

EXPERIMENT: 02

AIM:

***TO PREPARE AND STANDARDIZE 0.1N
SOLUTION OF HYDROCHLORIC ACID***

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REQUIREMENTS

A. Glassware & Instruments

1. Clean and calibrated burette
2. Pipette
3. Conical flask
4. Burette stand
5. Measuring cylinder

B. Chemicals & Reagents

1. Analyte- Hydrochloric acid (0.1 M)
2. Titrant- Sodium carbonate (Na_2CO_3)
3. Indicator- Methyl Red solution

THEORY

HCl is available in solutions with a maximum concentration of 38 percent (concentrated grade). Chemically, you can get concentrations of up to a little over 40%, but the rate of evaporation is so high that you have to take extra steps to store and handle it, like keeping it at a low temperature and pressure. Due to its high evaporation rate, laboratory-grade HCl is insufficiently pure to serve as a main standard. In this experiment, a standard solution of Na_2CO_3 is used to calculate the exact concentration of a HCl solution.

PRINCIPLE



This is a titration that involves acid and base. Standardization of HCl is accomplished by adding sodium

carbonate, and methyl red solution is employed as the indicating agent. A transition in hue may be seen, going from very light yellow to very light pink.

PROCEDURE

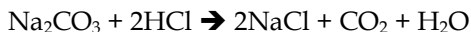
Preparation of HCl Solution

- Take 85ml of HCl and dilution it to 1000ml.
- Standardize the solution using the steps outlined below

Standardization of HCl Solution

- Weigh precisely anhydrous Na_2CO_3 (1.5g) that has been heated for one hour at 270°C .
- Mix it with 100 ml of water and 0.1 ml of methyl red solution.
- Slowly add the acid from the burette while stirring constantly until the solution becomes faintly pink.
- Boil the solution, let it cool, and proceed with the titration.
- Titrate as necessary until the light pink colour is not changed by heating again to boiling.
- 1 ml of 1M HCl is equivalent to 0.052 g of Na_2CO_3 .

REACTION



CALCULATION

Observation table

S. No.	Start Point	End Point	Column Consumed (ml)
1.			
2.			

3.			
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So, Density = Mass/Volume

Volume = Mass/Density

Density of hydrochloric acid is 1.18

So, Volume = $36.5/1.18=30.9$ mL

So, 30.9mL hydrochloric acid $\rightarrow$ 1000ml $\rightarrow$ 1M

The % purity of Hydrochloric acid is 35-38% w/w

i.e. 35g HCl is present in 100g conc. HCl solution.

So, 36.5g HCl is present in (?)g of conc. HCl solution

$$= 36.5 \times 100/35$$

$$= 104.28\text{g conc. HCl solution}$$

Therefore, 104.28g of conc. HCl solution is required to prepare 1M solution.

For Normality

The value of normality industrial HCl = $N_1 = 11.79\text{N}$

Normality we are going to prepare = $N_2 = 0.1\text{N}$

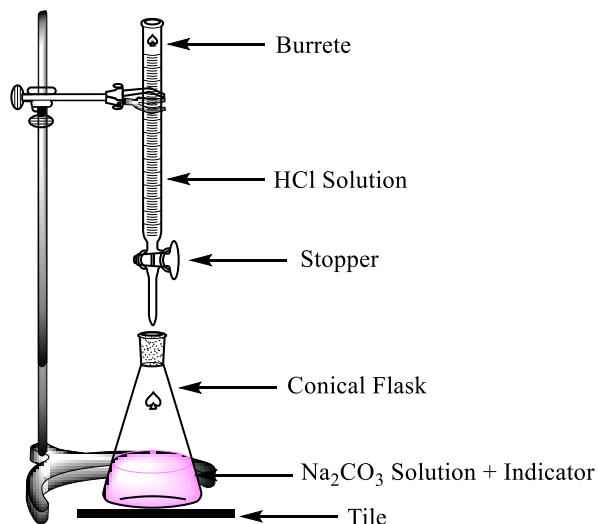
Volume during 0.1N = $V_2 = 1000\text{ml}$

Volume required to prepare 0.1N = $V_2 = ?$

Therefore, $N_1 V_1 = N_2 V_2$

So, ml of HCl is mixed 1000ml of solution to prepare 0.1N.

DIAGRAM



APPLICATION

Uses of HCl in daily life are:

1. In the Manufacturing of fireworks.
2. Manufacturing of batteries.
3. In some paints.
4. Used in making common salts.

RESULT

..... ml of HCl is mixed 1000ml of solution to prepare 0.1N. Therefore, Hydrochloric acid (HCl) can be effectively standardized by Sodium Carbonate (Na₂CO₃).

VIVA QUESTIONS

1. How you will prepare 0.1 N HCl?
2. How you will prepare 0.1 N Na_2CO_3 ?
3. What is the percentage purity of HCl available in the laboratory?
4. What is the density of the HCl available in the laboratory?
5. Define the term standardization.
6. What do you understand by the term indicator?
7. Define the term neutralization curve.
8. Current experiment comes under which type of titration?