

Invisible Ink with Lemon Juice



Grade: 5th Grade | **Topic:** Invisible Ink with Lemon Juice | **Measurement:** US Customary (cups, ounces, inches, etc.)

Purpose

To learn how lemon juice can be used as invisible ink to write secret messages. To explore how heat can reveal hidden writing.

Hypothesis

If I write with lemon juice on paper and let it dry, then apply heat carefully, a hidden message will appear because heat changes the lemon juice color.

Materials

- 1 lemon
- 1 small bowl
- Cotton swabs or a thin paintbrush
- White paper (plain printer paper or notebook paper)
- A lamp with an incandescent bulb or a light bulb (not LED or fluorescent)
- Iron or adult help to use a light bulb or iron safely
- Paper towels

Procedure

1. Cut the lemon in half and squeeze the juice into the small bowl.
2. Dip a cotton swab or thin paintbrush into the lemon juice.
3. Write a secret message or draw a simple picture on the white paper using the lemon juice.
4. Let the paper dry completely so the writing disappears.
5. Once dry, ask an adult to help you hold the paper close (about 6 inches) to a warm light bulb or gently iron the paper on low heat.
6. Watch carefully as the hidden message appears because the heat makes the lemon juice turn brown.
7. Use paper towels to clean up any spills.

Results

The lemon juice writing, which was invisible when dry, becomes brown and visible when heated. The heat causes the lemon juice to oxidize and change color.

Conclusion

Lemon juice can be used as invisible ink because it is a natural substance that turns brown when heated. This experiment shows how heat can cause chemical changes that reveal hidden messages.

Learning Objectives

- Understand that some substances can become invisible when dry and visible when heated.
- Learn how a chemical change can reveal hidden messages.
- Practice careful observation and recording of results.

Teacher Notes:

Key Concept: This experiment demonstrates oxidation, a chemical reaction that happens when lemon juice is heated and changes color. It also introduces the concept of invisible ink and how some materials can hide information until exposed to heat.

Answer/Explanation: The lemon juice is mostly water and organic compounds that are colorless when dry. When heated, the organic compounds break down and oxidize, turning brown and making the writing visible. This is a safe, simple example of a chemical change.

Teaching Tips:

- Always supervise students when using heat sources like light bulbs or irons. 2. Test the heat source yourself before the experiment to make sure it's not too hot. 3. Encourage students to try different messages or drawings. 4. Discuss other natural substances that might work as invisible ink, like milk or vinegar.

Relevant Standards: NGSS 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances., CCSS.ELA-LITERACY.RI.5.3: Explain the relationships or interactions between two or more individuals, events, ideas, or concepts.



Name: _____

Date: _____

Experiment Title:

Purpose: *(I wonder...)*

Hypothesis: *(I think...)*

Materials:

Procedure:

Results: *(What happened?)*

Conclusion: *(I learned...)*