# Secret Goldenrod Messages



An indicator shows or points out something to you. A smile can be an indicator that you are happy. Chemicals can indicate something by changing colors. In this activity, you will write secret messages on goldenrod paper and view your messages by painting the paper with acids and bases.

## Materials

- Measuring spoons
- Powdered laundry detergent
- 4 Plastic cups
- Pencil or pen
- Masking tape
- Baking soda
- Water
- Vinegar
- Water
- Goldenrod paper
- Piece of white candle or crayon
- Cotton swabs or paintbrushes

*NOTE: This activity only works with paper that has been dyed with natural goldenrod pigment. Many synthetic dyes will not change colors in the same way.*

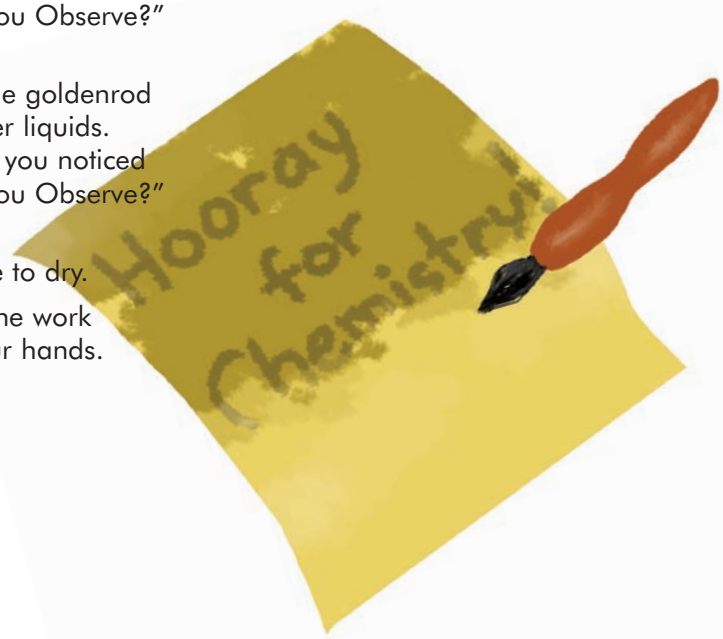
SAFETY! *Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not drink the water used in this activity! Powdered detergent is an irritant; do not breathe in the powder.*

## Procedure

1. Place ½ teaspoon of detergent in a cup. Add 3 tablespoons of water and mix well. Label this cup "detergent".
2. Place ½ teaspoon of baking soda in a cup with 2 tablespoons of water and mix well. Label this cup "baking soda".
3. Pour a small amount of vinegar into a third cup and label it "vinegar".
4. Label a 4th cup "water" and add some tap water to it.
5. Using the white candle or white crayon, write your name or a secret message or picture on the goldenrod paper.
6. Swab or paint over what you wrote with the detergent solution. Make note of what you noticed in the "What Did You Observe?" section.
7. Now try painting the goldenrod paper with the other liquids. Make note of what you noticed in the "What Did You Observe?" section.
8. Put the paper aside to dry.
9. Thoroughly clean the work area and wash your hands.

## Where's the Chemistry?

This goldenrod paper contains a pigment that changes color when it comes in contact with certain chemicals called bases. The detergent solution and the baking soda solution are bases, and therefore caused the paper to change in color from gold to red. This chemical reaction can be reversed if an acid, such as vinegar is added. No color change occurred when water was added because water is neither an acid nor a base. The wax from the candle or the crayon protects the surface of the paper, and the color of the paper under the wax is not changed by any of the liquids used.



## What Did you Observe?

| *Solution or Liquid Used in the Activity* | *Observation* |
|---|---|
| *1.* | |
| *2.* | |
| *3.* | |
| *4.* | |

The American Chemical Society develops materials for elementary school age children to spark their interest in science and teach developmentally appropriate chemistry concepts. The *Activities for Children* collection includes hands-on activities, articles, puzzles, and games on topics related to children's everyday experiences.

The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at www.acs.org/kids.

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# Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

## Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

**Never** eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

**Never** experiment on your own!

**For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".**