Rainbow in a Jar (Density)

SUPPLIES NEEDED:

- 6 cups
- warm water and measuring cup
- sugar and measuring spoon
- food coloring
- pipettes
- test tubes

INSTRUCTIONS:

STEP 1: Set out 6 cups. Measure 1 cup of water into each glass. This is a great time to explain the importance of all the glasses having the same amount of water!

STEP 2: Add a few drops of food coloring to each glass of water to make: red, orange, yellow, green, blue, and purple. (Primary and secondary colors)

STEP 3. Measure and add a different amount of sugar to each glass of colored water.

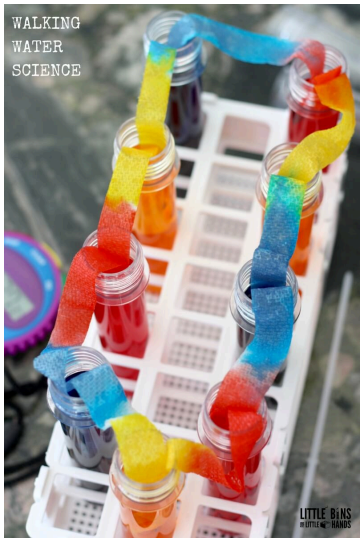
- **RED - 2 TBSP**
- **ORANGE - 4 TBSP**
- **YELLOW - 6 TBSP**
- **GREEN - 8 TBSP**
- **BLUE - 10 TBSP**
- **PURPLE - 12 TBSP**

STEP 4. Stir until as much of the sugar is dissolved as possible.

STEP 5. Students will carefully work to create a colorful rainbow in a test tube.

- **Use the pipette measuring marks to ensure you get the same amount of each color. First add the purple to the tube.**
- **Next, add the "same amount" of blue, but add the blue very, very slowly, releasing the water along the edge of the test tube.**
- **Continue to do the same thing with the other colors, working your way back through the colors. Slow and steady.**

Walking Water Experiment (Capillary Action)



SUPPLIES:

- Water
- Test Tubes and Rack
- Food Coloring
- Paper Towels
- Scissors
- Timer (optional)

INSTRUCTIONS:

STEP 1. Set up 6 test tubes with water almost to the top as pictured. This will be set up with 2 test tubes of red, yellow, and blue (one color per test tube). Add several drops of single color food coloring to each tube in a (R,Y,B,R,Y,B) pattern. (Try to put the same amount of food coloring in each container.) Give each test tube a little stir to distribute the color evenly.

STEP 2. Place the paper towel strips into the test tubes. (There will be two ends in each tube as illustrated above.)

STEP 3. Wait and watch what happens. At this point, you can set up a stopwatch to make note of how long it takes for the colors to meet and mix.

Once you have inserted the towels, it's the perfect time to talk about what we see happening (observations). Do they want to improve their hypothesis or have new ideas about what might happen?

WHAT IS HAPPENING?

This experiment helps students learn about some of the properties of water, like water's ability to flow without the help of external forces. The water travels through gaps in the paper towel fibers and "walks" through the material. This is a process called capillary action, and is what helps water climb from a plant's roots upward to the rest of the plant and leaves…defying the laws of gravity. This experiment also "shows" how primary colors mix to form new colors.

Capillary Action: This experiment demonstrates capillary action, which is the ability of water (or other liquids) to move upward against gravity through narrow spaces, such as the gaps between paper towels or the fibers of a paper towel.

Absorption: Students can learn about absorption, which is the process of one substance being taken up by another substance. In this experiment, they observe how water is absorbed by the paper towels and then transported from one cup to another.

Color Mixing: The walking water experiment also allows for exploring color mixing. Using colored water in the cups, students can observe how the colors blend as the water travels through the paper towels, creating new colors that overlap.

Properties of Water: Through this experiment, we can learn about the unique properties of water, including cohesion (water molecules sticking together) and adhesion (water molecules sticking to other substances, like paper towels).

Color Wheel Activity with Skittles Paint (Dissolving Solids)

SUPPLIES:

- Cups
- Skittles
- Water
- Paintbrush
- Color Wheel Printable

HOW TO MAKE A COLOR WHEEL:

STEP 1: To make the skittles paint, put eight skittles of each color into 2 teaspoons of water and let it dissolve for 5 minutes.

PROVIDE SCIENTIFIC/ARTISTIC BACKGROUND WHILE COLORS DEVELOP:

WHAT IS THE COLOR WHEEL?

