Ministry of Higher Education and Scientific Research

Mustansiriyah University

College of Science / Department of Chemistry

Practical Analytical Chemistry

For First Year Students Biology Department

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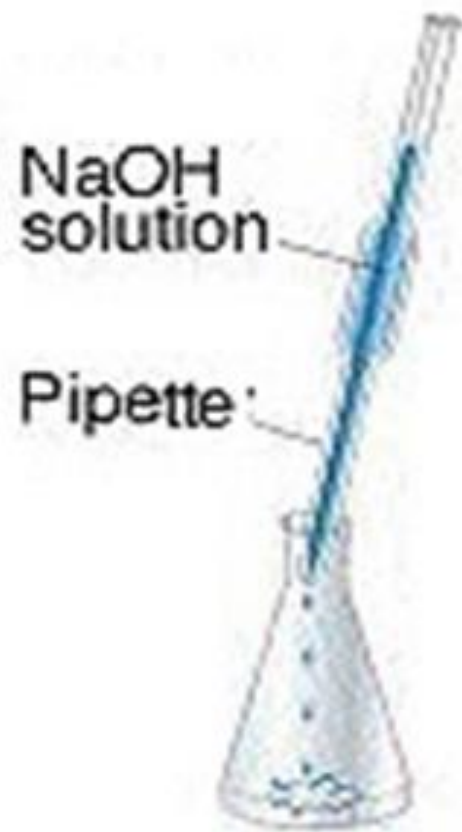*Determination the normality of a sodium hydroxide solution (NaOH) using a standard solution of hydrochloric acid (HCl)*

❖ **Purpose:** Determine the exact normality of a sodium hydroxide solution.

❖ **Theory:** The concentration of a basic solution will be determined by measuring the volume of the base required to completely neutralize a precisely measured volume of a known normality acid. The acid is hydrochloric acid (HCl), which is an important component in stomach digestive juices. The base is sodium hydroxide (NaOH), commonly known as lye. The reaction can be written as:
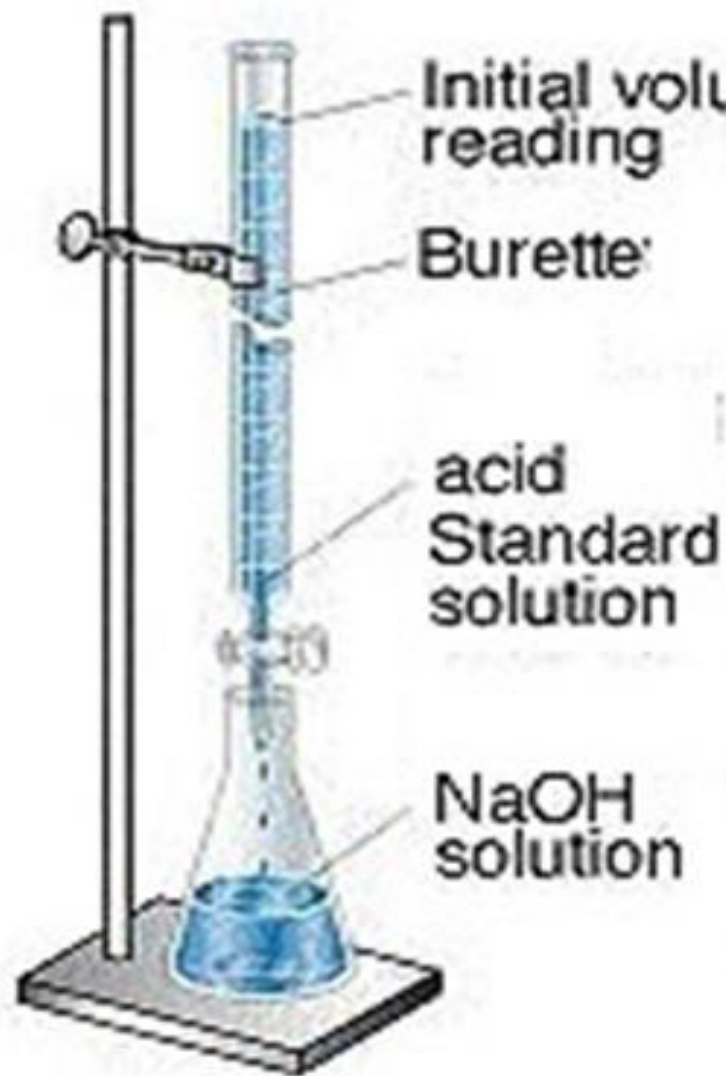
$$HCl + NaOH \longrightarrow NaCl + H_2O$$

