Experiment #01

Crystallization of Benzoic acid from water.

Apparatus and Chemicals :-

Benzoic acid 250 cm^3, beakers, tripod stand, wire guaze and filter paper.

Principle :-

Benzoic acid is more soluble in hot water and very less soluble in cold water.

Result :-

White crystals of Benzoic acid are obtained.

EXPERIMENT #01 :-

Crystallization of Benzoic acid from water :-

Procedure :-

Take 150 cm^3 of water in beaker. Heat it using bunsen burner. Add small quantity of Benzoic acid at one time while stirring the water. Go on adding benzoic acid till no more benzoic acid dissolves. Filter while the solution is hot. Allow it to cool; benzoic acid crystallizes out. Filter and dry the crystals of benzoic acid between folds of filter paper.

EXPERIMENT # 02:

Separate a mixture of coloured pigments (Mixture of Inks) by Paper Chromatography.

Procedure:-

Pour some solvent consisting of ethanol ($85cm^3$) and water ($15cm^3$) in one litre glass cylinder fitted with a rubber bung, carrying a glass hook at the lower end. Take a strip of whatman No. 42 filter Paper 2.5cm wide and more lengthy than the length of cylinder. Make a line 5cm from one end and its mid point with pencil. Apply a tiny drop of mixture of Inks at the mid point by means of capillary tube or micropippete. Dry the strip in air for about 15 min. Suspend it by glass hook with the impregnated end dipping into solvent to depth of 4-5cm. The centre of spot is taken as the reference line. After one hours the mixture of Inks migrate from its original place to different spots at different heights on surface of filter paper. The no. of spots will be equal to the no. of components in mixture. Thus we can separate mixture of various coloured pigments by chromatography.

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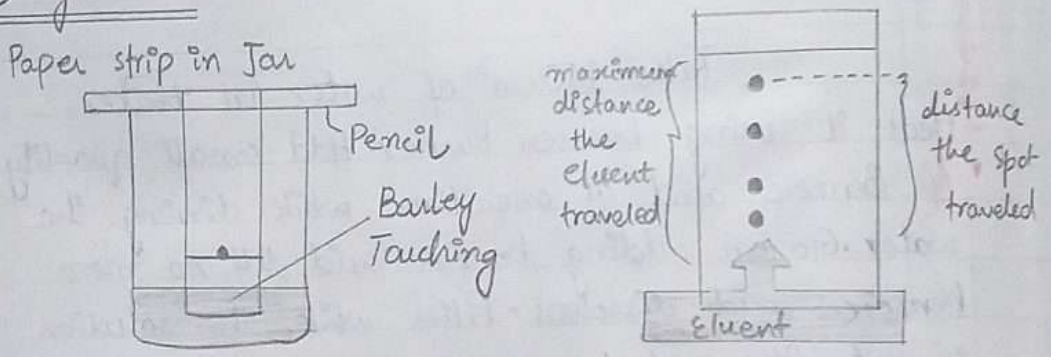
ent # 2 :

Separate a mixture of coloured pigments (mixture of Inks) by Paper Chromatography.

Apparatus :-

Filter Paper whatman No. 42, glass cylinder fitted with a rubber bung.

Diagram :-



R_f Value = $\frac{\text{Distance in cm from starting line to centre of spot}}{\text{Distance in cm from starting line to solvent front}}$

Result :-

Pigment	Distance travelled by component	Distance travelled by solvent	R_f Value
Red	9.2 cm	13.9 cm	0.6618
Blue	1.4 cm	13.9 cm	0.1007

R_f (Blue) = $\frac{1.4}{13.9}$ = 0.1007

(Red) = $\frac{9.2}{13.9}$ = 0.6618

Separation of ... cations

by Paper Chromatography.

Reagents:-

A 0.1 % solution of Chlorides or nitrates of cd^{2+} and Pb^{2+} is taken. Solvent is a mixture of Acetone, Water and Conc. HCl in ratio 87:5:8

Spraying agent: A concentrated solution of H_2S gas.

EXPERIMENT # 03 :-

Separation of cd^{2+} and Pb^{2+} cations by Paper Chromatography.

Procedure:-

Pour some solvent consisting of acetone ($87cm^3$), water ($5cm^3$) and conc. HCl ($8cm^3$) in a one litre glass cylinder fitted with a rubber bung, carrying a glass hook at the lower end. Take a strip of whatman No. 1 filter Paper 2.5cm wide and more lengthy than length of cylinder. Make a line 5cm from one end and its mid point with pencil. Apply a tiny drop of mixture of cations at mid point by means of capillary tube or micropipette. Suspend it by glass hook with impregnated end dipping solvent to depth of 4-5cm. The centre of support is taken as reference line. The solvent will ascend by diffusing into the pores of filter paper. After one hour, the mixture of ions will migrate from its original place to different spots and different heights on the surface of filter paper. Lead ions will appear as black spot where as cadmium ions will be yellow in colour.

Experiment # 04:-

Prepare a standard solution of oxalic acid and with its help standarize the given NaOH solution.

Principle:-

It is an acid-base titration. Oxalic acid can be titrated against standard NaOH solution.

Standard Solution:

0.1 M Oxalic Acid.

Indicator:

Phenolphthalein

End point:

Light pink to colourless

Equation:-

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

Observation:-

S.No	Initial Reading	final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Mean Volume = 10.0 cm^3

Calculations:-

NaOH Oxalic Acid

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

$$\frac{M_1 \times 10}{2} = \frac{0.1 \times 10}{1}$$

where $M_1 = ?$

$V_1 = 10.0 cm^3$

$V_2 = 10.0 cm^3$

$M_2 = 0.1M$

$M_1 = 2 \times 0.1 \times 10/10 = 0.2M$

Result:-

Molarity of NaOH = 0.2M

EXPERIMENT # 04:

Prepare a standard solution of oxalic acid and with its help standarize the given NaOH solution.

Procedure:

We weighted accurately 12.6 grams of oxalic acid on a clean watch glass. then transferred into one litre measuring flask and make volume upto mark with distilled water then we shaked well. This is the standard 0.1M oxalic acid solution. Pipette out 10.0 cm^3 of NaOH solution into a titration flask (conical). Then we added one drop of phenolphthaline as an indicator. Then we took the oxalic acid burette and then note the initial reading and then we added the oxalic acid solution drop wise from the burette into the titration flask and then we keep on titrating NaOH with oxalic acid. Until light pink colour appeared The volume of oxalic acid used and then we repeat the experiment to get three concordant readings.

Experiment # 05 :-

The given solution of H_2SO_4 is approximately 0.1 M. Find out its exact molarity. Also find the volume of this acid Required to prepare 500 cm^3 of 0.02 M acid.

Principle :

It is an acid - Base titration H_2SO_4 can be titrated against standard NaOH solution.

Standard Solution :-

0.1 M NaOH

Indicator :-

Phenolphthalein

End Point :-

Light Pink to Colourless.

Equation :-

$$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$$

Observation :-

No	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Mean Volume = 10.0 cm^3

Calculations :-

$H_2SO_4 = NaOH$ where $M_1 = ?$, $M_2 = 0.1M$

$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$ $V_1 = 10.0 cm^3$, $V_2 = 10.0 cm^3$

$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{2} \Rightarrow M_1 = 0.1 \times 10 / 2 \times 10 = 0.05M$

Molarity of $H_2SO_4 = 0.05M$

Given = Required

$H_2SO_4 = H_2SO_4$

$M_1V_1 = M_2V_2$

$0.05 \times V_1 = 0.02 \times 500 \longrightarrow V_1 = 0.02 \times 500 / 0.05 \longrightarrow 200$

Result = The required volume is 200 cm^3

EXPERIMENT #05:

The given solution of H_2SO_4 is approximately 0.2M. Find out its exact molarity. Also find volume of this acid Required to prepare $500cm^3$ of 0.02M acid.

