

Preparation and Standardization of Approximately 0.1 N Acetic Acid CH₃COOH

Introduction

Acetic Acid CH₃COOH is a weak monoprotic acid. Acetic acid is not a primary standard substance and an approximate solution is prepared and standardized with standard sodium hydroxide.

The concentration of an acetic acid solution will be determined by titration. The acetic acid reacts with sodium hydroxide according the chemical equation:-



The titration of acetic acid with NaOH is a titration of weak acid and strong base and have an alkaline end point (pH grater than 7) (pH=8.7) because hydroxide ions are produced by the hydrolysis of the salt (sodium acetate).



Therefore, methyl orange and methyl red are not suitable as indicator in this titration because they have color change at much lower pH than this pH. So that phenolphthalein (which have color change in alkaline medium pH=8.3-10) is used in this titration.

<i>Phenolphthalein</i>	
<i>Color on acid side</i>	<i>Color on base side</i>
<i>Colorless</i>	<i>red</i>

Procedure

A. Preparation of 0.1 N acetic acid

The normality of concentrated acetic acid can be calculated from the information written on the bottle (percentage % , specific gravity , equivalent weight) according to the equation:-

$$N = \frac{\% \times \text{Sp.gr} \times 1000}{\text{eq.wt}} = 17.43 \text{ N}$$

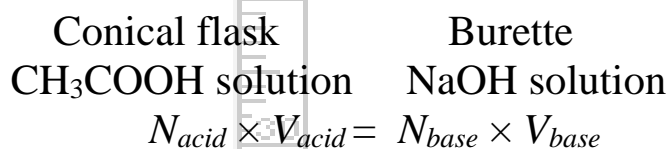
(Sp.gr=1.05 , eq.wt=60.05 , %= 99.7)

Transfer (1.43) mL of concentrated acetic acid into volumetric flask (250) mL using cylinder, complete to the mark with distilled water and mix well.

B. Standardization of acetic acid

- 1- Transfer (10) mL of prepared acetic acid solution into a clean conical flask using pipette.
- 2- Add few drops of phenolphthalein indicator into the conical flask (no color observed colorless)
- 3- Fill the burette with standardized NaOH (0.1) N.
- 4- Start titration against the NaOH solution very carefully until the color is obtained (the color is red), then record the burette reading.
- 5- Repeat the titration three times and find the concentration of acetic acid.

Calculations



N_{acid} = unknown

V_{acid} = 10 mL

N_{base} = 0.1 N

V_{base} = (x) mL from burette

So that

$$N_{acid} = \frac{N_{base} \times V_{base}}{V_{acid}}$$

$$V_{base} = \frac{V_1 + V_2 + V_3}{3}$$

$$E_{rel} \% = \frac{O - A}{A} \times 100$$