Name: Date: Period:

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

Question 1: How does the concentration of buffer components in a solution 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 (ΔpH) by subtracting the original pH (IV column) from the final measured pH for each row in the DV section of the data table.

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

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

Buffer Components	IV- Concentration of buffer components	DV- Change in pH when a strong acid or base is added			
		With 0.001 mol HCl		With 0.001 mol NaOH	
		pH	ΔpH	pH	ΔpH
HNO_3 + $NaNO_3$	0.1 M pH =				
	1.0 M pH =				
$HC_2H_3O_2$ + $NaC_2H_3O_2$	0.1 M pH =				
	1.0 M pH =				
NH_4Cl + NH_4OH	0.1 M pH =				
	1.0 M pH =				

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

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Question 2: How does the amount of the strong acid or strong base being added affect the change in pH of a buffer 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 "Buffer Components" (See Data Table 1).

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

    8. Calculate the change in pH (ΔpH) by subtracting the original pH of the Buffer Components from the final measured pH for each row in the data table.

$$\Delta pH = final\ pH - initial\ pH$$

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

Buffer Components	IV- Amount of strong acid or strong base being added to buffer	DV- Change in pH of the buffer solution			
		HCl		NaOH	
		pH	ΔpH	pH	ΔpH
0.1 M HNO$_3$ + **0.1 M NaNO$_3$** pH =	0.001 mol				
	0.010 mol				
0.1 M HC$_2$H$_3$O$_2$ **+** **0.1 M NaC$_2$H$_3$O$_2$** pH =	0.001 mol				
	0.010 mol				
0.1 M NH$_4$Cl + **0.1 M NH$_4$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.