

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Buffers in Action

Week # \_\_\_\_\_

*Directions: Read, annotate, and answer the questions.*

In order to survive, living organisms must maintain homeostasis, or a balanced internal environment. Even small changes in pH can cause distress to organisms. The changes in hydrogen ion ( $H^+$ ) concentration in cells can change the rates of some chemical reactions. For example, the pH of human blood is normally about 7.4 and must be in the range of 7.0 – 7.8 for survival. If the pH is in the 7.0 – 7.3 range, the person will feel tired, have trouble breathing, and may even be disoriented. If the pH of the blood is in the 7.5 – 7.8 range, the person will feel dizzy and agitated. To resist these changes in pH, human cells have chemical compounds called buffers.

In this activity, we will use potatoes to illustrate how living things are able to maintain homeostasis by being buffers. Based upon the results of this activity, you will be able to explain how living cells are buffers.

1. (RST.9-10.4) Use context clues to define the terms.

Homeostasis: \_\_\_\_\_

Buffer: \_\_\_\_\_

2. (RST.9-10.2) What is the purpose of this activity? \_\_\_\_\_

## Materials

- |                     |                                 |             |
|---------------------|---------------------------------|-------------|
| - Water             | - 0.1 M Hydrochloric acid (HCl) | - 2 beakers |
| - Potato Homogenate | - 0.1 M Sodium hydroxide (NaOH) | - pH probe  |

## Acid Procedure

1. Measure and record the initial pH of water.
2. Add 5 drops of HCl to the water beaker and gently swirl the beaker.
3. Measure and record the pH of the water.
4. Add another 5 drops of HCl to the water beaker and gently swirl the beaker.
5. Measure and record the pH of the water.
6. Add another 5 drops of HCl to the water beaker and gently swirl the beaker.
7. Measure and record the pH of the water.
8. Repeat steps 1-7 for the potato homogenate.

## Base Procedure

1. Measure and record the initial pH of water.
2. Add 5 drops of NaOH to the water beaker and gently swirl the beaker.
3. Measure and record the pH of water.
4. Add another 5 drops of NaOH to the water beaker and gently swirl the beaker.
5. Measure and record the pH of the water.
6. Add another 5 drops of NaOH to the water beaker and gently swirl the beaker.
7. Measure and record the pH of the water.
8. Repeat steps 1-7 for the potato homogenate.

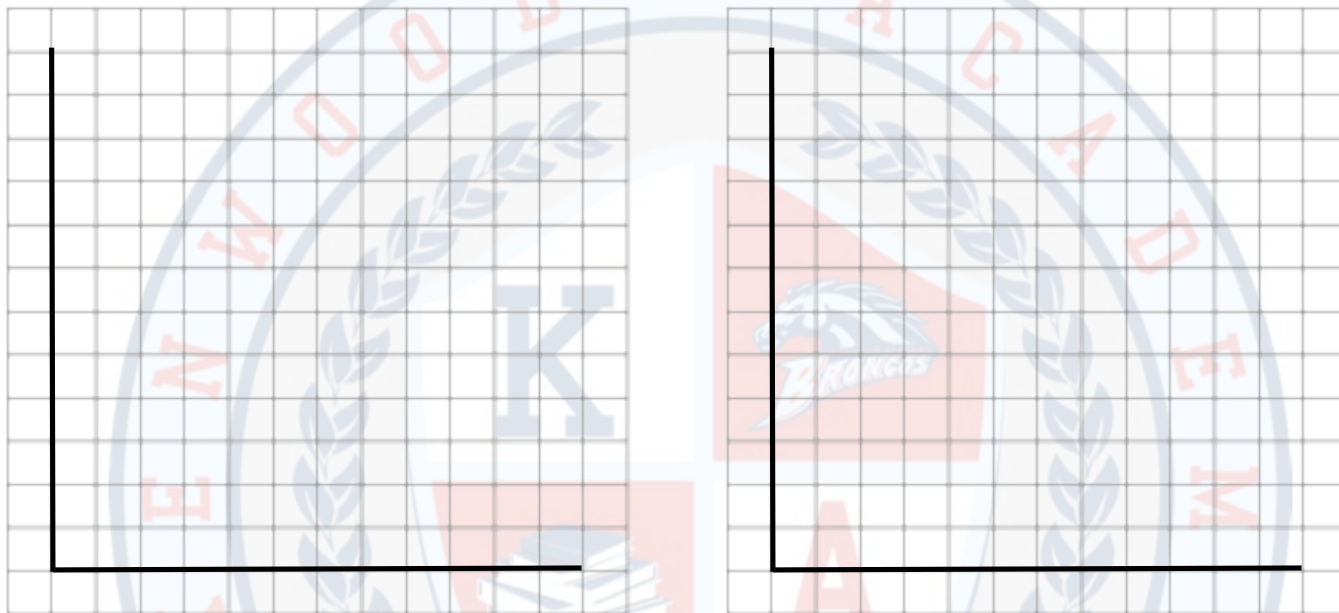
Substance	0.1 M HCl				0.1 M NaOH			
	0 drops	5 drops	10 drops	15 drops	0 drops	5 drops	10 drops	15 drops
Water								
Potato Homogenate								

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*Directions: Answer the questions below. Then create two graphs based on your results. One graph should represent the addition of HCl and the second graph should represent the addition of NaOH.*

3. What type of graph should you make? Why? \_\_\_\_\_

4. Does your graph need a key? Why or why not? \_\_\_\_\_



#### Analysis Questions

1. Describe the pH change in the potato homogenate compared to the water when acid was added.

\_\_\_\_\_

2. Describe the pH change in the potato homogenate compared to the water when base was added.

\_\_\_\_\_

3. Which substance – the potato homogenate or the water – is a buffer? How do you know?

\_\_\_\_\_

4. Use evidence to support the claim that “Living things are able to maintain homeostasis by being buffers.” \_\_\_\_\_

\_\_\_\_\_