Name: _____ Date: _____

Natural Indicators

Introduction

Red cabbage (*Brassica oleracea*) has dark reddish-purple leaves due to a pigment called anthocyanin. This water-soluble pigment is also found in apple skin, plums, poppies, cornflowers, and grapes. Because of the way this pigment reacts to chemicals in the environment, the plant itself changes its color according to the pH value of the soil. This explains the fact that the very same plant is known by different colors in various regions throughout the world, such as Northern Europe, Northern America and China. In this lab, we will use the colors produced by red cabbage indicator in order to determine the pH of several common household chemicals.

Materials

bleach and/or Oxi-Clean
distilled water
red cabbage
various household chemicals

Equipment *(* if not using a hot plate)*

beaker, 250 mL
beaker tongs
Bunsen burner*
hot plate
Erlenmeyer flask, 125 mL
iron rings, 2*
pipettes
ring stand*
stirring rod
well plate
wire gauze*

Safety Considerations

- **Be careful not to place bleach and ammonia in adjacent wells – this can generate poisonous chlorine gas!**
- Although you will not have to wear safety goggles, some of the household chemicals are irritating to the eyes and skin.
- Sometimes chemicals from previous labs still remain in glassware and on other lab equipment; wash all lab equipment before and after performing this lab.
- Wash your hands thoroughly after completing this lab.

Procedure A – Preparing the red cabbage

1. Obtain one leaf of red cabbage and tear it into small pieces. Place the pieces into a beaker with 150 mL of distilled water.
2. If you're using a hot plate, place the beaker on the hot plate and turn it up to "8". If you're using a Bunsen, place the beaker on an iron ring on a ring stand with wire gauze above a Bunsen burner. Be sure to double-ring your beaker if you're using a ring stand!
3. Heat the water until the cabbage has turned it a deep purple color, stirring it regularly.
4. Turn off the hot plate or Bunsen burner and remove the beaker from the heat source using beaker tongs. Allow the purple solution to cool for several minutes.
5. Strain the purple solution by pouring it into an Erlenmeyer flask while holding back the cooked pieces of cabbage with your stirring rod. Discard the cabbage in the trash; dispose of the extra indicator in the sink.

Procedure B – Testing household chemicals

1. Using a well plate, obtain twelve (12) samples of household chemicals, one in each well. Record the names of these chemicals in the data table below.
2. Carefully add one drop of the purple, natural indicator to each household chemical. Record the color that is formed in your data table.
3. For each of your household chemicals, determine whether it is acidic (pink), basic (green), or neutral (purple) and record your results in your data table.
4. After you have tested these household chemicals, be sure to test the natural indicator with bleach and/or Oxi-Clean using an empty well or a clean test tube.

Clean-up

1. Dispose of any cabbage leaves in the trash, NOT THE SINK.
2. Dispose of any extra natural indicator solution in the sink.
3. Clean all used lab equipment with soap, water and a test tube brush.
4. Return all equipment to its proper location.
5. Wipe down your lab area.
6. Wash your hands before leaving the lab.

Data Table

Well #	Household Chemical	Natural Indicator Color	Acidic, Basic or Neutral?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Questions

1. Do you think red cabbage indicator would be a useful chemical to use in lab activities in the future? Why or why not?

_____

_____

2. What effect did bleach and/or Oxi-Clean have on the red cabbage indicator? Why do you think this happened?

_____

_____

3. Red cabbage juice can be used to dye cotton a rich purple color. Why do you think it might be a bad idea for clothes?

_____

_____

4. Hydrangeas are a flowering plant that will produce blue flowers in acidic soil and pink flowers in basic (or alkaline) soil. I have three hydrangea bushes in front of my house (seriously!). The one on the left makes pink flowers, the one on the right makes blue flowers, and the one in the middle makes purple flowers. What would be a possible explanation for this unusual phenomenon (in other words, why might the soil be this way)?

_____

_____

5. List one way you could change this lab and describe how your results might be different.

_____

_____