Procedure:

Pipette out $10.0cm^3$ of NaOH solution into a titration flask, then we added one drop of phenolphthalein as an indicator. we took the H_2SO_4 in burette and note the initial reading. Added the solution dropwise from the burette into the filtration flask. We keep on titrating NaOH with H_2SO_4 until light pink colour appeared. Note the final reading of burette. The difference between the two readings gives the volume of H_2SO_4 used and then we repeat the experiment to get three concordant readings.

Experiment #06:

The solution contains 6.0g of caustic soda per dm^3 find the % impurity of sample.

Principle:-

It is an acid-base titration NaOH in caustic soda can be neutral by standard acid like HCl.

Standard Solution:-

0.1 M HCl

Indicator:-

Phenolphthalein

End Point:-

Light Pink to Colourless

Equation:-

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

Observation:-

Sr No.	Initial Reading	Final Reading	Volume Used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Calculation:-

NaOH-HCl

Mean Volume = 10.0 cm^3

where $M_1 = ?$, $M_2 = 0.1M$

$V_1 = 10.0 cm^3$, $V_2 = 10.0 cm^3$

$$\frac{M_1V_1}{\chi_1} = \frac{M_2V_2}{\chi_2}$$

$$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{1} \rightarrow M_1 = 0.1 \times 10/1 \times 10 \longrightarrow = 0.1M$$

$M_1 = 0.1 \times 10/1 \times 10 \longrightarrow 0.1M$

Strength of NaOH = Molarity $\times$ Mol.wt $= 0.1 \times 40 = 4.0 g/dm^3$

6gm of Caustic Soda contains pure NaOH = 4.0g

1gm of Caustic Soda Contains Pure NaOH = 4.016

100gm of Caustic Soda Contains Pure NaOH = (4.016) = 66.67%

Result:- Percentage of Impurity = 100 - 66.67% = 33.33%

EXPERIMENT # 06:

The solution contain 6.0g of caustic soda dissolved per dm^3 find the percentage impurity of the sample.

Procedure:-

Pipette out 10.0 cm^3 of solution of caustic soda (NaOH) into a conical flask. And then we added one drop of phenolphthalein as an indicator. Took the HCl in burette and note the initial reading. Added HCl solution dropwise from the buette into the titration flask. Keep on titrating NaOH with HCl until light pink colour appeared. Note the final reading of burette. The difference between two readings gives the volume of HCl used. We repeat the experiment to get three concordant reading.

Experiment #07: 5g of HCl and NaCl is dissolved per dm^3. Find % composition of mixture.

Principle:

It is the acid-base titration. HCl can be neutralized by some standard base like NaOH.

Standard Solution:-

0.1 M NaOH

Indicator:-

Phenolphthalein

End Point:-

Light pink to colourless.

Equation:

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

Observation:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	12.0	10.0 cm^3
2-	11.0	22.0	10.0 cm^3
3-	22.0	32.0	10.0 cm^3

Mean Volume = 10.0 cm^3

Calculations:-

Where $M_1 = ?$, $M_2 = 0.1M$

$V_1 = 10.0 cm^3$, $V_2 = 10.0 cm^3$

HCl NaOH

$$\frac{M_1V_1}{\chi_1} = \frac{M_2V_2}{\chi_2}$$

$$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{1} \longrightarrow M_1 = 0.1 \times 10 / 1 \times 10 = 0.1\ M$$

Strength of HCl:-

Molarity x Mol.wt = $0.1 \times 36.5 \longrightarrow = 3.65\ g/dm^3$

(a) = 5g of the mixture contains HCl = 3.65g

1g of mixture contains HCl = 3.65/5

100gm of mixture contains HCl = (3.65/5) x 100

Result: % of NaCl = 100 - 73 = 27%.

EXPERIMENT #07:

5g of HCl and NaCl is dissolved per dm
Find percentage composition of mixture.

Procedure:

Pipette out 10.0cm^3 of solution of NaOH in to a conical flask. We added one drop of phenolphthaline as an indicator. Took the HCl in burette and note the initial reading. Then we added HCl solution drop wise from the burette into the titration flask. Keep on titrating NaOH with HCl until light pink colour appeared. Note the final reading of burette. The difference between the two readings gives the volume of HCl used. We repeat the experiment to get three concordant readings.

Experiment # 08:

Principle :-

It is acid-base titration. NaOH in mixture can be neutralized by some standard acid like HCl standard solution.

Standard Solution :-

0.1M HCl

Indicator :-

Pherolphthalein

End Point :-

Light Pink to colourless

Equation :-

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

Observations :-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	11.0	11.0 cm^3
2-	11.0	22.0	11.0 cm^3
3-	22.0	33.0	11.0 cm^3

Calculations :-

Mean Volume = 11.0 cm^3

where $M_1 = ?$

$V_1 = 10.0\ cm^3$

$M_2 = 0.1M$

$V_2 = 11.0 cm^3$

NaOH HCl

$$\frac{M_1 V_1}{x_1} = \frac{M_2 V_2}{x_2}$$

$$\frac{M_1 \times 10}{1} = \frac{0.1 \times 11}{1}$$

$$M_1 = 0.1 \times 11 / 10 \times 1 = 0.11M$$

Strength of NaOH = Molarity × Mol.wt = 0.11 × 40 = 4.40 g/dm³

8 grams of mixture contains pure NaOH = 4.409

1 grams of mixture contains pure NaOH = 4.4018

100 grams of mixture contains pure NaOH = (4.4018) × 100 = 55%

% of NaOH = 55%.

Percentage of NaCl = 100 − 55 = 45%

EXPERIMENT #08:

The solution contains 8 grams of mixture of NaOH and NaCl dissolved per dm^3.

(a) Determine the % of NaOH

(b) % Composition of Sample

Procedure:

Pipette out 10.0 cm^3 of mixture of NaOH and NaCl solution into a conical flask. Add one drop of phenolphthalein as an indicator Take HCl in burette and note the initial reading Add HCl solution drop wise from the burette into the titration flask. Keep on titrating NaOH with HCl till light pink colour appears. Note the final reading of the burette. The difference between the two readings gives the volume of HCl used. Repeat the experiment to get three concordant readings.

Experiment #09:-

Principle: It is acid-base titration MOH can be neutralized by some standard acid like HCl.

Standard Solution:

0.1M HCl

Indicator:

Phenolphthalein

End Point:-

Light Pink to colourless

Equation:-

$MOH + HCl \longrightarrow MCl + H_2O$

Observations:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	$10.0 cm^3$
2-	10.0	20.0	$10.0 cm^3$
3-	20.0	30.0	$10.0 cm^3$

Calculations:-

Mean volume = $10.0 cm^3$

$$\frac{MOH}{\frac{M_1V_1}{x_1}} = \frac{HCl}{\frac{M_2V_2}{x_2}}$$

where $M_1 = ?$, $M_2 = 0.1M$

$V_1 = 10.0 cm^3$, $V_2 = 10.0 cm^3$

$$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{1}$$

$M_1 = 0.1 \times 10 / 10 \times 1 = 0.1M$

$100 cm^3$ of solution contain MOH = 0.4 gm

$1000 cm^3$ of solution contain MOH = $(0.4 \times 100) \times 100 = 4.0 gm$

Strength of MOH:-

Molarity x Mol. wt $\longrightarrow$ $4 = 0.1 \times (M + 17)$

$M + 17 = 4 / 0.1 = 40.0$

Result:-

(a) Atomic weight of Metal M = 40 - 17 = 23

Molecular weight of MOH = 23 + 16 + 1 = 40.

