

Acidic, neutral or alkaline

An experiment using red cabbage juice

Lemons are acidic – everyone knows that. You may also have heard that soap or detergents can be basic or alkaline.

When dealing with acids and bases, you'll often hear pH mentioned. This is a scale that measures just how acidic or basic a particular solution is. Pure water is neutral, and has a pH of 7. All acids have a pH below 7, and all bases have a pH greater than seven. The further away from 7 a pH value is, the more acidic or alkaline the solution.

A pH indicator is a substance that can be used to tell whether an aqueous solution (one in which the main liquid is water) is acidic, neutral or alkaline. Red cabbage juice is an excellent pH indicator, and is ideal for experiments at home.



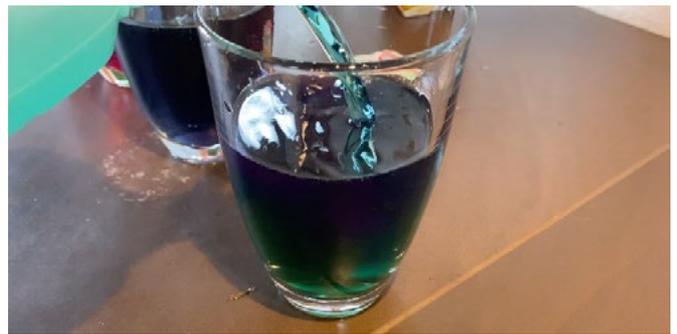
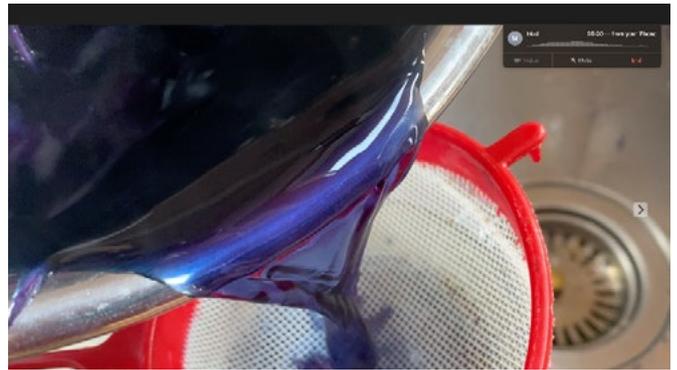
What you'll need

- 1 red cabbage
- a knife
- a cutting board
- a saucepan
- water
- a sieve
- containers for the red cabbage juice
- 6 glasses
- safety goggles (optional)
- various household liquids that you want to test to find out whether they are acidic, neutral or alkaline, such as lemon juice, vinegar, an effervescent vitamin C tablet, different household detergents, different kinds of soap



Instructions

- Cut the red cabbage in half, slice it into thin strips and wash it thoroughly. Put the strips in a saucepan and add around 2 liters of water. Cook for around 10 minutes.
- Decant and reserve the liquid, which will have turned blue. (Once we've finished the experiment, we'll cook the red cabbage some more, season it, and eat it!).
- Set out the 6 glasses, and fill them all with roughly the same amount of red cabbage juice.
- Pour a few drops of lemon juice into the first glass, and carefully watch what happens. If you don't see any change, add a little more lemon juice.
- Add a different substance, such as the effervescent vitamin C tablet, to the second glass and watch what happens.
- Carry on adding a few drops of a different substance (juice, soap, detergent, etc.) to each glass to find out what happens.



What you will see

- Some substances (like lemon juice) make the cabbage juice turn red.
- Others barely affect the cabbage juice, leaving it a blue-violet color. Household detergents make the juice turn green.
- There are some soaps that won't make our indicator turn blue at all, and leave it violet.



How it works

Red cabbage contains the pigment cyanidin, which belongs to a class of pigments known as anthocyanins. At a pH of 6 to 7, cyanidin has a violet color. At lower pH levels, the cyanidin molecule gains a hydrogen ion, which changes its color to red. At higher pH levels, cyanidin loses a hydrogen ion, making it blue. Above a pH of 8, it loses a second hydrogen ion, and the solution turns green. (Source: <https://www.seilnacht.com/Lexikon/Indikato.htm>)

Soaps that leave our cabbage juice violet protect our skin's acid mantle. The surface of human skin is quite acidic, with a pH of 5.5. This helps the skin fight off bacteria, which tend not to like acidic environments. Every time we wash our hands with alkaline soap, the acid mantle has to be restored. This is why it's better to use pH-neutral soaps with a pH value of 5.5.