وزارة التعليم العالي والبحث العلمي
جامعة المعقل
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EXPERIMENT (2)

Standardization of Hydrochloric Acid (HCI) against Sodium Hydroxide (NaOH)

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Sodium hydroxide is reacted with HCL according to the following formula:

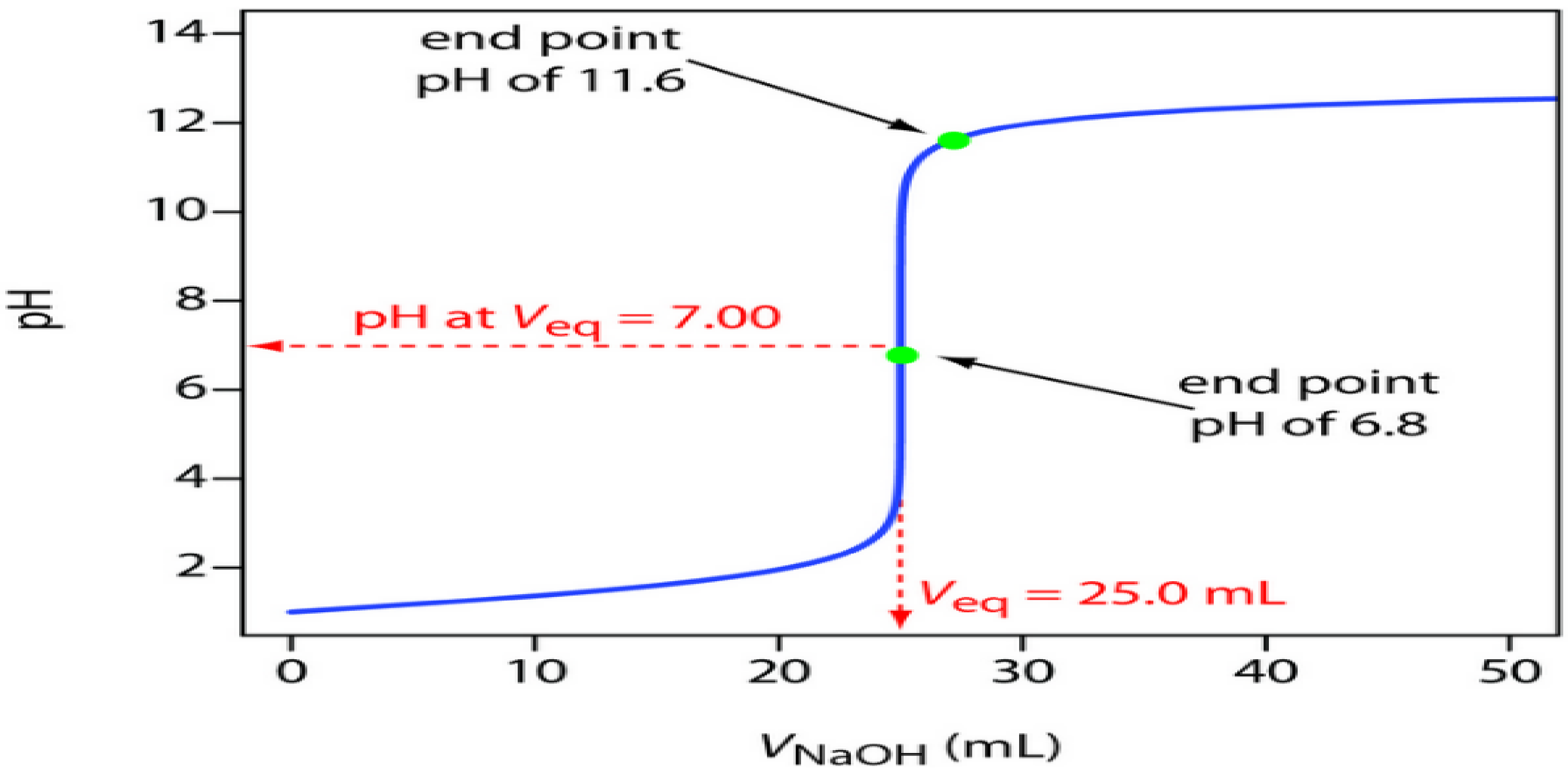
$$NaOH + HCl \rightarrow NaCl + H_2O$$

the acid is HCl (called hydrochloric acid) and the base is NaOH (called sodium hydroxide). When the acid and base react, they form NaCl (sodium chloride), which is also known as table salt. The titration proceeds until the equivalence point is reached, where the number of moles of acid is equal to the number of moles of base. This point is usually marked by observing a color change in an added indicator.

The acid-base indicator indicates the **endpoint** of the **titration** by changing color. The color change in the solution lets you know you have reached the pH that you need to have at the equivalence point. The **endpoint** and the **equivalence point** are not exactly the same because the **equivalence point** is determined by the stoichiometry of the reaction while the **endpoint** is just the color change from the indicator.

To be clear, the **equivalence point** is when the [H+] and the [OH-] that have been added to the solution are the same. This is the answer that MATH gives you.

The **endpoint** of a titration is when the indicator used in the titration changes colors. This may or may not be exactly at the **equivalence point**, but should be close to not create a large amount of error.



If you look at the titration graph, you should see that an indicator that changes in the range of pH of about 3 to 11 would have been good to determine the equivalence point in this titration. So, the indicator which signals the endpoint of the titration at a pH of 6.8 would be a good choice. On the other hand, there is an indicator option that signals the endpoint of the titration at a pH of 11.6. You can tell from the graph that the volume of NaOH necessary to reach this endpoint is NOT the same as the actual equivalence point volume. Choosing this indicator would have resulted in an error in your determination of the unknown molarity of acid.

N	Chemical and equipment
1	Hydrochloric acid (HCl)
2	Sodium Hydroxide (NaOH)
3	Phenolphthalein (indicator)
4	Volumetric flask
5	Graduated cylinder
6	Distilled water
7	Watch glass
8	Burette

Procedure:-

A//Preparation standard solution for Hydrochloric acid B//

Preparation Sodium Hydroxide solution

1) Weight accurately about (X) gm. of pure sodium hydroxide in a watch glass.
2) The weight taken from sodium hydroxide dissolves in a small amount of distilled water by the constant shaking.
3) Transfer the dilute solution to a 250 ml conical flask and supplement the solution with distilled water to the tip of the oval.

C. Standardization HCI solution against NaOH

1.Wash with burette water and then with distilled water two or three times and then wash with (NaOH)
2.Fill the burette with (NaOH) until the acid reaches the top and open the bottom control valve in the bowl to lower the acid level in the bowl until zero.
3.Wash a conical flask with its capacity (250 ml) with normal water and then with distilled water.
4.Wash a 10 mL pipette with distilled water and then with (HCl).
5.Remove 10 mL of HCl solution with the solvent and then place it fully in the conical flask. If there is a bit of solution at the end of the pipette, be sure to remove it in the beaker and gently snap it into the conical flask.
6.Add two or three drops of phenolphthalein (ph.ph) to the solution with conical flask (HCl solution) to obtain pinkish red.
7.Start calibration by gradually adding sodium hydroxide solution (NaOH) to the hydrochloric acid (HCl) in the conical flask with the conical flask continuously during calibration.

Calculation:

- Found Normality of NaOH after standardization with HCl

$$(N\times V)NaOH = (N\times V)HCl$$