EXPERIMENT #09:

The solution contain 0.4g of an alkali metal hydroxide(MOH) dissolver per $100cm^3$. Determine

(a) The atomic mass of Metal M
(b) Molecular Mass of Hydroxide

Procedure:

Pipette out $10.0cm^3$ of MaOH solution into a conical flask. We added one drop of phenolphthalein as an indicator. We took HCl in burette and note the initial reading. Added HCl solution dropwise from burette into titration flask. Keep on titrating MOH with HCl will light pink colour appeared. Note the findl reading of burette. The difference between the two readings give the volume of HCl used. We repeat the experiment to get three concordant readings.

Experiment # 10 :-

Principle :

It is acid-base titration. Acid can be neutralized by some standard base like NaOH.

Standard Solution :-

0.1 M of NaOH

Indicator :-

Phenolphthalein

End Point :-

Light Pink to Colourless

Equation :-

Suppose the Dibasic acid is H_2SO_4

$$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$$

Observations :-

Sr. No	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Mean Volume = 10.0 cm^3

Calculations :-

Acid NaOH

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

where $M_1 = ?$
$V_1 = 10.0\ cm^3$
$M_2 = 0.1M$
$V_2 = 10.0\ cm^3$

$$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{2}$$

$M_1 = 0.1 \times 10/10 \times 2 = 0.05M$

100 cm^3 of solution contain acid = 0.63g

1000 cm^3 of solution contain acid = $(0.63/100) \times 1000 = 6.3g$

Strength of Acid :- Molarity x Mol.wt

Mol.wt = Strength of Acid / Molarity

Mol.wt of acid = 6.3/0.05 = 126

EXPERIMENT # 10

The given solution contains 0.63g of a dibasic acid dissolved per 100cm^3. Determine volumetrically the molecular weight of acid.

Procedure:

Pipette out 10.0cm^3 of NaOH solution into a conical flask. And one drop of phenolphthalein as an indicator. Take the acid in burette and note the initial reading. Add acid solution dropwise from burette into the titration flask. Keep on titrating NaOH with acid till light pink colour appears. Note the final reading of burette. The difference between two readings gives the volume of acid used. Repeat the experiment to get three concordant readings.

Experiment # 11:-

Principle:- It is an acid-base titration Na_2CO_3 can be neutralized by some standard acid (HCl)

Standard Solution: 0.1M HCl

Indicator:- Methyl Orange

End Point:- Light Pink Colour

Equation: $Na_2CO_3 + 2HCl \longrightarrow 2NaCl + CO_2 + H_2O$

Observation:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	2.0	12.0	10.0cm^3
2-	12.0	22.0	10.0cm^3
3-	22.0	32.0	10.0cm^3

Calculations:

Na_2CO_3 HCl

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

$$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{2}$$

where $M_1 = ?$

$V_1 = 10.0cm^3$

$M_2 = 0.1M$

$V_2 = 10.0cm^3$

$$M_1 = \frac{0.1 \times 10}{10 \times 2} \longrightarrow M_1 = 0.05M$$

Strength of Na_2CO_3 = Molarity × Mol. wt $\longrightarrow 0.05 \times 106 \longrightarrow 5.3g/dm^3$

Result:

(a) 6g of washing soda contains pure $Na_2CO_3 = 5.3g$

1g of washing soda contains pure $Na_2CO_3 = 5.316$

25g of washing soda contains pure $Na_2CO_3 = (5.316) \times 25 = 22.0$

(b) 6g of washing soda contains pure $Na_2CO_3 = 5.3g$

1g of washing soda contains pure $Na_2CO_3 = 5.316$

25g of washing soda contains pure $Na_2CO_3 = (5.316) \times 100$

$= 88.3\%$

EXPERIMENT # 11:

The given solution contains 6g of (Na_2CO_3) dissolves per dm^3. Find
(a) The amount of Na_2CO_3 in 25g of sample.
(b) Percentage pusity of sample by volumetric method.

Procedure:-

Pipette out $10cm^3$ of Na_2CO_3 solution into a conical flask. We add few drops of methyl orange as indicator. We took HCl in the burette and note the initial reading. We added HCl solution dropwise from the burette into the titration of flask. Keep on titrating Na_2CO_3 solution with HCl till light pink colour appears. Note the final reading of the burette. The difference between the two readings gives the volume of HCl used. Repeat the experiment and get three concordant readings.

Experiment #12:-

Principle: It is an acid-base titration Metal carbonate can be neutralized by some standard acid like HCl.

Standard Solution:-

0.1 M HCl

Indicator:- Methyl Orange

End Point:- Light pink colour

Equation:- $M_2CO_3 + 2HCl \longrightarrow 2MCl + CO_2 + H_2O$

Observations:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	2.0	12.0	10.0 cm^3
2-	12.0	22.0	10.0 cm^3
3-	22.0	32.0	10.0 cm^3

Calculations:-

Mean Volume = 10.0 cm^3

$M_2CO_3 = HCl$

where M_1 = ?

$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$

V_1 = 10.0 cm^3

M_2 = 0.1M, V_2 = 10.0 cm^3

$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{2}$

$M_1 = 0.1 \times 10 / 10 \times 2 = 0.05M$

500 cm^3 contain alkali metal carbonate = 2.65

1000 cm^3 contain alkali metal carbonate = (2.65/500)1000

= 5.30g

Strength of M_2CO_3 = Molarity × Mol.Wt

Molecular Weight = Strength of M_2CO_3 / Molarity

Molecular Weight of M_2CO_3 = 5.30/0.5 = 106

Atomic Weight of Metal M = (106 - 60) 12 = 23

EXPERIMENT # 12:

The given solution contains 2.65g of an alkali metal carbonate dissolved per 500cm³. Find volumetrically the atomic weight of the metal M.

Procedure:

Pipette out 10cm³ of M_2CO_3 solution into a conical flask. Add few drops of methyl orange as indicator. Take the HCl in the burette and note the initial reading. Add HCl solution dropwise from the burette into the titration flask Keep on titrating M_2CO_3 solution with HCl till light pink colour appears. Note the final reading of burrete. The difference between two readings gives the volume of HCl used. Repeat the experiment to get three concordant readings.

Experiment # 13:-

Principle:- It is an acid-base titration. Acetic Acid can be titrated against standard NaOH.

Standard Solution:- 0.05 M NaOH

Indicator:- Phenolphthalein

End Point:- Light pink to colourless

Equation:- $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$

Observation:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Calculations:- Mean Volume = 10.0 cm^3

Acetic Acid NaOH

Where M_1 = ?

V_1 = 10.0 cm^3

M_2 = 0.05 M

V_2 = 10.0 cm^3

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

$$\frac{M_1 \times 10.0}{1} = \frac{0.05 \times 10}{1}$$

$M_1 = 0.05 \times 10/1 \times 10 = 0.05$ M

Strength:-

Molarity x Mol. wt = $0.05 \times 60 = 3.0$ g/dm^3

1000 cm^3 of Vinegar contains amount of acetic acid = 3

100 cm^3 of Vinegar contains amount of acetic acid

$= (3.0 \times 100)/1000 = 0.3$g

5 cm^3 of Vinegar contains acetic acid = 0.31g

100 cm^3 of Vinegar contains acetic acid = $(0.3 \times 100)/5$

= 6.0g.

EXPERIMENT # 13:

Determine the amount of acetic acid in 100 cm^3 of Vinegar sample.

