

Experiment

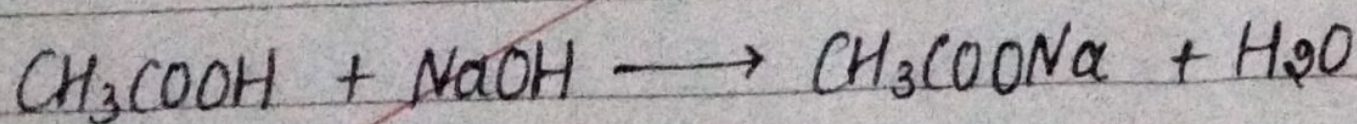
Aim- Estimation of acetic acid in commercial vinegar using NaOH.

Objective- To determine the concentration of acetic acid in a commercial vinegar sample by titrating it against a standardized [N/20] NaOH solution using Phenolphthalein as an internal indicator.

Theory- Acetic acid is the main component of vinegar and it is widely used in food preservation, flavoring, and other industrial applications. Commercial vinegar generally contains 4-15% acetic acid.

Therefore,

it is essential to determine the concentration of acetic acid in vinegar accurately. The hypothesis of this experiment is that the concentration of acetic acid in the commercial vinegar can be determined by neutralizing the acetic acid in the sample with a standard NaOH (sodium hydroxide) solution. The reaction of acetic acid with sodium hydroxide is:



Observation Table

Standardization of NaOH Solution.

Sno.	Volume of NaOH Solution taken (ml)	Burette Reading		Volume of oxalic acid used (ml)
		Initial	Final	
1.	10	0	9.1	9.3 ml
2.	10	0	9.3	
3.	10	0	9.3	

(NaOH)

(Oxalic acid)

$$N_1 V_1 = N_2 V_2$$

$$N_1 \times 10 = \frac{1}{20} \times 9.3$$

$$N_1 = \frac{9.3}{20 \times 10}$$

$$N_1 = 0.046$$

Experimental Setup:-

Apparatus-Required:- Burette, pipette, conical flask, beaker, measuring cylinder etc.

Reagents-Required:- Commercial Vinegar, NaOH Solution, Phenolphthalein Indicator, and distilled water ...

Procedure:-

1. Fill the burette with a standard $N/20$ NaOH solution and adjust the level to the zero mark.
2. Pipette out 10ml of the Vinegar sample, pour it into a conical flask, and add 1 drop of phenolphthalein Indicator to it.
3. Titrate the sample in the conical flask with the standard $N/20$ NaOH solution with continuous shaking until a permanent pink colour appears.
4. Note down this reading; this will be the end point.
5. Repeat the process until two concordant readings are obtained.

Observation table

Commercial vinegar sample solution.

SNo	Volume of Vinegar Sample taken (ml)	Burette reading		Volume of N/20 NaOH used (ml)
		Initial	Final	
1	10	0	1.1	1.5 ml.
2	10	0	1.5	
3	10	0	1.5	

Calculation

$$\overset{\text{Vinegar}}{N_1 V_1} = \overset{(\text{NaOH})}{N_2 V_2}$$

$$N_1 \times 10 = 0.046 \times 1.5$$

$$N_1 = 0.069$$

Since Normality of diluted vinegar solution = 0.069 N

$$\begin{aligned}\text{Strength} &= N \times \text{Equivalent weight of acetic acid.} \\ &= 0.069 \times 60 \\ &= 4.14\text{ g/L}\end{aligned}$$

Result - The strength of acetic acid in the given commercial vinegar solution is 4.14 g/L

Precaution -

1. Wash the glass apparatus with distilled water before the experiment.
2. Always read the volume at the bottom of the meniscus for a light-coloured liquid like the NaOH solution.
3. Add the Indicator (phenolphthalein) to the vinegar solution before titration.
4. Continuously swirl the flask while adding the NaOH solution.
5. Add the solution drop by drop, especially as you approach the end point.

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