A color wheel is a color circle, based on red, yellow, and blue, which is traditional in the field of art. Three colors are used to create all other colors. They are red, yellow, and blue. We call these colors Primary Colors.
These primary colors are unable to be created through the mixing of any other colors. By mixing the primary colors together, they create other colors, such as the secondary colors, which are green, orange, and violet. The first color wheel was presented by Sir Isaac Newton in the 17th century when he first discovered the visible spectrum of light and basically helped us understand light and the colors in rainbows.

STEP 2: Paint the color wheel with the primary skittles watercolor paint.
Tip: Start with yellow. Skip a section and paint blue, then skip another section and paint red.

Ask for ideas about painting the secondary colors between each primary. Students experiment with their color wheel creations using the group created color cups and their individual paintbrush.

STEP 3: If time permits, students may use the extra space on the page to create their own unique masterpiece by mixing the primary colors.

DIY AIR CANNON (Air Pressure)

SUPPLIES:

- **Plastic Bottle**
- **Scissors**
- **Balloon**
- **Markers (optional)**

HOW TO MAKE AN AIR CANNON:

STEP 1: First, you want to cut off the ends of the bottle and balloon as shown in the picture below.

STEP 2: Then you will want to stretch the balloon over the end of the bottle as shown. Done! You've made a super simple awesome air vortex cannon to blast out air.

STEP 3: Test! By using the end of the bottle with the balloon, to essentially suck air back, you can then aim and shoot that air out the front of the bottle. Simply stretch out the end of the balloon and let it go.

STEP 4: You can even knock over dominoes with that force of air! Set up dominoes with your team and test the power of air with a chain reaction of force.

STEP 5: Decorate the bottle if desired! (Time Permitting)

HOW DOES AN AIR CANNON WORK?

We can't see air but we can see the effects of air moving through trees, the beach ball being blown across the lawn and even the empty trash can as it blows out of the driveway and down the street. You can also feel air when it's windy. Air is made up of molecules (oxygen, nitrogen, and carbon dioxide) even if you can't see them though on a windy day, you can sure feel them!

Why does the air move? Generally, it's because of air pressure caused by temperature changes and moves from high pressure to low pressure. This is when we see storms pop up, but we can also see it on an ordinary day too with a soft breeze.

Although the temperature is a big part of the pressure change, you can also make that pressure change yourself with this cool air cannon project! The air blaster creates a burst of air that shoots out of the hole. Although you can't see it, the air actually forms a donut shape. The difference in air pressure from the fast-moving air through the opening creates the spinning vortex that is stable enough to travel through the air and knock over a domino!

"Test your air cannon out and home and see what else you can move with the power of air!"

WHAT ARE THE FORCES ACTING ON THE DOMINOES?

The basic physics are straightforward. Standing a domino on its end stores a certain amount of potential energy which is released by pushing it over. However, the force required to topple the domino is smaller than the force it generates when it falls.

Additionally, a tiny amount of energy is turned into sound energy. For example, the click-click noise the dominoes make is sound energy. In a chain reaction, an even smaller amount of energy is turned into heat. Friction is the force that occurs when two objects move against each other.

PENNY SCIENCE EXPERIMENT (Chemical Reactions)

SUPPLIES:

- white vinegar
- salt
- water
- bowl with a good size bottom base
- spoon
- paper towels
- pennies

EXPERIMENT SETUP:

STEP 1: Fill 2 small bowls with about 1/4 cup of vinegar and a teaspoon of salt each. Mix thoroughly.
STEP 2: Take one penny and dip it halfway into the bowl. Count to 10 slowly and pull it out. What happened? Have students add five more pennies and let them sit for a few minutes. What can you see happening? (Make sure to have students add 6 pennies to the other bowl, too.)
STEP 3: Now, take the pennies from one bowl, rinse them and let them dry on a paper towel. Take the other pennies from the other bowl and place them directly on another paper towel (do not rinse). Let's wait and see what happens.

DISCUSSION POINTS:

- ***Can you see the differences between the two groups of rinsed and unrinsed pennies?*** **Our dull pennies should either be green or polished!**
- ***What makes green pennies green?***
    - **Your green pennies have what is called a patina. A patina is a thin layer that has formed on the surface of your copper penny from "weathering" and oxidation from the chemical process we just put the penny through.**
- ***What is copper?***
    - **Copper is a chemical element. It is made of only a single type of atom—it cannot be broken down into simpler substances. The copper atom has an atomic number of 29, which means that its atomic nucleus contains 29 protons.**
- ***What does all this have to do with the Statue of Liberty?***

- **The Statue of Liberty is covered in a thin layer of copper. Because she sits out in the elements and is surrounded by salt water, she has a patina similar to our green pennies. It would be a huge job to polish her!**