Procedure:-

Take 5 cm^3 of Vinegar in a 100 cm^3 measuring flask and dilute up to mark with distilled water and shake well. Pippete out 10.0 cm^3 of NaOH solution into a titration flask. Add one drop of phenolphthalein as indicator. Take the vinegar in burette and note the initial reading. Add acetic acid dropwise from the burette into the titration flask. Keep on titration NaOH solution with acetic acid till light pink colour appears. The differance between two readings give the volume of acetic acid used. Repeat the experiment to get three concordant readings.

Experiment # 14

Principle :- It is an acid-base titration free alkali is present in laundary soaps and can be titrated against standard HCl solution.

Standard Solution :- 0.2M HCl

Indicator :- Phenolphthalein

End Point :- Light Pink, to colourless

Equation :- $HCl + NaOH \longrightarrow NaCl + H_2O$

Observations :-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Calculations :-

Mean Volume = 10.0 cm^3

Alkali Acid

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

where $M_1 = ?$

$V_1 = 10.0\ cm^3$

$M_2 = 0.02M$

$V_2 = 10.0\ cm^3$

$$\frac{M_1 \times 10}{1} = \frac{0.02 \times 10}{1}$$

$M_1 = 0.02 \times 10/10 \longrightarrow = 0.02M$

→ **Strength :** Molarity × Mol. wt = $0.02 \times 40 \longrightarrow 0.8 g/dm^3$

1000 cm^3 soap solution contain free alkali = 0.8g

100 cm^3 soap solution contain free alkali $(0.8/1000) \times 100 = 0.08$

100 cm^3 of diluted soap solution = 5g of laundary soap

→ **Result :-**

5 grams of laundary soap contains free alkali = 0.08g

100 gram of laundary soap contains free alkali = $(0.08/5) \times 100 = 1.6\%$

% of free alkali in the soap = 1.6 %

EXPERIMENT # 14:

Determine the amount of free alkali in a given sample of soap.

Procedure:-

Take 5g of laundary soap in a beaker distilled water warm it to dissolve the soap and transfer it to $100cm^3$ measuring flask. Wash the beaker with distilled water and also transfer the washings to measuring flask. Dilute up to mark with distilled water and shake well. Pipette out $10cm^3$ of soap (NaOH) solution into a titration flask. (conical). Add one drop of phenolphthalein as indicator. Took the burette and HCl in it and note the initial reading. Add HCl dropwise from the burette into titration flask. Keep on titrating soap solution with HCl till light pink colour appears The difference between the two readings gives the volume of acid used. Repeat the experiment to give three concordant readings.

Experiment # 15:-

Principle: It is an acid-base titration oxalic acid can be neutralized will some standard base say NaOH.

Standard Solution: 0.1 M NaOH

Indicator:- Phenolphthalein

End Point:- Light Pink to colourless

Equation:-

$$\begin{matrix} COOH \\ | \\ COOH \end{matrix} \times H_2O + 2NaOH \longrightarrow \begin{matrix} COONa \\ | \\ COONa \end{matrix} (2+x)H_2O$$

Calculations:-

Oxalic Acid NaOH

$$\frac{M_1V_1}{X_1} = \frac{M_2V_2}{X_2}$$

$$\frac{M_1 \times 10}{1} = \frac{0.1 \times 10}{2}$$

$$M_1 = \frac{0.1 \times 10}{2 \times 10} = 0.05\,M$$

where $M_1 = ?$

$V_1 = 10.0\,cm^3$

$M_2 = 0.1\,M$

$V_2 = 10.0\,cm^3$

Observations:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	2.0	12.0	10.0 cm^3
2-	12.0	22.0	10.0 cm^3
3-	22.0	32.0	10.0 cm^3

Strength of Oxalic Acid :-

Molarity × Mol. wt

$6.3 = 0.05 \times (90 + 18x)$

$6.3 / 0.05 = 90 + 18x$

$90 + 18x = 126$

$18x = 126 - 90 = 36$

$x = 36/18 = 2$

EXPERIMENT # 15:

6.3 grams of given sample of hydrated oxalic acid $(COOH)_2 \cdot xH_2O$ have been dissolved per dm^3 of solution. Determine the volume of x volumetrically.

Procedure:-

Pipette out $10.0 cm^3$ of NaOH solution into a titration flask. Add one drop of phenolphthalein as an indicator. Take oxalic acid in burette and note the initial reading. Add oxalic acid solution dropwise from burette into the titration flask. Keep on titrating NaOH with oxalic acid till light pink colour appears. Note the final reading of burette. The difference between two readings gives the volume of oxalic acid used. Repeat the experiment to get three concordant readings.

Experiment #16 :-

Principle :- It is an acid-base titration. Oxalic acid can be neutralized with some standard base say NaOH.

Standard Solution : 0.1 M NaOH

Indicator : Phenolphthalein

End Point : Light Pink to Colourless

Equation :

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

Observations :

Sr No.	Initial Reading	Final Reading	Volume used
1-	2.0	10.0	8.0 cm^3
2-	10.0	18.0	8.0 cm^3
3-	18.0	26.0	88.0 cm^3

Mean Volume = 8.0 cm^3

Calculations :-

Oxalic Acid NaOH

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

$$\frac{M_1 \times 8}{1} = \frac{0.1 \times 10}{2}$$

$M_1 = 0.1 \times 10 / 2 \times 8 \longrightarrow 0.0625M$

where $M_1 = ?$
$V_1 = 8.0\ cm^3$
$M_2 = 0.1M$
$V_2 = 10.0\ cm^3$

Strength of Oxalic Acid :- Molarity x Mol. Wt $\longrightarrow 0.0625 \times 126 = 7.875$

1000 cm^3 of solution contains oxalic acid = 7.875 g

100 cm^3 of diluted solution contains oxalic acid = (7.875/1000) $\times 100 = 0.875$ g

100 cm^3 of diluted solution = 5 cm^3 of saturated solution

5 cm^3 of saturated solution contains oxalic acid = 0.875 g

100 cm^3 of saturated solution contains oxalic acid = (0.7875/5) $\times 100 = 15.75$ g

Result :-

Solubility of Oxalic Acid = 15.75 g / 100 cm^3

EXPERIMENT #= 16 :

Determine solubility of oxalic acid at room temperature volumetrically.

Procedure :-

Prepared a saturated solution of oxalic acid at room temperature when no more acid goes into solution filled it. Take 5cm^3 of this filtrate in 100cm^3 measuring flask and make up the volume by adding more distilled water to it. Pipette out 10cm^3 of NaOH solution into a titration flask. Add one drop of phenolphthalein as an indicator. Took oxalic acid in burette and note the initial reading. Add oxalic solution from dropwise from burette. Keep on titrating NaOH solution with oxalic acid till light pink colour appears. Note the final reading of the burette. The difference between two readings gives the volume of oxalic acid used. Repeat experiment three times.

Experiment # 17 :-

Principle : It is an oxidation-reduction titration. $KMnO_4$ is an oxidizing agent.

