materials: ice cube tray, food coloring, toothpick, freezer, clear tank filled with lukewarm water

Procedure: Fill an ice cube tray with water and add different colors of food coloring to each unit. Stir with a toothpick and freeze. Fill a large, clear tank with lukewarm water. Place the colored ice cubes in the water, two or three at a time. Students can observe them melting. The colors from the ice cubes will slowly seep downwards towards the bottom of the tank.

Explanation: As the ice cube melts, the cold liquid water (colored water) sinks to the bottom of the tank. Since the tank is warm and the colored water is cold, the colored liquid sinks. Later on in the day, you'll probably see the colors more evenly distributed in the tank.

2. Finding the Mass of Air

Concept: Air has mass

Materials: balance or scale (with accuracy of .1 gram or better), 2 balloons

Procedure: Find the mass of the deflated balloon. Then, blow it up at large as possible, tie it, and find the mass of the inflated balloon. The inflated balloon should weigh slightly more. (Note: Be sure you have an accurate scale. If you need to use a small piece of tape to secure the inflated balloon to the scale, be sure you factor the mass of the tape in your measurement.)

Explanation: The air inside the balloon has mass. When air is freely moving around the room (not trapped inside an inflated balloon) it cannot be measured. When it is contained inside the balloon, we see is has mass.

Also note: Students will often ask about helium balloons. Helium tends to rise above the other forms of air the surround us, usually lifting the balloon with it. Helium also has a mass, but it is much less than the mass of the typical gases that surround us.

3. Magic Paper Towel

Concept: Air takes up space, even under water

Materials: large clear tank of water; clear plastic cup, paper towel

Procedure: Ball up the paper towel and stuff it in the clear plastic cup. Be sure it is stuffed way down and does not extend to the areas near the rim. Be sure it stays in place when the cup is turned upside down.

Flip the cup upside down and push it straight down in the tank of water. Do not tilt the cup of the air will leak out. Students will be able to see that the air is still inside the cup. Carefully lift the cup straight up and out of the water. Observe the paper towel. It should be dry.

Explanation: The air is trapped inside the cup and cannot escape. The air keeps the paper towel dry. If the cup were tilted sideways, the air would escape and rise to the top. The space inside the cup would then be filled with water, which would make the paper towel wet.

Also Try This: As long as you have the tank and the cups out, show students how you can "pour a cup of air." Place two empty cups underwater in the tank. Push one straight down so it is filled with air underwater. Tilt the other one so it fills with water. Carefully tilt the cup filled with air so bubbles escape into the other cup. Pour the air into the second cup.

4. Magic Density Layers

Concept: Dense liquids sink below less dense liquids

Materials: clear jar or graduated cylinder; maple syrup, cooking oil, water

Procedure: Fill the jar with $\frac{1}{3}$ cooking oil, $\frac{1}{3}$ water, and $\frac{1}{3}$ maple syrup. Pour slowly. Observe. The liquids will divide into layers. The maple syrup will sink to the bottom, the water will create a middle layer, and the cooking oil will float on top.

Explanation: The most dense liquid (syrup) sinks to the bottom. The least dense (oil) floats to the top. There is less matter (per cubic unit) in the cooking oil than the water or syrup. There is more matter (per cubic unit) in the syrup than the water or oil.