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Determination of Na_2CO_3 and NaOH in a Mixture By Titration

Aim -

To determine the amount of Na_2CO_3 & NaOH in mixture using HCl.

Principle

When a known volume of mixture of Na_2CO_3 and NaOH is titrated with HCl using Phenolphthalein indicator at the point, all the OH^- ions & only half of the CO_3^{2-} are reacted with HCl acid

when the titration is continued with methyl orange indicator the remaining half of CO_3^{2-} ions will be neutralized with HCl at the end point.

A = all hydroxide ions of half of carbonate ion
B = half of carbonate ions after phenolphthalein end point.
2B = all carbonate ions
A - B = all hydroxide ions.

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Titration - 1

Sl. No.	Vol of Na_2CO_3 (mL)	Burette Reading 1	Burette Reading 2	Volume of HCl (mL)
1	20 mL	0	20.1	20.1
2	20 mL	0	19.5	19.5
3	20 mL	0	19.5	19.5

→ Concordant value = 19.5 mL
Indicator used = Methyl Orange

Calculation-1

Volume of HCl = 19.5 mL
Normality of Na_2CO_3 = 0.05 (N_2)
Volume of Na_2CO_3 = 20 mL

Normality of HCl = $\frac{0.05 \times 20}{19.5}$ = 0.0512 (N_1).

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Procedure -

(i) Titration I : Standardisation of HCl.

Pipette out 20 mL of Na_2CO_3 solution into a clean conical flask and add 2-3 drops of methyl orange indicator to the soln. Then titrate the solution against HCl acide taken in a burette. Record end point. Repeat titration till concordant value is obtained.

(ii) Titration II : Estimation of Na_2CO_3 and NaOH in a given mixture

Dilute the given unknown solution to 100 mL in a standard flask using diluted water. Pipette out 20 mL of this made up solution into a clean conical flask. Add 2-3 drops of phenolphthalein indicator to the solution & titrate against satandardised HCl. Record the burette reading at an end point of the titration when disappearance of pink colour is observed. Lets consider the burette reading at the end point be A mL. To the same soln, add 2-3 drops of methyl orange indicator and continue to titrate till color changes. Note down burette readings as methyl orange

Titration - II

Sl No	Vol of unknown sol	Initial Reading	Burette Readings. Vol consumed for Phenolphthalein end point (A). Final	Vol Req	Vol consumed for methyl orange end point (B) Final	Vol Req
1	20 mL	0	28	28	38.5	10.5
2	20 mL	0	28	28	38.5	10.5

Concordant Values (A) 28mL (B) 10.5mL

CALCULATION:

① Estimation of amount of Na_2CO_3.

Volume of HCl = 2B = 2×10.5 = 21mL

Volume of mixture = 20mL

Normality of HCl = 0.0512

Normality of Na_2CO_3 = $\frac{21 \times 0.0512}{20}$ → 0.053.

∴ Amount of Na_2CO_3 present in whole of given solution = $\frac{N_2 \times 53}{10}$ = 0.2805g.

② Estimation of amount of NaOH

Vol of HCl (V_1) = A − B = 17.5mL

Vol of mixture = 20mL Normality of HCl = 0.0512

Normality of NaOH (N_1) = $\frac{(A-B) \times N_1}{20}$ = 0.0448

Amount of NaOH present = $\frac{N_2 \times 40}{10}$ (Eq wt of NaOH)

= 0.1792g.

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end point. Consider it to be "B" m l. Repeat titration till concordant value for "A" and "B" is obtained.

RESULT -

(i) Amount of Na_2CO_3 present in given solution = 0.2805 g

(ii) Amount of NaOH present in given solution = 0.1792 g

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