Standard Solution = 0.05 M $FeSO_4$

Indicator = $KMnO_4$ itself

End Point = Light Pink colour

Equation :-

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5(O)$$

$$[2FeSO_4 + H_2SO_4 + O \longrightarrow Fe_2(SO_4)_3 + H_2O] \times 5$$

$$2KMnO_4 + 8H_2SO_4 + 10FeSO_4 \longrightarrow 5Fe_2(SO_4)_3 + K_2SO_4 + 2MnSO_4 + 8H_2O$$

Observations :-

Sr No	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Calculations :-

$$\frac{KMnO_4}{\frac{M_1V_1}{x_1}} = \frac{FeSO_4}{\frac{M_2V_2}{x_2}}$$

where $M_1 = ?$

$V_1 = 10.0 cm^3$

$M_2 = 0.05 M$

$V_2 = 10.0 cm^3$

$$\frac{M_1 \times 10}{2} = \frac{0.05 \times 10}{10}$$

$M_1 = 0.01 M$

Strength of $KMnO_4$:-

Molarity x Mol. wt $= 0.01 \times 158 = 1.58 / dm^3$

(a) 3g of mixture contain $KMnO_4 = 1.58 g$

50g of mixture contain $KMnO_4 = (1.58/3) \times 50 = 26.33 g$

Amount of KCl in 50g of mixture $= 50 - 26.33 = 23.67 g$

(b) 3g of mixture contains $KMnO_4 = 1.58 g$

100g of mixture contains $KMnO_4 = (1.58/3) \times 100 = 52.66\%$

Result :-

%age of $KMnO_4 = 52.66\%$

EXPERIMENT #17:

The given solution contains a mixture KCl and $KMNO_4$ 3 grams of which have been dissolved per dm^3. Determine

(a) The amount of KCl present in 50 grams of mixture.

(b) % of $KMnO_4$ in the mixture by volumetric method.

Procedure:-

Pipette out $10cm^3$ of $FeSO_4$ solution into the conical flask. Add half test tube of dilute H_2SO_4. Took the $KMnO_4$ solution in burette and note the initial reading of burette. Add $KMnO_4$ solution dropwise from burette into the titration flask. Keep on titrating $FeSO_4$ solution with $KMnO_4$ till light pink colour appears which is end point of titration. Note the final reading of burette. Repeat the experiment and got three concordant readings.

Experiment # 18 :-

Principle: It is an oxidation-reduction titration. $FeSO_4$ is a reducing agent can be titrated against some standard oxidizing agent such as $KMnO_4$.

Standard solution: 0.01 M $KMnO_4$

Indicator: $KMnO_4$ itself

Equation:

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5(O)$$

$$[2FeSO_4 + H_2SO_4 + O \longrightarrow Fe(SO_4)_3 + H_2O] \times 5$$

$$2KMnO_4 + 8H_2SO_4 + 10FeSO_4 \longrightarrow 5Fe_2(SO_4)_3 + K_2SO_4 + 2MnSO_4 + 8H_2O$$

Observations :-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Mean Volume = 10.0 cm^3

Calculations:

$FeSO_4$ $KMnO_4$

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

where M_1 = ?
V_1 = 10.0 cm^3
M_2 = 0.01 M
V_2 = 10.0 cm^3

$$\frac{M_1 \times 10}{10} = \frac{0.01 \times 10}{2}$$

$M_1 = 0.01 \times 10 \times 10 / 2 \times 10 = 0.05$ M

Strength of $FeSO_4$:-

Molarity x Mol.wt = 0.05 x 278 = 13.9 g

15 g of mixture contains $FeSO_4$ = 13.9 g

100 g of mixture contains $FeSO_4$ = (13.9/15) x 100

= 92.6 %.

EXPERIMENT # 18:

The given solution contains 15 g of a mixture of $FeSO_4$ and $(NH_4)_2SO_4$ dissolved per dm^3. Find out the amount of $FeSO_4$ in 100 g of mixture.

Prodedure:-

Pipette out 10 cm^3 of $FeSO_4$ solution into the conical flask. Add half test tube of dilute Sulphuric acid. Take the $KMnO_4$ solution in burette and note the initial reading of burette. Add $KMnO_4$ solution dropwise from burette into titration flask. Keep on titrating $FeSO_4$ solution with $KMnO_4$ solution till light pink colour appears which is the end point of titration. Note the final reading. The difference between two readings gives the volume of $KMnO_4$ used. Repeat the experiment to get three concordant readings.

Experiment # 19:-

Principle:- It is an oxidation-reduction titration $FeSO_4$ is a reducing agent and titrated against $KMnO_4$

Standard solution :- 0.02M $KMnO_4$

Indicator :- $KMnO_4$ itself

End Point :- Light Pink Colour

Equation :-

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5(O)$$

$$[2FeSO_4 + H_2SO_4 + O \longrightarrow Fe(SO_4)_3 + H_2O] \times 5$$

$$2KMnO_4 + 8H_2SO_4 + 10FeSO_4 \longrightarrow 5Fe(SO_4)_3 + K_2SO_4 + 2MnSO_4 + 8H_2O$$

Observations :-

Sr No	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Calculations :-

$$\frac{FeSO_4}{x_1} \quad \frac{KMnO_4}{x_2}$$

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

$$\frac{M_1 \times 10}{10} = \frac{0.02 \times 10}{2}$$

Where $M_1 = ?$

$V_1 = 10.0 cm^3$

$M_2 = 0.02M$

$V_2 = 10.0 cm^3$

$M_1 = 0.1M$

$5 cm^3$ of solution contain $FeSO_4 \times H_2O = 13.9g$

$1000 cm^3$ of solution contain $FeSO_4 \times H_2O = (13.9/500) \times 1000 = 27.8g$

Strength of $FeSO_4$ = Molarity x Mol. wt

$$27.8 = (0.1M) \times (152 + 18x)$$

$$152 = 18x = 27.8/0.1 = 278 \longrightarrow 18x = 278 - 157 = 126$$

$$x = 126/18 = 7$$

Result :-

H_2O of Crystallization = 7 Molecules

EXPERIMENT # 19:

Given solution contains 13.9 g of $FeSO_4 X_2 H_2O$. Dissolved in $500cm^3$. Determine volumetrically value of x.

Procedure:-

Pipette out $10cm^3$ of ferrous sulphate into conical flask. Add half test tube of dilute H_2SO_4. Took $KMnO_4$ solution in burette and note its initial reading. Add $KMnO_4$ solution dropwise solution from burette into titration flask. Keep on titrating ferrous sulphate solution with $KMnO_4$ solution till light pink colour appears which is end point of titration flask. Note the final reading of burette. The difference between two readings gives the volume of $KMnO_4$ used. Repeat the experiment.

Experiment # 20

Principle:- It is an oxidation-reduction titration. $FeSO_4$ is a reducing agent. It can titrated against some standard oxidizing agent such as $KMnO_4$.

Standard solution: 0.01 M $KMnO_4$

Indicator: $KMnO_4$ itself

End Point: Light Pink Colour

Equation: $2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5(O)$

$[2FeSO_4 + H_2SO_4 + O \longrightarrow Fe_2(SO_4)_3 + H_2O] \times 5$

$2KMnO_4 + 8H_2SO_4 + 10FeSO_4 \longrightarrow 2Fe_2(SO_4)_3 + K_2SO_4 + 2MnSO_4 + 8H_2O$

Observations:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	6.0	6.0 cm^3
2-	6.0	12.0	6.0 cm^3
3-	12.0	18.0	6.0 cm^3

Mean Volume = 6.0 cm^3

Calculations:-

$FeSO_4$ $KMnO_4$

$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$

$\frac{M_1 \times 10}{10} = \frac{0.01 \times 6}{2}$

where M_1 = ?

V_1 = 10.0 cm^3

M_2 = 0.01 M

V_2 = 6.0 cm^3

$M_1 = 0.01 \times 6 \times 10/2 \times 10 = 0.03$ M

Strength of $FeSO_4$ per dm^3 = Molarity × Mol. wt = $0.03 \times 278 = 8.24$ g/dm^3

1000 cm^3 of solution contains $FeSO_4 \cdot 7H_2O = 8.24$ g

100 cm^3 of diluted solution contains $FeSO_4 \cdot 7H_2O = (8.24/1000) \times 100 = 0.824$ g

100 cm^3 of diluted solution = 5 cm^3 of saturated solution

5 cm^3 of saturated solution contains $FeSO_4 \cdot 7H_2O = 0.824$ g

100 cm^3 of saturated solution contains $FeSO_4 \cdot 7H_2O = (0.824/5) \times 100 = 16.68$ g

Solubility of $FeSO_4 \cdot 7H_2O = 16.68$ g/100 cm^3

EXPERIMENT # 20:

Determine the solubility of $FeSO_4 \cdot 7H_2O$ at room temperature by volumetrically method.

