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Bio 103

## Lab C: pH and Buffers

### Procedure 1: Phenolphthalein

#### Materials:

- Tap Water
- Flask
- Phenolphthalein
- Baking Soda
- Clean Straw
- Stir Stick

1. Pour 50mL of water into a 125mL flask. Add a pea sized amount of baking soda (same as the kind you can find in your kitchen) to the water and stir with a stir stick.

2. Add a small amount of phenolphthalein (about 4-5 drops) to the solution and stir. What change do you observe?

The solution turns from clear to pink

3. Using a straw, blow steadily into the solution (do not drink the solution!). What changes do you observe? \*It may take several minutes of bubbling to observe any change.

After several minutes of blowing, no changes occurred. (15 mins)

What happened as  $\text{CO}_2$  from your breath was blown into the basic solution?

### Procedure 2: pH Paper and Purple Cabbage

#### Materials:

- pH Paper
- 24-well Plate
- Wax Pencil
- Graduated Transfer Pipet
- Purple Cabbage Extract

Measure the pH of 6 solutions using the pH paper. You can do this by taking a sample of solutions from around your house like milk, tap water, vinegar, coffee etc.

1. Transfer a small sample of your chosen solutions (about .5-1 mL) to your 24-well plate using a transfer pipet. Dip pH paper into each sample. Compare the color of the pH paper to the chart to determine the approximate pH, record the pH of each sample below.

Solution:	pH:
Body Armor water	6-7
Milk	8-9
Tap water	5-6
Bleach	4
Coffee	6-7
Aquafina water	5



To tell if something is an acid or a base, you can use a chemical called an indicator. An indicator changes color when it encounters an acid or base. There are many different types of indicators, some that are liquids and others that are concentrated on little strips of paper. Indicators can be extracted from many different sources, including the pigment of many plants. For example, purple cabbages contain an indicator pigment molecule called flavin, which is a type of molecule called an anthocyanin. Very acidic solutions will turn an anthocyanin red whereas neutral solutions will make it purplish and basic solutions will turn it greenish-yellow. Consequently, the color an anthocyanin solution turns can be used to determine a solution's pH—a measure of how basic or acidic a solution is.

2. Add 3 to 4 mL of water to the vial labeled "purple cabbage extract" and shake well.

Now, using the same samples used previously, add a few drops (about 3-5 with a transfer pipette) of the purple cabbage extract to each well. Record your observations below:

Solution:	Observations w/ cabbage extract
Bodyarmor Sport Water	Purplish
Milk	bluish-purple
Tap water	Blue
Bleach	light yellow
Coffee	doesn't really change
Aquafina water	Purplish

You will see a color change occur for each of your samples. How do your observations of the solutions compare to your results of the pH paper?

The Bodyarmor and Aquafina waters turned a purplish color while tap water turned blue. Bleach gave a hint of yellow and milk changed the shade of white closer to blue.

What color would you expect for the following solution types when using cabbage extract as an indicator?

Hydrochloric acid red  
Baking soda solution greenish-yellow  
Water purple

### Procedure 3: Antacids

#### Materials:

- Tap water
- Ground Tums® Antacid (in labeled Eppendorf tube in your kit)
- Transfer Pipette
- 10 mL Graduated Cylinder
- .1 M Hydrochloric Acid (HCl)
- Phenolphthalein

1. In your kit you will find a tube of crushed Tums® antacid. Add this powder to a bowl or one of the beakers in your kit and mix it well with 10 mL of water. Add 2 mL of the solution to your 10 mL graduated cylinder using a transfer pipette.
2. Add 1 mL of phenolphthalein to the test tube, gently swirl. Observe for any changes (there will be a color change).
3. Carefully add .1 M HCl one drop at a time, swirling the solution gently. Count each drop until the solution becomes clear. When the solution becomes clear, the antacid solution has been neutralized.

How many drops of .1 M HCl needed to be added to neutralize the antacid solution?

It took me about 20-25 drops of HCl to clear the cylinder and get down to the remaining powder

What causes heartburn and how do over-the-counter antacids work to help with heartburn?

Heartburn is caused by acidic or high-fat foods.

Antacids neutralize acids that cause the heartburn.