**pH Lab**  Name \_\_\_\_\_\_\_\_\_\_\_\_\_

Red Cabbage Lab

**BACKGROUND INFORMATION:**

Very acidic solutions will turn anthocyanin a red color. Neutral solutions result in a purplish color. Basic solutions appear in greenish-yellow. Therefore, it is possible to determine the pH of a solution based on the color it turns the anthocyanin pigments in red cabbage juice.

What is it about cabbage that causes this to happen? Red cabbage contains a water-soluble pigment called *anthocyanin* that changes color when it is mixed with an acid or a base. The pigment turns red in acidic environments with a pH less than 7 and the pigment turns bluish-green in alkaline (basic) environments with a pH greater than 7.

Red cabbage is just one of many indicators that are available to scientists. Some indicators start out colorless and turn blue or pink, for example, when they mix with a base. If there is no color change at all, the substance that you are testing is probably neutral, just like water.

**PRINCIPALS:**

Students are introduced to the concept of acids and bases.

**MATERIALS:**

* Red cabbage extract
* Distilled Water
* Testing cups or tubes
* White paper
* Test chemicals: HCl, NaOH, Bleach, Vinegar, Baking soda, Lemon juice, Washing soda, Laundry detergent, Soda pop, Alka-Seltzer, Aspirin, Alcohol, Milk, Alka-Seltzer
* safety goggles or glasses
* graduated cylinder
* spoon or stirrer

**PROCEDURE:**

1. Using a disposable pipette, add 1ml of red cabbage concentrate to each test cup or tube.
2. Fill a large beaker with Distilled water and bring it back to your desk.
3. Use your disposable pipette to transfer some Distilled water from your beaker to the graduated cylinder, until you reach the 20 ml graduated mark on your graduated cylinder.
4. Pour the 20 ml of Distilled Water from your graduated cylinder to one of your test cups or tubes.
5. Repeat steps 3 and 4 until all of your test cups or tubes have been filled.
6. Label your cups 1 through 12 *(Take good notes to keep track of what substance you tested in each cup or tube!)*
7. Carefully add a few drops of HCl (hydrochloric acid) to #1. Enter the relevant data into your TABLE I.
8. Carefully add a few drops of aspirin dissolved in water to #2. Enter the relevant data into your TABLE I.
9. Carefully add a few drops of clear soda to #3. Enter the relevant data into your TABLE I.
10. Carefully add nothing to #4. Enter the relevant data into your TABLE I.
11. Carefully add a few drops baking soda to #5. Enter the relevant data into your TABLE I.
12. Carefully add a few drops of distilled water from your beaker to #6. Enter the relevant data into your TABLE I.
13. Carefully add a few drops of TAP water from the sink to #7. Enter the relevant data into your TABLE I.
14. Carefully add a few drops of soap to #8. Enter the relevant data into your TABLE I.
15. Carefully add a few drops of cooking oil to #8. Enter the relevant data into your TABLE I.
16. Carefully add a few drops of vinegar to #9. Enter the relevant data into your TABLE I.
17. Carefully add a few drops of sodium hydroxide to #10. Enter the relevant data into your TABLE I.
18. Carefully add a few drops of lemon juice to #11. Enter the relevant data into your TABLE I.
19. Carefully add a few drops of apple juice to #12. Enter the relevant data into your TABLE I.
20. Answer the questions and list any other observations!

**QUESTIONS:**

1. **A substance having a pH value between 1 and 5 is considered to be \_\_\_\_\_\_\_\_\_? (Hint: acidic or basic)**
2. **A substance having a pH value between 8 and 14 is considered to be \_\_\_\_\_\_\_\_\_? (Hint: acidic or basic)**
3. **The substance in red cabbage that changes color with changing pH values is called \_\_\_\_\_\_\_\_\_?**
4. **A very acidic substance will turn the solution \_\_\_\_\_\_\_\_\_\_? (Hint: what color)**
5. **A neutral substance will turn the solution \_\_\_\_\_\_\_\_\_\_? (Hint: what color)**
6. **A very basic substance will turn the solution \_\_\_\_\_\_\_\_\_\_? (Hint: what color)**
7. **List your substances added in order or acidity below; from most acidic to least acidic:**

|  |  |
| --- | --- |
| **Most acidic:** |  |
|  |  |
|  |  |
|  |  |
|  | **Lease acidic/Most basic:** |

1. **Were the different water sources the same color? (Yes/No)**
2. **Why do you think the water sources were or were not the same color?**

**TABLE I**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Cup/Tube Number** | **Color before adding substance** | **Name of substance added** | **Color after adding substance** | **Estimated pH**  **(Use pH color chart)** |
| **1** |  |  |  |  |
| **2** |  |  |  |  |
| **3** |  |  |  |  |
| **4** |  |  |  |  |
| **5** |  |  |  |  |
| **6** |  |  |  |  |
| **7** |  |  |  |  |
| **8** |  |  |  |  |
| **9** |  |  |  |  |
| **10** |  |  |  |  |
| **11** |  |  |  |  |
| **12** |  |  |  |  |