Procedure:

Prepare a saturated solution of $FeSO_4 \cdot 7H_2O$ at room temperature. Take $5cm^3$ of this solution in a $100cm^3$ measuring flask and add distilled water to make up the volume up to mark. Pipette out $10cm^3$ of diluted solution of $FeSO_4 \cdot 7H_2O$ and transfer it into conical flask. Add half test tube of dilute sulphuric acid. Take $KMnO_4$ solution in burette and note the initial reading. Add $KMnO_4$ solution dropwise from burette into titration flask. Note the final reading. The difference between the two readings give the volume of $KMnO_4$ used. Repeat the experiment to get three concordant readings.

Experiment #21:-

Principle:- It is an oxidation-reduction titration generally known as Iodimetry. Iodine can be titrated against standard $Na_2S_2O_3$.

Standard Solution:- 0.2M $Na_2S_2O_3$ solution

Indicator :- Starch Solution

End Point :- Blue to Colourless

Equation:-

$$2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$$

Observations:-

Sr No.	Initial Reading	Final Reading	Volume used
1-	2.0	12.0	10.0cm³
2-	12.0	22.0	10.0cm³
3-	22.0	32.0	10.0cm³

Mean Volume = 10.0cm³

Calculations:-

Iodine $Na_2S_2O_3$

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

$$\frac{M_1 \times 10}{1} = \frac{0.2 \times 10}{2}$$

$$M_1 = \frac{0.2 \times 10}{2 \times 10} = 0.1M$$

Where M_1 = ?
V_1 = 10.0cm³
M_2 = 0.2M
V_2 = 10.0cm³

Molarity of Iodine = 0.1M

Given	Required
I_1	I_2
M_1V_1	= M_2V_2
$0.1 \times V_1$	= 0.05×200

$V_1 = 0.05 \times 200 / 0.1 = 100cm^3$

EXPERIMENT # 21:

Standarize the given solution of iodine which is approximately 0.1M. Find out its exact molarity. Also find volume of this solution required to prepare 200cm^3 of 0.05M I_2 soln.

Procedure:-

Take about 50cm^3 of water and dissolve 10gm of KI. Now add 12g of powdered iodine. Dissolve the iodine without adding more water and transfer it to one dm^3 measuring flask and make up the volume as usual. Add a test tube of water to dilute iodine solution. Now add 2cm^3 of freshly prepared solution of starch as indicator in to titration flask, which gives an intense blue colour. Continue titrating iodine solutions with sodium thiosulphate drop by drop and stirring till the blue colour just disappears. Note the final reading. Repeat the experiment to get three concordant readings.

Experiment # 22 :-

Principle : It is an oxidation-reduction titration generally known as iodimetry. $Na_2S_2O_3$ solution can be titrated against standard iodine solution.

Standard Solution :- 0.05M I_2 solution

Indicator : Starch solution

End Point : Blue to Colourless

Equation :- $2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$

Observations :-

Sr No.	Initial Reading	Final Reading	Volume used
1-	0.0	10.0	10.0 cm^3
2-	10.0	20.0	10.0 cm^3
3-	20.0	30.0	10.0 cm^3

Mean volume = 10.0 cm^3

Calculation :-

$Na_2S_2O_3$ Iodine

$$\frac{M_1V_1}{x_1} = \frac{M_2V_2}{x_2}$$

$$\frac{M_1 \times 10}{2} = \frac{0.05 \times 10}{1}$$

$$M_1 = \frac{2 \times 0.05 \times 10}{10} = 0.1M$$

Where $M_1 = ?$
$V_1 = 10.0 cm^3$
$M_2 = 0.05M$
$V_2 = 10.0 cm^3$

Molarity of $Na_2S_2O_3 = 0.1M$

Given	Required
$Na_2S_2O_3$	$Na_2S_2O_3$
M_1V_1 =	M_2V_2
$0.1 \times V_1$ =	0.05×250

$V_1 = 0.05 \times 250 / 0.1 = 125 cm^3$

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EXPERIMENT #22:

Standarize the given solution of sodium thiosulphate. Also calculate the volume of this solution required to prepare 250 cm^3 of 0.05M sodium thiosulphate solution.

Procedure:-

Pipette out 10 cm^3 of iodine solution and transfer it to conical flask. Add a test tube of water to dilute iodine solution. Note the initial reading of sodium thiosulphate and titrate it against iodine solution till the solution aquires a pale yellow colour. Now add 2 cm^3 of freshly prepared solution of starch as indicator in to titration flask, which gives an intense blue colour. Continue titrating iodine solutions with sodium thiosulphate drop by drop and stirring till the blue colour just disappears. Note the final reading. Repeat the experiment to get three concordant readings.

NO. Experiment	Observation	
TEST FOR NITROGEN		
To one part of the solution (about 1 ml) add few drops of NaOH solution and then small amount freshly prepared $FeSO_4$ solution and boil. Acidify with dil. H_2SO_4 + $FeCl_3$	**Case 1** A purssian blue or green colouration or ppt. is formed.	Nitrogen is indicated.
$6NaCN + FeSO_4 \longrightarrow Na_4[Fe(CN)_6] + Na_2SO_4$ $3Na_4[Fe(CN)_6] + 2Fe_2(SO_4)_3 \longrightarrow Fe_4[Fe(CN)_6]_3 + 6Na_2SO_4$		
	Case 2 red blood colouration	Nitrogen and sulphur both indicated.
$FeCl_3 + 3SCN^- \longrightarrow Fe(SCN)_3 + 3Cl^-$		
TEST FOR SULPHUR		
(i) To the second part of sodium extract, add acetic acid and lead acetate soln.	Black ppt. formed	Sulphur is indicated.
$Na_2S + 2CH_3COOH \longrightarrow 2CH_3COONa + H_2S$ $(CH_3COO)_2Pb + H_2S \longrightarrow PbS + 2CH_3COOH$		

No.	Experiment	Observation	Inference
(ii)	To the second part of sodium extract, add sodium nitro prusside $Na_2[Fe(CN)_5NO] + Na_2S \longrightarrow Na_4[Fe(CN)_5NOS]$	Violet colouration is formed.	Sulphur is present.
	TEST FOR HALOGENS		
	To third portion of sodium extract, add few drops of conc. HNO_3 and boil. Then add silver nitrate solution $AgNO_3 + NaX \longrightarrow AgX + NaNO_3$	1- White ppt. soluble in NH_4OH. 2- Pale yellow ppt. partially. 3- Deep yellow ppt. insoluble in NH_4OH.	Chlorine indicated. Bromine indicated. Iodine indicated. $X = Cl, Br, I$.

