KRISHNA VISHWA VIDYAPEETH
(DEEMED TO BE UNIVERSITY), KARAD

UNIVERSITY EDUCATION AND TECHNOLOGY CELL &
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Assay of Ammonium Chloride

By

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Objectives

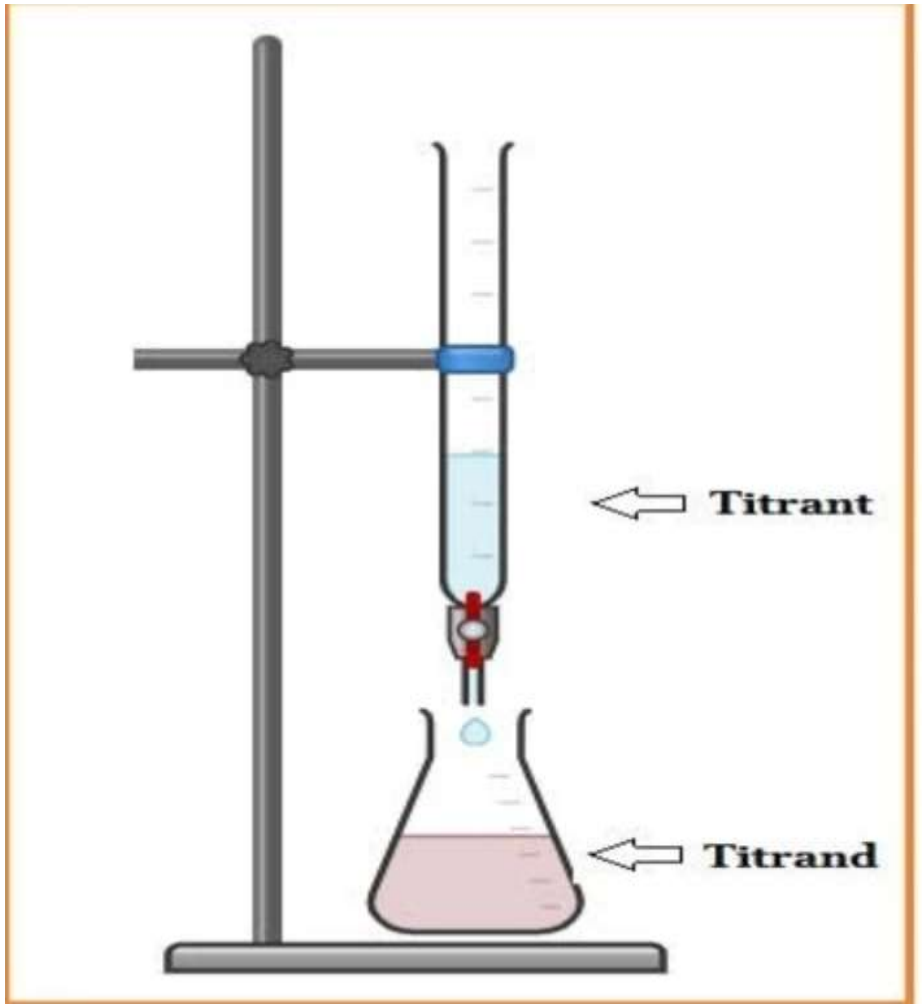
Objectives of this topics is :

1. To determine the percentage purity of given sample of ammonium chloride.

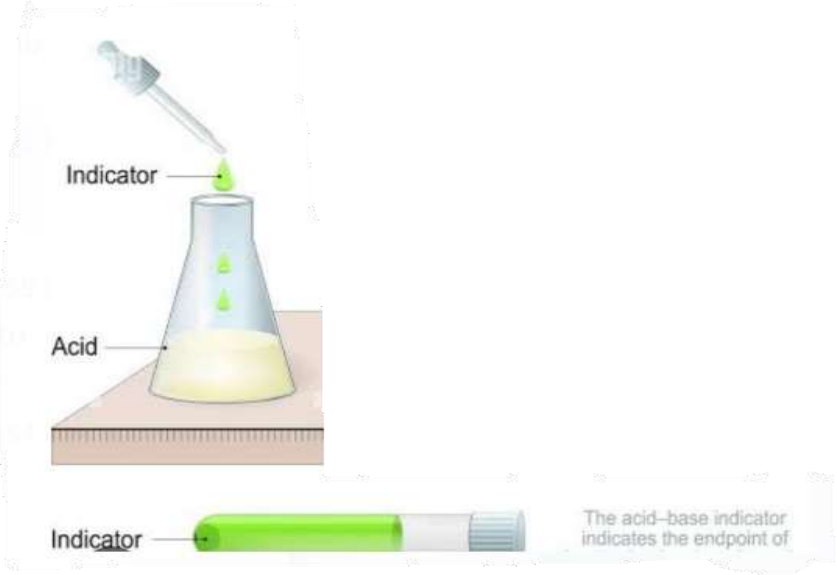
Titration :Titration is defined as method of analysis involved in determination of volume of test Solution (unknown concentration solution) by using standard solution (Known conc solution).

