Indicator Blues

A surprising thing happens when you place pieces of a red cabbage leaf in water. When you squish the pieces and water together, the water turns blue! If you add small amounts of different liquids, the cabbage-water will turn a variety of beautiful colors—pink, purple, teal, or green. Try this activity to see some amazing color changes and find out what they tell you about different substances.

Materials:

- Red cabbage leaf (torn into pieces)
- Warm water
- Measuring spoons
- Measuring cup
- Plastic zip-closing bag
- 2 eye droppers
- 5 small cups (paper or plastic)
- Vinegar (about 1 teaspoon)
- Laundry detergent powder (about 1 teaspoon)
- 1 flat toothpick (to use as a tiny scoop)
- Masking tape
- Ball point pen

Procedures:

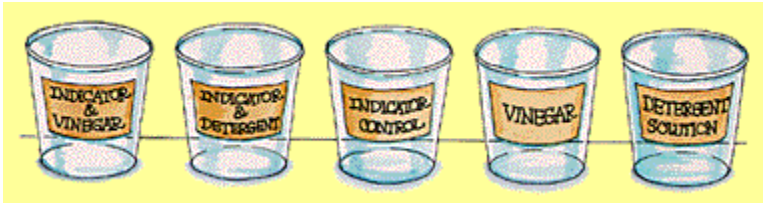
First, prepare your Indicator Solution:

1. Place the red cabbage leaf pieces into the zip-closing bag. Add 3/4 cup of warm water and close the bag tightly.

Squeeze the bag of cabbage and water until the water turns dark blue (about 3 minutes). This dark blue liquid is your indicator solution.

Now you can begin your activity:

1. Use your masking tape and pen to label the five cups as shown.

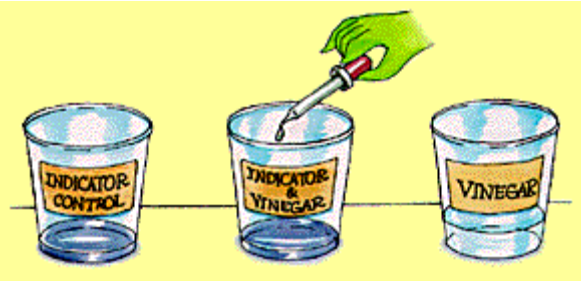


2. Pour about 2 tablespoons of vinegar into the *Vinegar* cup.

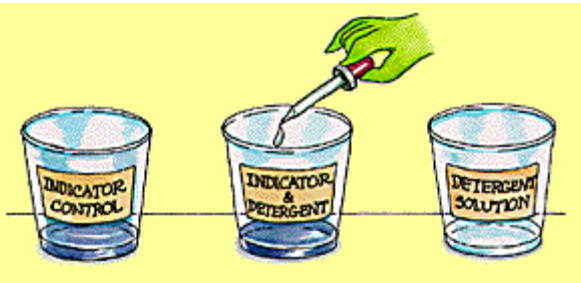
3. Place 2 tablespoons of water into the *Detergent Solution* cup. Add 1 teaspoon of detergent and swirl to mix.

4. Place 2 tablespoons of indicator solution into the three Indicator cups.

5. Use your dropper to place 1 drop of vinegar in the *Indicator + Vinegar* cup. Gently swirl the cup to mix. What did you observe? How does the color compare with the Indicator control?



6. Use the second dropper to add 1 drop of detergent solution to the *Indicator + Detergent* cup. Gently swirl to mix. What did you observe? How does it compare with the Indicator control?



Think about this ...

See if you can change the color in your *Indicator + Vinegar* cup back to blue! Add a drop of detergent solution to the *Indicator + Vinegar* cup. Swirl to mix. Compare the color in the vinegar cup with the color in your *Indicator Control* cup. How close did you get? If the color does not match, see if you can add just the right amount of either detergent or vinegar to match the color of the control. Now, try to change the color in your *Indicator + Detergent* cup back to blue! How would you do it?

Where's the Chemistry?

Red cabbage-water is a special substance called an indicator. This means that the color the cabbage-water turns says something about the liquid that was placed in it. When the indicator is blue, it's considered to be neutral. Adding a neutral liquid like water will keep the indicator blue. You can make the indicator change to pink by adding an acid like vinegar, lemon juice, or cream of tartar. The indicator will change to green by adding a base like laundry detergent or soap. Try adding different substances to red cabbage indicator and use the color changes to classify each substance as an acid or a base.

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.

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".