

Experiment no: 01

1. Aim:-

To determine the strength of commercial hydrochloric acid (HCl), 10 ml of which have been dissolved per liter of solution.

2. Reagent Required:

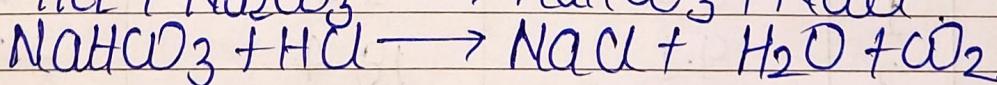
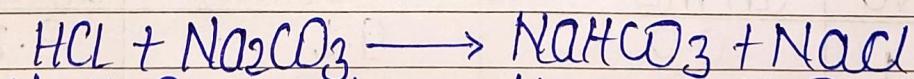
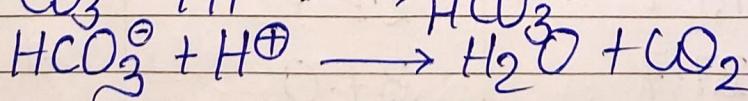
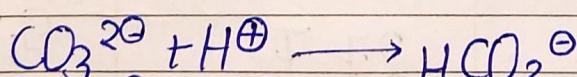
Sodium carbonate (Na_2CO_3), Hydrochloric acid (HCl), Distilled water.

3. Indicator: → Methyl Orange

4. End point:

Yellow to Pink (acid solution in burette)

5. Reaction Envolved:

Chemical:-Ionic:-

6.) Procedure:

Spjohri

As the given solution of HCl is having 10ml of commercial HCl (nearly 10N) in 1000ml. Hence the standard solution to be prepared should have nearly same normality.

* Preparation of 0.1N solution of Na_2CO_3

Dry 1.2 - 1.4g of reagent grade Na_2CO_3 in a weighing bottle at $150 - 160^\circ\text{C}$ for 2 hours cool & store the loosely stoppered bottle in desiccator, weight out nearly but accurately 1.325 g of dried Na_2CO_3 , by method of difference. Transfer quantitatively to the calibrated 250 ml volumetric flask. Add 40 - 50 ml of distilled water & stir gently to dissolve the solid. Then make up the volume upto 250 ml & mix well. This is standard Na_2CO_3 solution whose normality can be calculated by considering the amount transferred to flask.

* Titration

- o Rinse the burette with given acid solution. Removed the air bubbles and set it at zero mark.
- o Pipette out 10mL of the standard Na_2CO_3 soln into a 100ml titration flask and added 1 drop of methyl orange.

- o) Titrated with the HCl to a sharp colour change, pink colour should be obtained.
- o) Repeated the titration with every 10mL of the Na_2CO_3 solution until three concurrent readings are obtained

% Theory:

Titration involved in HCl & Na_2CO_3 is Acid-Base Titration
 Methyl Orange is indicator used. It shows red colour if pH value of solution is less than 3.1. If $\text{pH} > 4.4$ it shows yellow colour. In range 3.1-4.4, solution appears to be orange in colour

- o) Titration - It is quantitative analysis carried out for determining the concentration of any unknown solution whose fixed volume will react with the definite volume of known standard solution.
 Concentration of the unknown solution can be determined by using the law of Normality
- o) Types of Titrations

- o) Acid-Base Titration

- o) Redox Titration
- o) Complexometric Titration
- o) Precipitation Titration

→ Titrant → Solution of known Strength

→ Titrator / Analyte → Solution of whose concentration is to be determined

→ Equivalence Point → The point in a titration when the amount of added Standard reagent is exactly equivalent to the amount of analyte. The equivalence of both substance becomes equal.

→ End Point → Point at which observable physical change occurs near the equivalence point

Signature

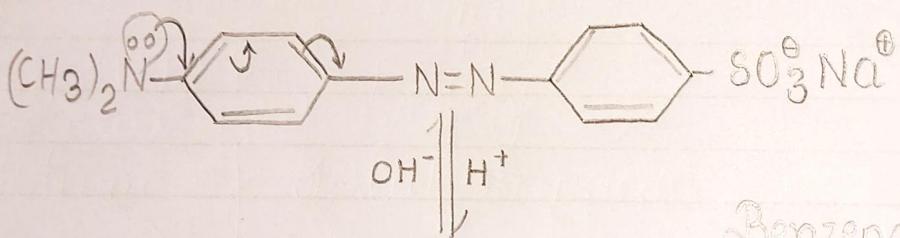
Experiment no.1

Aim:- To determine the strength of commercial HCl, 10ml of which has been dissolved per liter of soln.

