

Acids and Bases

Acids and Bases are everywhere, right from the soaps used during the shower to the citric acid or vinegar present in the kitchen. Though it is sometimes difficult to distinguish between them there are common characteristics to help tell the difference. Acids are sour in taste, create a burning sensation, and react with metals. Bases taste bitter, are slippery to the touch, and react with oils. With a water-based indicator, there's also a visual difference!

The Indicator is in the Cabbage!

In this experiment, we are going to take a natural indicator (red cabbage) and use it to discover which household substances are acids and which are bases.

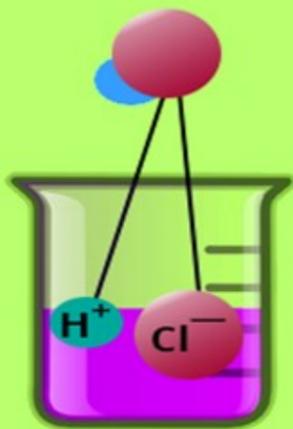
1. Grate a small red cabbage and place the pieces into the pot of hot water,
2. Leave the cabbage mixture steeping, stirring occasionally, until the liquid is room temperature. This may take at least half an hour. The liquid should be reddish purple in color,
3. Place a strainer over a second large bowl or pot and pour the mixture through the strainer to remove the cabbage pulp. Press down on the pulp in the strainer using a large spoon to squeeze more liquid out of the pulp.
4. Set aside your indicator solution. This is your "stock" solution for each test.
5. Using a separate cup for each substance to test, fill about half of the cup with your cabbage indicator solution. You can use less indicator solution for each cup if you do not have a lot of indicator solution.
6. Add drops of a liquid you want to test to a single cup until you see the solution change in color. Gently swirl the cup as you add the drops, being careful not to spill the solution.

If a substance is an acid, the cabbage indicator will turn purple to red. If the substance is a base, the indicator will turn blue to green.

Materials

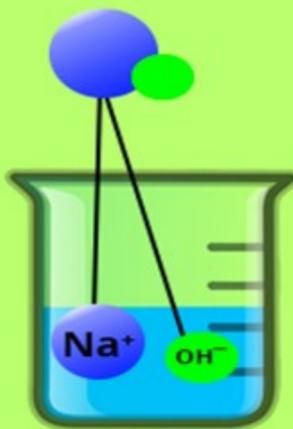
- Pot of Just Boiled Water
- Large Bowl
- Small Red Cabbage
- Grater
- Strainer
- Cup for Each Item to Test
- Eye Dropper
- Baking Soda In Water
- Lemon Juice
- Soap
- Vinegar

HCL



(a) Acid

NaOH



(b) Base

What's Happening?

Water is a molecule made from one Oxygen atom, and two Hydrogen atoms (H₂O!). Acids that mix with water start a chemical reaction where the acid molecule donates an extra hydrogen to the water molecule (H₃O⁺). Bases that mix with water start an opposite reaction, where the base molecule receives one of the hydrogen atoms from the water molecule (OH⁻). The cabbage indicator changes color to show whether H₃O⁺ or OH⁻ is present.

What do you think would happen to the indicator if an acid and base were added to water at the same time?