Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Lab Day & Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_

## Data Sheet

Buffer composition: Molarity of acetic acid \_\_\_\_\_\_\_\_\_\_\_\_; Molarity of sodium acetate: \_\_\_\_\_\_\_\_\_\_\_\_.

### Effect of adding acid to a buffer

Molarity of HCl solution that was prepared \_\_\_\_\_\_\_\_\_\_\_\_

p*K*a = \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mL HCl added each time | Solution color | | pH meter reading | | Total mL HCl added | Total mL of solu-tion | H+  molarity in water from pH reading | Moles H+  actually added | Moles  remaining in buffer | | Expected pH | |
| Buffer | Water | Buffer | Water | HA | A– | Buffer | Water |
| 0 |  |  |  |  |  | 50 |  | ― | (initial) | (initial) |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |

### Effect of adding base to a buffer

Molarity of NaOH solution that was prepared \_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mL NaOH added each time | Solution color | | pH meter reading | | Total mL NaOH added | Total mL of solu-tion | OH–  molarity in water from pH reading | Moles OH–  added | Moles  remaining in buffer | | Expected pH | |
| Buffer | Water | Buffer | Water | HA | A– | Buffer | Water |
| 0 |  |  |  |  |  | 50 |  | ― | (initial) | (initial) |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |

## Post Lab Questions

1. Based on your results in the “Effect of adding acid to a buffer” section of the data sheet, compare the abilities of the buffer solution and the water to resist pH changes when HCl solution was added.
2. Based on your results in the “Effect of adding base to a buffer” section of the data sheet, compare the abilities of the buffer solution and the water to resist pH changes when NaOH solution was added.
3. Buffers have limits. If enough acid or base is added, the buffer “capacity” will be exceeded. In which runs did the buffer capacity nearly get reached? (Hint: this would be where the moles of either HA or A– nearly reaches zero, and the pH starts to change a lot.)
4. The measured pHs were not exactly the same as the expected pHs you calculated. What are some reasons that could cause this experimental errors?
5. Would you trust using the indicator color changes to determine pH?