ARIZONA SCIENCE CENTER
Never stop wondering.
Never stop imagining.™

Chemistry

The Rainbow in a Bottle Reaction

Can you make your very own rainbow in a bottle? You can with the magic of pH! pH is a measurement of how acidic or basic something is. Very acidic things have a pH of 0, while very basic things have a pH of 14. What's in the middle? Neutral materials, like water, have a pH of around 7. Red grape juice naturally changes color base on pH, so we can use it as a pH indicator. Grape juice is mostly made out of the water and is fairly neutral, so its purple color indicates around pH 7. An acid with pH 0 would be a bright clear yellow. A base with a very high pH will have a green color. We can make a rainbow by first making an acid solution and then slowly lowering the pH until the solution is a base. We can make that happen slowly with a medicine called milk of magnesia, which can neutralize acids.

Supplies

A Water Bottle
1 cup - water
2 TBS - red grape juice
2 TBS - vinegar
2 TBS - milk of magnesia
Other household chemicals

Challenge

Can you make a Rainbow in a Bottle?

1. Fill the bottle with about 1 cup of water, that's about half of a small water bottle.
2. Add 2 TBS of Red Grape Juice. Add 2 TBS of vinegar.
3. Add 2 TBS of Milk of Magnesia.
4. Put the lid on the bottle tightly and shake vigorously.

Guiding Questions?

1. What color do you see when you add each chemical to the bottle?
2. Did the color change quickly or slowly?
3. What are some acids that you use every day? Lemonade and soda are acidic, but they are less acidic than vinegar and much less acidic than dangerous chemicals like battery acid.
4. Do you know anything that is basic? The most basic chemicals in your house are probably bleach and drain cleaner, these can be dangerous, just like very acidic things. Some other bases you might find around the house are soap, baking soda, chalk, and toothpaste.
5. Try testing different household chemicals. Which has higher or lower pH? Can you predict which are acidic, basic, or neutral? Can you find chemicals with a variety of pH and line them up from lowest to highest pH? You made another rainbow!