

Name:

Date:

Period:

## Understanding, Making, and Using Buffers: Part I. Investigating Buffers Virtual Lab

**Question 1:** How does the concentration of components in a solution containing an acid-base pair affect the change in pH when a strong acid or strong base is added?

1. Identify the variables based on the scientific question above.

Independent (Manipulated) Variable	
Dependent (Responding) Variable	

2. Fill in the pH values from question 1 in the independent variable (IV) column.
3. To collect each data point, watch the corresponding video on the Part I: Investigating Buffers webpage.
4. Calculate the change in pH ( $\Delta\text{pH}$ ) by subtracting the original pH (shown in the video) from the final measured pH for each row in the DV section of the data table.

$$\Delta\text{pH} = \text{final pH} - \text{initial pH}$$

**Data Table 1** - Investigating changes in pH based on concentrations of components.

Acid-Base Pair Components	IV- Concentration of acid-base components	DV- Change in pH when a strong acid or base is added			
		With 0.001 mol HCl		With 0.001 mol NaOH	
		pH	$\Delta\text{pH}$	pH	$\Delta\text{pH}$
<b>HNO<sub>3</sub> + NaNO<sub>3</sub></b>	0.1 M pH =				
	1.0 M pH =				
<b>HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub> + NaC<sub>2</sub>H<sub>3</sub>O<sub>2</sub></b>	0.1 M pH =				
	1.0 M pH =				
<b>NH<sub>4</sub>Cl + NH<sub>4</sub>OH</b>	0.1 M pH =				
	1.0 M pH =				

**Analysis 1:** Describe the relationship between the concentration of components in solution and the change in pH when an acid or base is added.

Name:

Date:

Period:

**Question 2:** How does the amount of the strong acid or strong base being added affect the change in pH of an acid-base pair in solution?

5. Identify the variables based on the scientific question above.

Independent (Manipulated) Variable	
Dependent (Responding) Variable	

6. Fill in the pH values for the 0.1 M solutions in the first column under “Acid-Base Pair Components.”

7. To collect each data point, watch the corresponding video on the Part I: Investigating Buffers webpage.

8. Calculate the change in pH ( $\Delta\text{pH}$ ) by subtracting the original pH of the Acid-Base Pair Components (shown in video) from the final measured pH for each row in the data table.

$$\Delta\text{pH} = \text{final pH} - \text{initial pH}$$

**Data Table 2:** Investigating changes in pH based on amount of added acid/base.

Acid-Base Pair Components	IV- Amount of added strong acid or strong base	DV- Change in pH of the acid-base solution			
		HCl		NaOH	
		pH	$\Delta\text{pH}$	pH	$\Delta\text{pH}$
0.1 M $\text{HNO}_3$ + 0.1 M $\text{NaNO}_3$  pH =	0.001 mol				
	0.010 mol				
0.1 M $\text{HC}_2\text{H}_3\text{O}_2$ + 0.1 M $\text{NaC}_2\text{H}_3\text{O}_2$  pH =	0.001 mol				
	0.010 mol				
0.1 M $\text{NH}_4\text{Cl}$ + 0.1 M $\text{NH}_4\text{OH}$  pH =	0.001 mol				
	0.010 mol				

**Analysis 2:** Describe what happened to the change in pH when different amounts of strong acid or strong base were added to the solutions.