PH RAINBOW

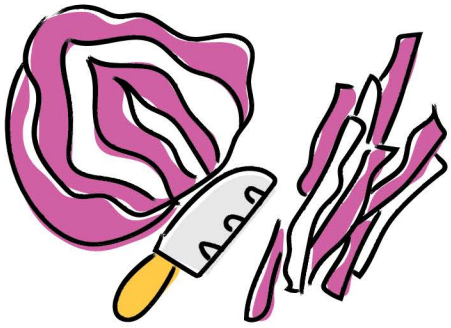
We encounter acids and bases every day in the food we eat and the household cleaners we use–like bleach, vinegar and milk. In chemistry, the pH scale tells you how acidic or basic a substance is. Make your own simple pH indicator and do some testing!

MATERIALS

- ☐ **Red cabbage (doesn't work with green cabbage!)**
- ☐ **Knife**
- ☐ **Cutting board**
- ☐ **Measuring cup**
- ☐ **Measuring spoons**
- ☐ **Boiling water**
- ☐ **Two large bowls or containers**
- ☐ **Several smaller containers**
- ☐ **Strainer**
- ☐ **Sticky notes**
- ☐ **Substances to test like lemon juice, vinegar, milk, clear soda, baking soda, soapy water**

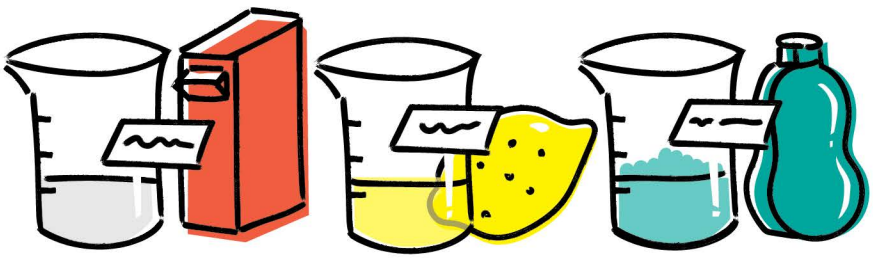
INSTRUCTIONS

With the help of an adult, chop the cabbage into small pieces (about half an inch). Place all the pieces in a large bowl. Boil four cups of water. Take the water off the heat and carefully pour the hot water over the cabbage. Let the cabbage sit until it cools to room temperature.



Pour the mixture through a strainer and collect the liquid in a second container. This is your pH indicator. The color should be bright purple. Be careful, it can stain.

Prepare your substances for testing. Put about a quarter cup of a substance into a small container and label it using a sticky note. Repeat, placing substances in separate containers until you have all your samples ready. For powders like baking soda, mix one tablespoon into a quarter cup of water.



Add a few tablespoons of the cabbage juice pH indicator to each small container. Check the color and match it to the pH scale chart to determine how acidic or basic the substance is. Refer to the pH scale below or at https://tinyurl.com/phcolorscale.

RED CABBAGE COLOR INDICATOR CHART

WHAT'S HAPPENING?

Scientists monitor the chemical and physical properties of natural water, like our rivers and lakes. Changes in pH levels and properties like acidity, temperature, density and the concentration of different chemicals can have a profound impact on the health of the living organisms in the water. For example, organisms that use calcium carbonate to build shells—like oysters, clams, sea urchins and corals—are especially sensitive to changes in pH levels. Conditions that are more acidic, or lower on the scale, make it harder for them to build shells. The National Oceanic and Atmospheric Administration is studying whether rising levels of carbon dioxide is making the Great Lakes more acidic.

TIPS

When disposing of the substances you tested, pour each one down the drain individually with plenty of water.

If you spill red cabbage juice on your clothes, blot as much excess liquid as possible and run the hottest water that is safe for the fabric through the stain. Use laundry detergent or stain remover and wash normally.

EXTENSIONS

Red cabbage makes a very broad pH indicator. If you want to test natural waters from lakes, streams or rain, you can purchase more accurate pH strips from a pet store. Does the pH of a nearby lake or stream change over the seasons? Is the pH of the rain and in bodies of water the same?

LEARN MORE

Explore other chemicals and see what reactions they create with MSI's online goREACT game (msichicago.org/goreact).

RECOMMENDED READING

Rachel Carson and Her Book That Changed the World, by Laurie Lawlor

Humans and the Hydrosphere: Protecting Earth's Water Resources, by Ava Sawyer