

Invisible Ink

Have you ever wanted to write a secret message? In this experiment we will use chemistry to test two different methods for making your own invisible ink.



Experiment 1- Oxidation

Lemon juice is an organic substance, meaning it contains carbon. When placed onto the paper, the carbon-based compounds are absorbed into the paper's fibers. The heat from the lightbulb causes some of the chemical bonds to break down, freeing the carbon into the air. Contact with the air causes the carbon to oxidize, turn brown, and reveal your message!

Key Terms

Organic substance- Substance containing carbon atoms

Oxidation- chemical reaction that occurs when a substance is in contact with oxygen, often resulting in the discoloration of the substance

Materials

A lemon
Water
Small bowl
Spoon
Water droppers
Cotton Swab
White Paper
Hot Light Bulb (Adult supervision required)

Procedure

1. Squeeze a lemon into a bowl
2. Add 3 drops of water and stir
3. Use a cotton swab to write a secret message or draw a secret picture onto white paper
4. Allow ink to dry
5. With adult supervision, hold the paper up to a hot light bulb to reveal the message

Guiding Questions

1. Have you ever seen an oxidation reaction other than this experiment? Some examples of oxidation are rusty metal or fruit slices that turn brown after sitting out. What other examples of oxidation can you think of?
2. Try the experiment one more time and closely observe the oxidation reaction. Use all five senses: does it smell, or give off heat? Is it fast, or slow?

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Experiment 2- Acids and Bases

Grape juice is a mild acid, which means it isn't very strong. When this mild acid mixes with the baking soda, an acid base reaction occurs, changing the color of the liquid.



Key Terms

pH- a scale that scientists use to measure how acidic or basic something is, goes from 0-14

Acid- a substance with a pH 0-7, often sour or bitter

Base- a substance with a pH 7-14, often slippery or slimy

Acid-Base reaction- chemical reaction between an acid and a base, the results of which can often be changing colors

Materials

Baking Soda

Water

Measuring cup

Small bowl

Spoon

Cotton swabs

Acidic juice (grape juice works well)

White paper

Procedure

1. Measure a $\frac{1}{4}$ cup of baking soda and a $\frac{1}{4}$ cup of water and mix them together in a small bowl
2. Dip a cotton swab into the baking soda and water mixture and use it to write a secret message or draw a secret picture on white paper
3. Allow ink to dry
4. Using a new, clean cotton swab, dip the swab into the juice and rub it across the paper where you wrote your message

Guiding Questions

1. Other than grape juice, what other juices/foods could you try with this experiment?
2. Not only can you find a lot of acids in your kitchen/home, you can also find a lot of bases. What household items do you think might be bases?