NO.	Experiment	Observation	
	TEST FOR PHENOLS		
1-	**Physical state** Note the physical state and colour of organic compound.	Solid having yellow or slight greenish colour	May be phenols or carboxylic acids.
2-	**Odour** Note the odour of the organic compound.	Characteristic odour of carbolic acid.	Phenols may be present.
3-	**Solubility** (a) Dissolve the organic compound in water.	i- Soluble	i- Phenols, aliphatic acids or aromatic bases may be present.
		ii- Insoluble	Aromatic acids, aromatic phenols may be present.
	(b) Dissolve the organic compound in CCl_4 or ether.	Soluble	May be some aromatic compound.
4-	**Ignition Test** Burn the organic compound in a spatula.	Burns with sooty flame.	Aromatic compound is indicated.
5-	**Unsaturation Test** (a) To organic compound	Purple colour of	Unsaturated group

NO.	Experiment	Observation	Inference
	add acidified $KMnO_4$ solution	$KMnO_4$ is not discharged.	($>C=C<$) is absent in organic compound.
	(b) To organic compound add bromine water.	Colour of Bromine is discharged with formation of white or yellow ppt. of poly bromo derivatives.	Phenol is absent.
6-	**Litmus Test**		
	To aqueous solution of organic compound add litmus solution.	Blue litmus turns red.	May be aromatic acid or phenol.
7-	**NaOH solution Test**		
	To organic compound add 10% NaOH solution.	Soluble	May be aromatic acid or phenol.
8-	**Sodium Bicarbonate Test**		
	Add colour solution of 10% $NaHCO_3$ to organic compound.	No effervescense of CO_2 is seen.	Aromatic acid is seen. Phenol is indicated.
9-	**Neutral $FeCl_3$ Test**		
	Add neutral $FeCl_3$ solution to solution of organic compound.	Violet, blue or green colour is formed.	Phenolic group is confirmed.
10-	**Azodyne Test**		
	To aloine, add dil-	Orange red dye is	

	Experiment	Observation	Inference
	ute HCl and $NaNO_2$, cool and then add to alkaline solution of organic compound.	formed.	Phenolic group is confirmed.
11.	**Ring Test** To $1cm^3$ of phenol solution, add one drop of 90% solution of $NaNO_2$, then carefully add $2cm^3$ of concentrated H_2SO_4 along side of test tube.	A ring, green below and red above forms at the junction of two solutions.	Phenol is confirmed.
12.	**Lieber mann's Test:** Dissolve small amount of organic compound in conc. H_2SO_4, add few crystals of $NaNO_2$; red or brown solution; then add NaOH in excess.	Intense blue or green colour is produced.	Phenol is confirmed.

NO.	Experiment	Observation	Interence
	TEST FOR ALDEHYDES		
1-	**Physical State**		
	Note the physical state and colour of organic compound.	Colourless solid	May be phenols or carboxylic acids, aldehydes and ketones.
2-	**Odour**		
	Note the odour of the organic compound	Pungent Smell	May be aldehydes.
3-	**Solubility**		
	(a) Dissolve the organic compound in water	i-Soluble	May be aliphatic acid, aldehydes or ketones.
		ii Insoluble	May be aromatic compounds
	(b) Dissolve the organic compound in CCl_4 or ether.	Soluble	May be some aromatic compounds
4-	**Ignition Test**		
	Burn the organic compound in spatula	(i) Burns with non-sooty flame.	Aliphatic compound is indicated.
		(ii) Burns with sooty flame.	Aromatic compound is indicated.
5-	**Unsaturation Test**		
	(a) To organic compo-	Colour of $KMnO_4$	May be aldehy-

	Observation	Inference
unds add acidified $KMnO_4$ solution. (b) To organic compound add bromine water.	is delolourised. No decolourization of bromine water.	de. Saturated compound is indicated.
6- Litmus Test To aqueous solution of organic compound add litmus solution.	Neutral	Acids and bases are absent. May be aldehydes, Ketones or amide.
7- Action of Sodium Bisulphate Add aqueous sodium bisulphate to organic compound.	Crystalline precipitates are formed.	May be aldehyde or ketone.
8- 2,4-Dinitrophenyl Hydrazine Test Add 2,4-dinitro phenyl hydrazine to organic compound.	Yellow ppt. are formed.	May be aldehyde or ketone.
9- Silver Mirror Test To $5cm^3$ of $AgNO_3$ solution add a very dilute solution of NH_4OH till the precipitates of Ag_2O, first formed dissolves. Add organic compound	A silver mirror is formed.	Aldehyde confirmed.

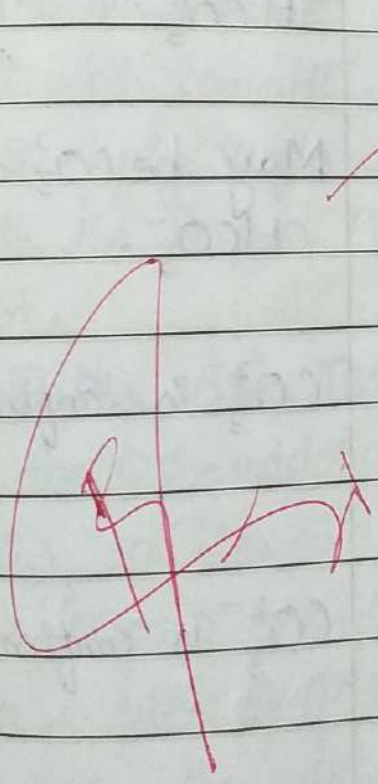
O.	Experiment	Observation	Inference
	to this solution and keep in boiling water bath.		
10-	**Fehling's Solution Test**		
	Add Fehling's solution to the organic compound and warm.	A red ppt. of Cu_2O are formed.	Aldehyde confirmed.

TEST FOR CARBOXYLIC ACIDS

	Observation	Inference
1- Physical State Note the physical state and colour of organic compound	Colourless crystalline solid.	May be carboxylic acid or phenol.
2- Odour Note the odour of the organic compound	Odourless	Carboxylic acid may be present.
3- Solubility (a) Dissolve the organic compound in water.	i- Soluble	i- Aliphatic acids, phenol or aromatic bases may be present.
	ii- Insoluble	Aromatic acids, aromatic phenols may be present.
(b) Dissolve the organic Compound in CCl_4 or ether	Soluble	May be some aromatic compound.
4. Ignition Test Burn the organic compound in a spatula.	(i) Burns with sooty flame. (ii) Burns with non-sooty flame.	Aromatic compound is indicated. Aliphatic compound is indicated.

NO.	Experiment	Observation	Inference
5-	**Unsaturation Test**		
	(a) To organic compound add bromine water.	Colour of bromine is not discharged.	Unsaturated group ($>C=C<$) is absent in organic compound.
	(b) To organic compound add acidified $KmnO_4$ solution.	Purple colour of $KMnO_4$ is not discharged.	Unsaturated group ($>C=C<$) is absent in organic compound.
6-	**Litmus Test**		
	To aqueous solution of organic compound add litmus solution.	Blue litmus turns red.	May be aromatic acid or phenol.
7-	**NaOH Solution Test**		
	To an organic compound add 10% NaOH solution.	Soluble	May be aromatic acid or phenol.
8-	**Sodium Bicarbonate Test**		
	Add cold solution of 10% $NaHCO_3$ to organic compound.	CO_2 is evolved with effervescence.	Phenol is absent. Carboxylic acid is indicated.
9-	**Neutral $FeCl_3$ solution**		
	Add neutral $FeCl_3$ solution to solution of organic compound.	A red colour soln. or yellow ppt. is formed.	Carboxylic acid is confirmed.

NO.	Experiment	Observation	
10-	**Ester Formation Test** To organic compound add few drops of C_2H_5OH and $1cm^3$ of conc. H_2SO_4 and warm. Drop the contents in cold water.	Fruity smell of ester is formed.	Carboxylic acid is confirmed.



