

## 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:

**A)** You are provided with **0.1M alanine** (amino acid solution) and **0.1M NaOH** (strong base solution):

1. Fill up the Burette with **0.1M NaOH** solution using the funnel.
2. To a beaker, add 10 ml of **0.1M alanine** solution and measure its pH value.
3. Start the titration: slowly add 0.5ml of **0.1M NaOH** (drop-wise) to the alanine solution and mix, then record the pH value.
4. Keep on titration (step 3) until the pH reaches 11.

**B)** You are provided with **0.1M alanine** (amino acid solution) and **0.1M HCl** (strong acid solution):

1. Fill up the Burette with **0.1M HCl** solution using the funnel.
2. To a beaker, add 10 ml of **0.1M alanine** solution and measure its pH value.
3. Start the titration: slowly add 0.5ml of **0.1M HCl** (drop-wise) to the alanine solution and mix, then record the pH value.
4. 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
  - a. 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)
  - b. Determine pH value from the curve, and record it in Table B
  - c. 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	
<b>pKa1</b>		
<b>pKa2</b>		
<b>pI</b>		

**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)