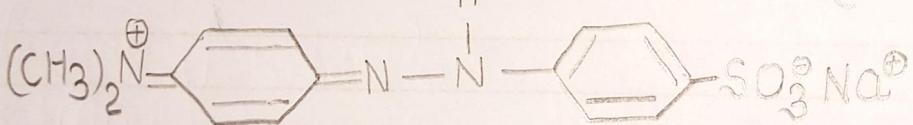
Indicator used:-

Methyl Orange

Resonance Structures



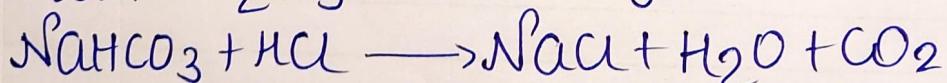
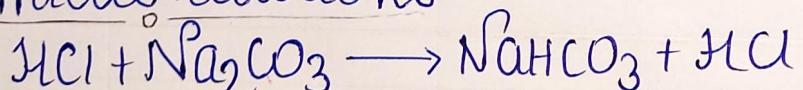
Benzenoid Structure
(Yellow in colour)



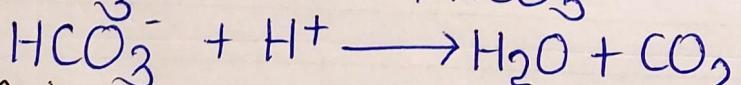
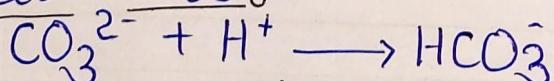
Quinonoid Structure
(Pink in colour)

Reactions involved.

i) Chemical Reactions



ii) Bonic Reactions



Endpoint:-

Yellow to Pink (acid solution in Thelvrette)

Spigot

Observations

1) Preparation of 0.1N solutions of Na_2CO_3

- * Wt. of weighing bottle = $W_1 = 20\text{g}$
- * Wt. of weighing bottle + $\text{Na}_2\text{CO}_3 = W_2 = 21.325\text{g}$
- * Wt. of weighing bottle after transferring the salt = $W_3 = 20\text{g}$
- * Wt. of Na_2CO_3 transferred to volumed flask,
 $W_4 = W_2 - W_3 = 1.325\text{g}$
- * Volume of solution made = 250mL

2) Titration

- Volume of Na_2CO_3 soln taken for each titration is = 10mL
- Buerette Readings : Titration of Na_2CO_3 Vs HCl

Sr. No	Initial Reading (in mL)	Final Reading (in mL)	Vol of HCl used (in mL)
1	0.0	9.1	9.1
2	9.1	18.4	9.3
3	18.4	27.7	9.3
4	27.7	37.0	9.3

Concordent Reading = 9.3mL

Vol. of HCl used = 9.3mL

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Calculations

1) Preparation of 0.1N solution of Na_2CO_3 -

$$N = \frac{\text{gram equivalent}}{\text{Vol of sol(l)}} = \frac{\text{Weight}}{\text{Equivalent weight}} \times 1000 / \text{Vol of sol (ml)}$$

$$\text{Normality of } \text{Na}_2\text{CO}_3 \text{ soln} = \frac{1.325}{53} \times \frac{1000}{250} = 0.1 \text{ N}$$

2) Titration

To calculate normality of dil HCl soln, apply normality equivalence,

$$N_{\text{HCl}} \times V_{\text{HCl}} = N_{\text{Na}_2\text{CO}_3} \times V_{\text{Na}_2\text{CO}_3}$$

$$N_{\text{HCl}} = \left(\frac{N_{\text{Na}_2\text{CO}_3} \times V_{\text{Na}_2\text{CO}_3}}{V_{\text{HCl}}} \right) \times \frac{0.1 \times 10}{9.3} = 0.1075$$

$$N_{\text{HCl}} = 0.107$$

$$\text{Strength of dil. HCl soln} = N_{\text{HCl}} \times 36.5 \text{ g/L}$$

$$= 0.107 \times 36.5$$

$$= 3.924 \text{ g/L}$$

Now, since commercial HCl was diluted 100 times/mol the strength of commercial HCl can be obtained by multiplying strength of dil HCl by 100.

$$\text{Hence, Strength (dil. HCl)} = 3.924 \times 100 \text{ g/L}$$

$$= 392.4 \text{ g/L}$$

g) Results: The Strength of the commercial hydrochloric acid (HCl) is 392.4 \text{ g/L} Ans

P g) Precautions

1. Rinse the burette and pipette properly after each titration
2. Shake the titration flask continuously while adding the solution from the burette
3. Keep your eye in level with the liquid surface while reading the pipette or measuring flask
4. Always read the lower meniscus in case of a colourless solution

8/10/18