Titrant: The Solution of Known concentration which is usually taken in a burette.

Titrate : The solution of whose concentration is to be determined (unknown Concentration) & usually taken Conical flask



- **Indicators**: A reagent is used to indicate the end point of titration by bring out clear visual colour change of Solution on addition of little amount.



End point :

The point in the titration at which reaction between two solution is just completed at which the indicator can show sharp colour change is called as end point.

- **Aim:**

  To perform assay of given sample of ammonium chloride IP.

- **Requirements:**

  1. Apparatus:

  Beaker, conical flask, pipette, burette, measuring cylinder, burette stand and holder, glass funnel.

  2. Chemicals:

  Ammonium chloride, sodium hydroxide, formaldehyde solution, phenolphthalein indicator solution.

- **Principle:**

1) The assay of ammonium chloride is carried out by aqueous acid-base titration which based on neutralization reaction.
2) It is a direct type of titration.
3) Ammonium chloride is treated with formaldehyde solution to liberate equivalent amount of hydrochloric acid.
4) The liberated hydrochloric acid is subsequently titrated with 0.1 M sodium hydroxide solution.

- **Theory:**
- (A) Ammonium chloride (Analyte):
- 1. Molecular formula: NH_4Cl
- 2.Molecular weight: 53.53.
- 3.Melting point: 338°C

- 4.Description: Ammonium chloride is a white crystalline salt that is highly soluble in water. Solutions of ammonium chloride are mildly acidic.
- 5. Pharmacological activity:
- (i) Ammonium chloride is used as an expectorant in cough medicine.
- (ii) Ammonium salts are irritant to the gastric mucosa and may induce nausea and vomiting.

- **Reagent preparation :**
- **(a) 0.1 M Sodium hydroxide:**
- It may be prepared by dissolving 4 g of sodium hydroxide in sufficient carbon dioxide-free water to produce 1000 mL.

- **Assay Procedure:**
- 1. Weigh accurately about 0.1 g of ammonium chloride.
- 2. Dissolve in 20 mL of water.
- 3. Add a mixture of 5 mL of formaldehyde solution, add 20 mL of water.
- 4.Add few drops of phenolphthalein indicator.
- 5. After few minutes, titrate slowly with 0.1 M sodium hydroxide until faint pink colour appears.

- **Reaction:**
- $NH_4Cl + H_2O \longrightarrow NH_4OH + HCL$
- $NH_4OH + HCHO \longrightarrow CH_2{=}NH_2 + H_2$

  Urotropine
- $HCl + NaOH \rightarrow NaCl + H_2O$

Observation table :

Sr.no	Burette Reading (ml) of NaOH		
	Initial	Final	Mean
1.	0.0 ml	12 ml	$\frac{12+15+13}{3}$ = 13 ml
2.	12 ml	27 ml	
3.	27 ml	38 ml	

Calculation :

- **Step I: (Amount of ammonium chloride)**

1 mL of 0.1 M NaOH = 0.005349 g of ammonium chloride

13mL(Burette reading of assay) of 0.1 M NaOH = A g of NH_4Cl

$$Ag = \frac{13mL \times 0.1 \times (0.005349)}{1 \times 0.1}$$

$$= \mathbf{0.06\ gm}$$

- **Step II: (% Purity)**

For 0.1 g of ammonium chloride 100%

A g of ammonium chloride → p%

Hence,

$$p = \frac{(100) \times 0.06}{0.1}$$

$$= \mathbf{60\%}$$

- **Limit:**
- Ammonium chloride contains not less than 99.0% and not more than 100.5% of NH_4Cl, calculated on the dried basis.

- 1. The percent purity of given sample of ammonium chloride was found to be **60%.**

- In todays class we all have completed with Aim , Principal, Theory , procedure , Observation table and calculations of assay.
- From this practical students can able to find out % purity of any sample.

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