

Name: _____

Group Members: _____

Red Cabbage Indicator to Determine pH

Purpose/Outcomes:

- Identify examples of acids and bases in consumer products
- Explain how acid-base indicators function chemically, using Le Chatelier's Principle.
- Estimate the pH of solutions using acid-base indicator solutions
- Design and carry out an experiment to differentiate between weak and strong acids using indicators.

pH Value	H ⁺ Concentration Relative to Pure Water	Example
0	10 000 000	battery acid
1	1 000 000	gastric acid
2	100 000	lemon juice, vinegar
3	10 000	orange juice, soda
4	1 000	tomato juice, acid rain
5	100	black coffee, bananas
6	10	urine, milk
7	1	pure water
8	0.1	sea water, eggs
9	0.01	baking soda
10	0.001	Great Salt Lake, milk of magnesia
11	0.000 1	ammonia solution
12	0.000 01	soapy water
13	0.000 001	bleach, oven cleaner
14	0.000 000 1	liquid drain cleaner

Background info:

MAKING AN INDICATOR FROM RED CABBAGE

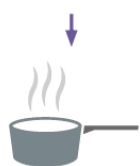
The compounds that give red cabbage its colour can be extracted and used as a pH indicator solution. Here we look at the method and the colours!

MAKING THE INDICATOR



1

ROUGHLY CHOP THE CABBAGE



2

BOIL FOR A FEW MINUTES



3

STRAIN AND LET COOL



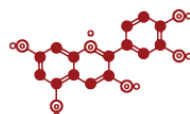
4

USE AS AN INDICATOR!



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

← ACIDIC pH ALKALINE →



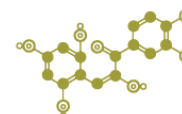
RED (pH <3)



VIOLET (pH 4-7)



BLUE (pH 7-8)



YELLOW GREEN (AT pH >8)

Hydrogens on carbon atoms implied; each carbon has 4 bonds.

The red cabbage extract can be used to determine whether substances are acidic or alkaline. The structures of the anthocyanin pigments which give the red cabbage its colour are subtly changed at varying pH. These different structures give a range of colours.

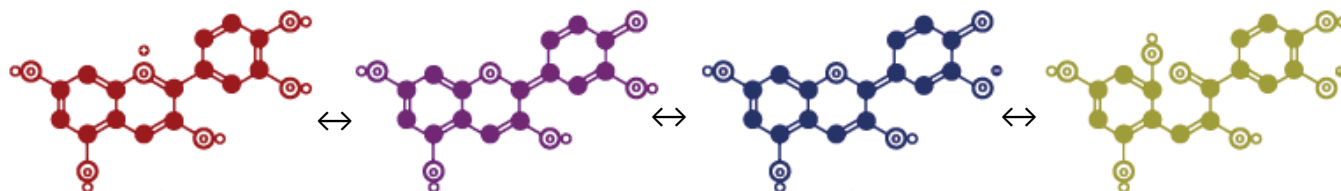


© Andy Brunning/Compound Interest 2017 - www.compoundchem.com | Twitter: @compoundchem | FB: www.facebook.com/compoundchem
This graphic is shared under a Creative Commons Attribution-NonCommercial-NoDerivatives licence.



Analysis Questions:

- Below is a diagram that shows how the red cabbage indicator changes with the loss of hydrogen ions. The image on the left represents the molecule with the most hydrogen ions (in an acid) and on the right is the molecules with the least hydrogen ions (in a base).
 - Circle the parts of the molecule that have changed with each step.



- The H^+ ions that are removed from the molecules are not shown in this image. Add the ions beside the molecules they are removed from.
- Using Le Chatelier's principle, describe why the colour of the indicator changes when it is in an acid vs when it is in a base.

- Where there any substances where the pH surprised you? Why or why not?