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EXPERIMENT NO. 5

NAME OF EXPERIMENT: TO PREPARE N/10 STANDARD SOLUTION OF OXALIC ACID AND TO DETERMINE THE STRENGTH OF GIVEN NaOH SOLUTION BY USING STANDARD SOLUTION OF OXALIC ACID.

APPARATUS REQUIRED

1. Volumetric flask
2. Beaker
3. Conical flask
4. Burette
5. Burette stand
6. Funnel
7. Pipette

CHEMICALS REQUIRED

1. Standard oxalic acid solution
2. Phenolphthalein
3. Bench NaOH

THEORY

Molecular weight of oxalic acid solution ($C_2H_2O_4 . 2H_2O$) = 126

$\therefore$ Equivalent weight of oxalic acid = $\frac{126}{2}$ = 63

Now,

$$\text{Normality} = \frac{\text{Weight in gm}}{\text{Equivalent weight} \times \text{Volume in litre}}$$

$$\text{or, } N/10 = \frac{\text{Weight in gm} \times 1000}{63 \times 100}$$

∴ Weight of oxalic acid to be taken = 0.63 gm

Normality factor = $\frac{\text{Weight taken}}{\text{Weight to be taken}}$

$= \frac{10 \text{ gm}}{0.63 \text{ gm}}$

$= 0.063$ gm

The unknown strength of approximately N/10 NaOH can be determined by titrating against standard decinormal oxalic acid solution in presence of phenolphthalein indicator.

Titration is the technique of determining the strength of unknown solution by reacting it with the standard solution by means of volume measurement normally in presence of third chemical substance.

End point of titration is the point of completion of reaction of titration which is shown by the colour change of third chemical substance. Indicator is the third chemical substance used in titration which helps to predict the end point of titration by its colour change.

$$\begin{matrix} COOH \\ | \\ COOH \end{matrix} + 2NaOH \longrightarrow \begin{matrix} COONa \\ | \\ COONa \end{matrix} + 2H_2O$$

The unknown strength is calculated using the normality equation:

$$V_1 S_1 = V_2 S_2$$

Where,

V_1 = Volume of acid (say)
S_1 = Normality of acid
V_2 = Volume of alkali
S_2 = Normality of alkali

PROCEDURE

1. The whole apparatus was cleaned with water.
2. The burette was cleaned with distilled water and it was rinsed with the standard solution of the acid.
3. The burette was clamped vertically to the stand so that the jet of the burette remains slightly above the mouth of the conical flask. The burette was filled with acid upto the zero mark.
4. The pipette was cleaned with distilled water and it was rinsed with the given NaOH solution.
5. 10 ml of standard alkali was added into a clean conical flask with pipette. 2-3 drops of phenolphthalein was added and shaked gently.
6. The first reading was taken by running ~~of~~

out 1 ml of acid at a time from the burette into the alkali taken in the conical flask. The flask was shaked during each addition giving the rotatory motion to the solution into the flask.

7. When the pink colour disappeared, end point was attained. The volume of the acid was noted in the burette.
8. The conical flask was washed. The procedure was repeated and some more reading was taken till we get at least two concurrent reading.

OBSERVATION TABLE

Indicator used : Phenolphthalein

No. of Obs.	Vol. of alkali	Burette readings ml			Concurrent Vol. of alkali
		Initial	Final	Difference	
1.	10 ml	0	10.5	10.5	
2.	10 ml	10.5	20	9.5	10.5
3.	10 ml	20	30.5	10.5	

CALCULATIONS

Volume of acid (V_1) = 10.5 ml

Strength of acid (S_1) = 0.1 N

Volume of alkali (V_2) = 10 ml

Strength of alkali (S_2) = ?

We have,

$V_1S_1 = V_2S_2$

or, $10.5 \times 0.1 = 10 \times S_2$

$\therefore S_2 = 0.11$

Again, Normality = Molarity $\times n$

or, 0.11 = Molarity $\times 1$

$\therefore$ Molarity $= 0.11$ M

Again, g/L = N x Equivalent weight of NaOH

$= 0.11 \times 40$

$= 4.4$ g/L

Again, purity % $= \frac{\text{g/L}}{10} = \frac{4.4}{10} = 0.44\%$

RESULT

Hence, the strength of the given NaOH solution was found to be 0.11N.

PRECAUTIONS

1. All the glasswares should be handled with care.
2. Conical flask should never be rinsed with chemicals.
3. Lower meniscus of the solution should be observed while taking the readings.
4. Excess of indicator should not be used.

Sangmatha