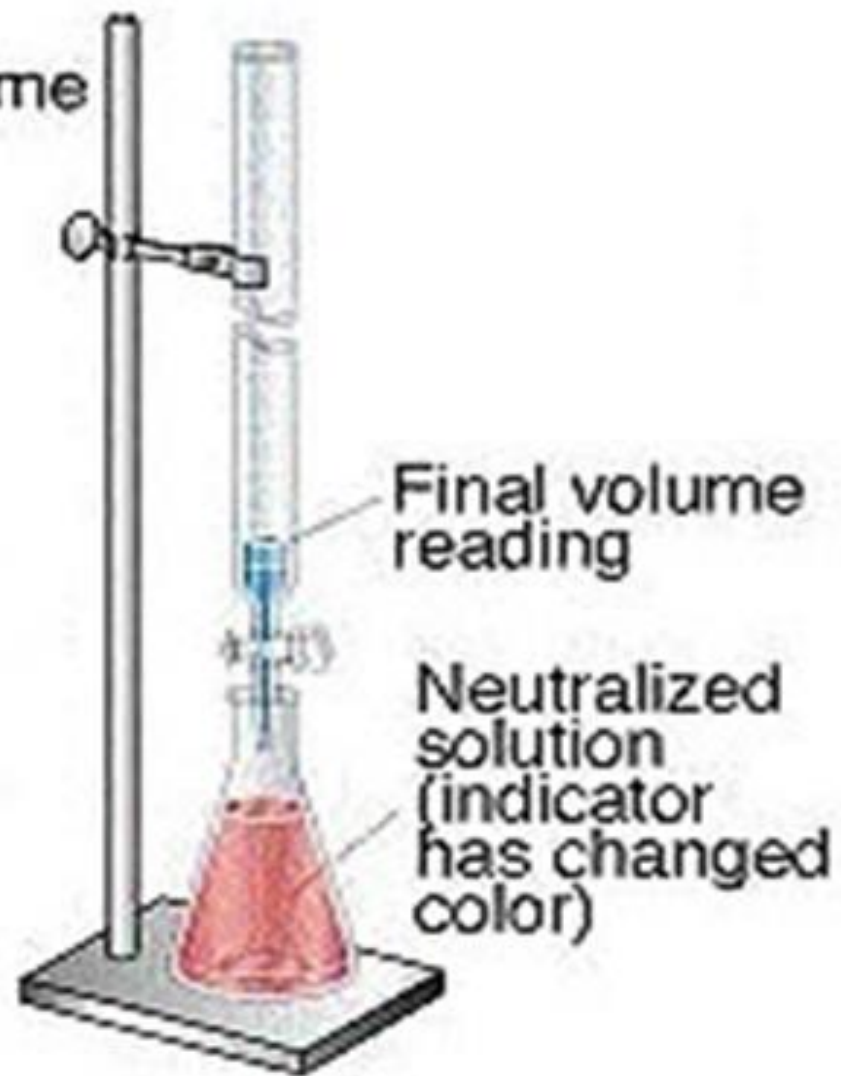| Equipment	Materials
• Burette	Sodium hydroxide solution (NaOH) unknown
• Beaker	Hydrochloric acid solution (HCl) 0.1N
• Pipette	Phenolphthalein indicator
• Pipette filler	Distilled water
• Conical flask	
• Dropper bottle	
• Funnel	
• Stand	
• Clamp	
• Filter paper	

Procedures

1. Wash the burette, pipette and conical flask with distilled water.

2. Rinse the burette with hydrochloric acid solution (HCl).

3. Using a funnel, fill the burette with hydrochloric acid solution (HCl) 0.1N.

4. Transfer a 5.00 mL volume of the sodium hydroxide solution (NaOH) by the pipette to a conical flask. indicator solution. Note the color of the solution (solution I).

5. Titration (solution I) by adding hydrochloric acid solution (HCl) 0.1N from the burette in about 1.00 mL portions to the conical flask, swirling the conical flask (Figure 3) after each addition. The end-point of the titration is reached when the color of the solution in the conical flask changes.

6. Note the burette reading and calculate how adding hydrochloric acid solution (HCl) was used.

7. Repeat the titration for a more accurate reading. Repeat the titration until two readings agree within 0.10 mL. Calculate the normality of the sodium hydroxide solution (NaOH).
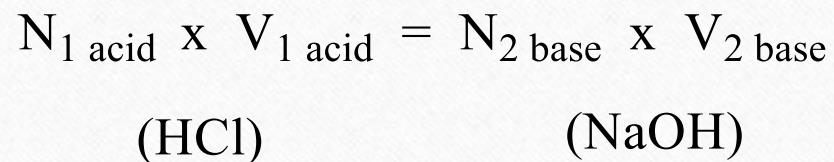
(a) NaOH solution — Pipette

(b) Initial volume reading — Burette — acid Standard solution — NaOH solution

(c) Final volume reading — Neutralized solution (indicator has changed color)

Calculations

$$N_{1\,acid} \times V_{1\,acid} = N_{2\,base} \times V_{2\,base}$$

(HCl) (NaOH)

Questions:

Explain briefly:

1. Can be used any of the following chemicals as primary standards (NaOH, H2SO4, HNO3)? Explain your answer.

2. Why the plastic bottle container containing of sodium hydroxide solution should be tightly closed always?

3. Mention three operations that should be carried out during the titration to ensure an accurate analyses?

4. Why it is important to avoid solid sodium hydroxide to touching the skin?