**Lab sheet #8**

**-Titration curve of amino acids -**

**Objectives:**

* To study titration curves of amino acid.
* To use this curve to estimate the pKa values of the ionizable groups of the amino acid.
* To determine pI.
* To determine the buffering region.
* To understand the acid base behaviour of an amino acid.

**Method:**

1. You are provided with **0.1M alanine** (amino acid solution) and **0.1M NaOH** (strong base solution)**:**
2. Fill up the Burette with **0.1M NaOH** solution using the funnel.
3. To a beaker, add 10 ml of **0.1M alanine** solution and measure its pH value.
4. Start the titration: slowly add 0.5ml of **0.1M NaOH** (drop-wise) to the alanine solution and mix, then record the pH value.
5. Keep on titration (step 3) until the pH reaches 11.
6. You are provided with **0.1M alanine** (amino acid solution) and **0.1M HCl** (strong acid solution)**:**
7. Fill up the Burette with **0.1M HCl** solution using the funnel.
8. To a beaker, add 10 ml of **0.1M alanine** solution and measure its pH value.
9. Start the titration: slowly add 0.5ml of **0.1M HCl** (drop-wise) to the alanine solution and mix, then record the pH value.
10. Keep on titration (step 3) until the pH reaches 2.17.

**Results:**

**Table (A):**

|  |  |  |  |
| --- | --- | --- | --- |
| **ml of 0.1M NaOH** | **pH** | **ml of 0.1M HCl** | **pH** |
| 0 |  | 0 |  |
| 0.5 |  | 0.5 |  |
| 1 |  | 1 |  |
| 1.5 |  | 1.5 |  |
| 2 |  | 2 |  |
| 2.5 |  | 2.5 |  |
| 3 |  | 3 |  |
| 3.5 |  | 3.5 |  |
| 4 |  | 4 |  |
| 4.5 |  | 4.5 |  |
| 5 |  | 5 |  |
| 5.5 |  | 5.5 |  |
| 6 |  | 6 |  |
| 6.5 |  | 6.5 |  |
| 7 |  | 7 |  |
| 7.5 |  | 7.5 |  |
| 8 |  | 8 |  |
| 8.5 |  | 8.5 |  |
| 9 |  | 9 |  |
| 9.5 |  | 9.5 |  |
| 10 |  | 10 |  |
| 10.5 |  | 10.5 |  |
| 11 |  | 11 |  |
| 11.5 |  | 11.5 |  |
| 12 |  | 12 |  |

**1.** Record the pH values in the titration Table A

**2.** Plot the titration curve (pH versus ml of 0.1M titrant added).

**3.** The calculations

1. Calculate the pH of the alanine solution after the addition of 0 ml, 5 ml of 0.1M NaOH, and after the addition of 0.5 ml, 2 ml of HCl. (using the theoretical Pka1= 2.34 and pKa2= 9.69)
2. Determine pH value from the curve, and record it in Table B
3. Determine the pKa1, pKa2, and pI values of alanine from the curve, and record it in Table C

**Table (B):**

|  |  |  |
| --- | --- | --- |
| **ml of titrant added** | **Calculated pH** | **pH from titration curve** |
| **0 ml of 0.1M NaOH** |  |  |
| **5 ml of 0.1M NaOH** |  |  |
| **0.5 ml of 0.1M HCl** |  |  |
| **2 ml of 0.1M HCl** |  |  |

**Table (C):**

|  |  |  |
| --- | --- | --- |
| **Theoretical values** | | **values from titration curve** |
| **Pka1** |  |  |
| **Pka2** |  |  |
| **pI** |  |  |

**In the Discussion**

* Discuss how alanine behaves toward the addition of acid and base.
* Discuss the titration curve of alanine, and determine/ discuss the buffering region.
* Compare between pH values (table B)
* Compare the theoretical values with the values from the titration curve (table C)