RAFT IDEAS

Topics: Acids and Bases, Chemical Reactions

Materials List

- ✓ Red cabbage
- ✓ Knife
- ✓ Cooking pot
- ✓ Water
- ✓ Storage bottle w/ lid
- ✓ Funnel
- ✓ Baking soda
- ✓ Vinegar
- ✓ Eye droppers or disposable pipettes
- ✓ Cups, test tubes or preforms

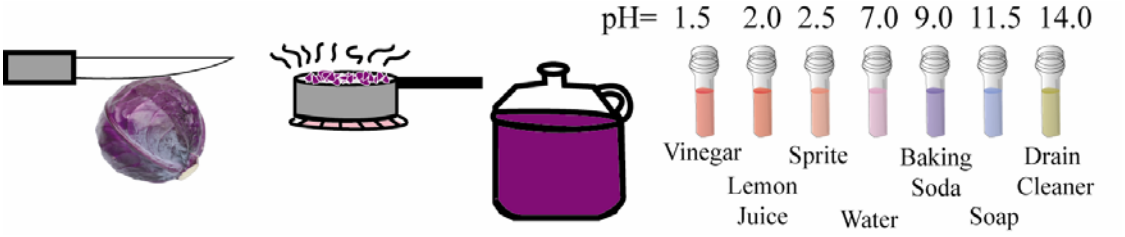
This activity can be used to teach:

- Acids and bases (CA Science Standards: Grade 8, 5.e, HS, Chemistry, 5.a-f)
- Properties of products from chemical reactions (CA Science Standards: Grade 5, 1.a)

raft resource area for teaching
1355 Ridder Park Drive San Jose, CA 95131
www.raft.net

Cabbage Patch Indicator

Create an inexpensive pH test solution



Red cabbage juice is amazing! Acids and bases make it change color!

Preparation

Note: Strong smell alert! Consider doing this investigation outside. Carefully wash all cups and equipment after the investigation.

1. Chop the red cabbage into ~5 cm (2") pieces and boil in a pot with water until the water turns dark purple.
2. Allow time for the solution to cool. Use a strainer or sieve to separate the red cabbage solution from the leaves. Discard the leaves.
3. Cabbage juice indicator solution can be refrigerated for short-term (1-2 day) use or stored indefinitely in a freezer. When ready for use, allow time to thaw.

To Do and Notice

1. Add a couple of drops of vinegar (contains acetic acid, a weak acid) to a cup or preform filled with indicator. The cabbage juice will turn slightly pink.
2. Mix 5 ml (1 teaspoon) of baking soda (contains sodium bicarbonate, a weak base) into 240 ml (1 cup) of water. Add a couple of drops of sodium bicarbonate solution to the indicator. The cabbage juice should slightly bluish-green.
3. Mix the vinegar/cabbage juice solution in step 1 with the baking soda/cabbage juice solution in step 2. Bubbles will form (carbon dioxide) and the cabbage juice will change to back to purple (the indicator solution has become more neutral).

The Science Behind the Activity

An **acid** is substance that can donate **hydrogen ions (H^+)**. A **base** is a substance that can accept hydrogen ions. **Indicators** are used to detect the relative concentrations of hydrogen ions (pH). Cabbage juice contains **anthocyanins** that are highly sensitive to pH. Anthocyanins reflect red light in the presence of acids **(pH < 7)** and blue light **(pH>7)** when mixed with bases. When vinegar reacts with baking soda, the resulting reaction neutralizes both the acid and the base to form a **salt (sodium acetate)**. The reaction also produces **carbon dioxide (CO_2)** gas.

Taking it Further

Test the pH of various household liquids (e.g. - lemon juice, sprite, soap, drain cleaner). Note: Use caution when using household cleansers and do not mix them.

Web Resources (Visit www.raft.net/more for how-to videos and more ideas!)
For more information on the pH scale, go to:
http://staff.jccc.net/PDECELL/chemistry/phscale.html

Written by Jay Gluckman (RAFT)