Red Cabbage Indicator

At-Home

Is it an acid, base, or neutral? Make your own acid-base indicator from red cabbage, then test various household substances.

Question to investigate

How can you use a red cabbage to test and classify substances?

Chemistry concepts

- Acids and bases are classes of materials that have different properties.
- Acid-base indicators change color depending on whether they are in acids or bases.
- Red cabbage leaves contain a substance called anthocyanin that changes color depending on whether mixed with an acid or a base.

Activity logistics

- **Ages**: As written, this activity is suited for ages 8–12.
- **Time**: 45 minutes–1 hour

Be safe

- Do not eat or drink any of the materials used in this activity.
- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels.
- Wear Personal Protective Equipment (PPE), such as goggles, safety glasses, or gloves.
- Tie back long hair, roll up sleeves, and secure loose clothing.

- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well before and after the activity

Disposal: Dispose of all solid waste in the trash. The liquids can be safely disposed of down the drain with plenty of water.

What you'll need

- Red cabbage
- Household items to test, like:
  - Fruit juice, for example: lemon, lime, orange, apple
  - Soda pop (light-colored sodas work best)
  - Vinegar
  - Milk
  - Yogurt
  - Liquid cleaning products (don't use bleach)
  - Solutions made by dissolving a solid such as baking soda, detergent, or baking powder in water
  - Bowl
- Water
- Zip-closing plastic bag
- Dropper or straw[1]
- Several small cups (one for each test)
- Small bowl or cup
- Measuring cups
- Measuring spoons

Procedure

Make red cabbage indicator

1. Tear several leaves of red cabbage into small pieces and place into zip-closing plastic bag.
2. Add about a cup of water to the bag. Remove as much air as possible from the bag and seal it.
3. Hold the bag at the top with one hand and squish the leaves in the water with the other hand for a couple of minutes until the water turns a dark blue.
4. Pour the liquid from the plastic bag into a cup. Discard the leaves. The liquid is your red cabbage indicator.

[1] You can use a straw as a dropper. First, dip the straw into the liquid. Place a finger over the top of the straw to make a seal. When you remove the straw from the liquid, the liquid will remain inside the straw. When you are ready to release the liquid, remove your finger from the top of the straw.

Test various household solutions

Your red cabbage indicator should be dark blue in color. The color of the cabbage indicator will change to red or pink if the solution is an acid and it will change to green or yellow if it is a base. It will remain purple or blue if the test solution is neutral.

5. Add about 1 tablespoon of the indicator liquid to a small cup.
6. Use a dropper or straw to place several drops of the test liquid into the cup with the indicator.
7. Record the color of the liquid in the cup below.
8. To test another item, use a clean cup and fresh indicator liquid. Repeat steps 4-6.
9. In the table below, record the item, the color the liquid turns, and if it is an acid, a base, or neutral.

What did you observe?

Item	Color	Acid/Base/Neutral

How does it work?

Chemists classify substances as **acids** or **bases**. Lemon juice and vinegar are both examples of acids. On the other end of the spectrum are bases. An example of a base is baking soda, which you might have used in the kitchen to make cookies and cakes. Many soaps are bases. Some substances are **neutral**, meaning they are neither an acid nor a base, like water.

How can you tell if something is an acid or a base? Acids and bases can change the color of substances called **acid-base indicators**.

Red cabbage contains a chemical called **anthocyanin**. This pigment is a natural acid-base indicator. It is blue in neutral substances, like plain water. When an acid like lemon juice gets in the water, a reaction makes the indicator molecule change shape and it looks pink. When instead a base gets in the water, a different reaction happens that changes the indicator molecule and it looks green.

This activity is adapted from an activity that originally appeared in the Celebrating Chemistry *issue for Chemists Celebrate Earth Day 2010.*