NO.	Experiment	Observation	Inference
	SOLUBLE CARBONATE CO_3^{2-}		
1-	Treat the salt with dil. H_2SO_4 in a test tube e.g $Na_2CO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + CO_2 + H_2O$	A colourless, odourless gas evolved with effervescence.	Dilute acid group (CO_3^{2-} HCO_3^- S^{2-} NO_2^- SO_3^{2-} $S_2O_3^{2-}$) is present. May be CO_2 gas.
2-	Pass the gas through lime water. $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$	Lime water turns milky.	May be CO_3^{2-} or HCO_3^-
3-	Salt + Distilled water and shake.	Soluble	May be CO_3^{2-} or HCO_3^-.
	CONFIRMATORY TESTS		
	To O.S. add $BaCl_2$ solution. e.g $Na_2CO_3 + BaCl_2 \longrightarrow BaCO_3 + 2NaCl$	White ppt. in cold state.	CO_3^{2-} is confirmed.
	To O.S add $MgSO_4$ solution. e.g $Na_2CO_3 + MgSO_4 \longrightarrow MgCO_3 + Na_2SO_4$	White ppt. in cold state.	CO_3^{2-} is confirmed.
	To O.S add $CaCl_2$ solution. e.g $Na_2CO_3 + CaCl_2 \longrightarrow CaCO_3 + 2NaCl$.	White ppt. in cold state.	CO_3^{2-} is confirmed.

SODIUM RADICAL Na^+

	Observation	
Dry Tests :-		
(i) Note the colour of the salt	White	Coloured radicals Cu^{2+}, Fe^{2+}, Co^{2+}, Mn^{2+}, Cr^{3+}, Fe^{3+}, Ni^{2+} are absent.
(ii) Flame Test Make the paste of salt with conc. HCl and apply to flame with the help of Pt wire.	Persistent golden yellow flame, invisible through blue glass.	Na^+ indicated.
(iii) Filter Ash Test To the O.S. add $Co(NO_3)_2$ solution and few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	No characteristics colour of ash.	Mg^{2+} Sn^{2+}, Zn^{2+} Al^{3+} are absent.
Group Identification		
1. To the O.S add dil HCl.	No ppt.	1st group (Ag^+ Pb^{2+} Hg_2^{2+}) is absent.

NO.	Experiment	Observation	Inference
2-	To the O.S. add dilute HCl and pass H_2S gas.	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3-	To the O.S. add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No ppt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portions add. Pass H_2S.	No ppt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5-	To the second portion add $(NH_4)_2CO_3$ solution	No ppt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
	The absence of first five groups shows the presence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+)		
	Radical Identification		
6-	To the O.S. add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$.	No white ppt.	Mg^{2+} absent.
7-	Heat the solution with NaOH solution.	No smell of NH_3.	NH_4^+ absent.
8-	To O.S add tartaric acid.	No white ppt.	K^+ absent and hence Na^+ indicated.

Experiment	Observation	
CONFIRMATORY TEST		
9- To O·S· add KOH and solution of potassium pyroantimonate.	White ppt. of sodium pyroantimonate.	Na^+ confirmed.
10- To O·S add zinc uranyl acetate solution.	Yellow ppt. of sodium zinc uranyl acetate.	Na^+ confirmed.
Result : Na_2CO_3		

NO.	Experiment	Observation	Inference
	BICARBONATE HCO_3^-		
1-	Treat the salt with dil. H_2SO_4 in a test tube. e.g $Na_2CO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + CO_2 + H_2O$	A colourless, odourless gas evolved with effervescence.	Dilute acid group (CO_3^{2-} HCO_3^- S^{2-} NO_2^- SO_3^{2-} $S_2O_3^{2-}$) present. May be CO_2 gas.
2-	Pass the gas through lime water. $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$	Lime water turns milky.	May be CO_3^{2-} or HCO_3^-.
3-	Salt + distilled water and shake.	Soluble	May be CO_3^{2-} or HCO_3^-.
	CONFIRMATORY TEST		
4-	To O.S add $BaCl_2$ solution. e.g: $2NaHCO_3 + BaCl_2 \longrightarrow Ba(HCO_3)_2 + 2NaCl$ $Ba(HCO_3)_2 \longrightarrow BaCO_3 + CO_2 + H_2O$.	White ppt. in hot state.	HCO_3^- confirmed.
5-	To O.S. add $MgSO_4$ solution. e.g:- $2NaHCO_3 + MgSO_4 \longrightarrow Mg(HCO_3)_2 + Na_2SO_4$ $Mg(HCO_3)_2 \longrightarrow MgCO_3 + CO_2 + H_2O$	White ppt. in hot state.	HCO_3^- confirmed.
6-	To O.S. add $CaCl_2$ solution.	White ppt. in hot state.	HCO_3^- confirmed

	Observation	
POTASSIUM RADICAL K^+		
Dry Tests		
(i) Note the colour of the salt.	White.	Coloured radicals Cu^{2+}, Fe^{2+} Mn^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, Co^{2+} are absent.
(ii) Flame Test		
Make the paste of salt with conc. HCl and apply to flame with help of Pt wire.	Violet flame, pink through blue glass.	K^+ indicated.
(iii) Filter Ash Test		
To the O.S. add $Co(NO_3)_2$ solution and few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	No characteristic colour of ash.	Mg^{2+} Sn^{2+}, Zn^{2+} Al^{3+} are absent.
Group Identification		
1. To the O.S add dil HCl.	No ppt.	1st group (Ag^+ Pb^{2+} Hg_2^{2+}) is absent.

NO.	Experiment	Observation	Inference
2-	To the O.S add dil. HCl and pass H_2S gas.	No PPt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3-	To the O.S. add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No PPt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portions pass H_2S.	No PPt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} (O^{2+}) is absent
5-	To the second portion add $(NH_4)_2CO_3$ sol.	No PPt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
	The absence of first five groups shows the presence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+).		
	Radical Identification.		
6-	To the O.S add KOH and solution of potassium pyroantimonate.	No white PPt.	Na^+ absent.
7-	To the O.S add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$	No White PPt.	Mg^{2+} absent.

Experiment	Observation	
8. Heat the solution with NaOH solution.	No smell of NH_3.	NH_4^+ absent.
9. To 0.5 add tartaric acid.	White ppt. of potassium tartarate.	K^+ indicated.
CONFIRMATORY TEST		
10. To 0.5 add picric acid solution.	Yellow needle like ppt of potassium picrate.	K^+ confirmed.
11. To 0.5 add acetic acid and sodium cobaltinitite.	Yellow ppt. of $K_3[(O(NO_2)_6]$	K^+ confirmed.

Result : $KHCO_3$

NO.	Experiment	Observation	Inference
	CHLORIDE Cl^-		
1-	Treat the salt with dil. H_2SO_4 in a test tube and heat.	No gas evolved.	Dilute acid group (CO_3^{2-} HCO_3^- SO_3^{-2} NO_2^- S^{2-}) is absent.
2-	To the salt add conc. H_2SO_4 and heat.	A gas which is colourless with irritating smell evolved.	Conc. H_2SO_4 group (Cl^- Br^- I^- NO_3^- $C_2O_4^{2-}$ CH_3COO^-) is present. May be HCl gas.
3-	Test the gas with a rod dipped in NH_4OH solution.	White dense fumes of NH_4Cl.	Cl^- is indicated.
	CONFIRMATORY TEST		
4-	To the O.S add $AgNO_3$ solution.	White ppt. soluble in NH_4OH but insoluble in dil. HNO_3.	Cl^- confirmed.
5-	**Chromyl Chloride test**		
	To small amount of solid salt, add equal amount of solid. $K_2Cr_2O_7$ + 1 ml of Conc. H_2CO_4. Heat the mixture. Orange	Yellow ppt. of lead Chromate $PbCrO_4$.	Cl^- confirmed

Experiment	Observation	Infer
brown fumes will be evolved. Dissolve orange brown fumes of chromyl chloride (CrO_2Cl_2 in NaOH solution and then add lead acetate solution.).		
1. Heat solid mixture of salt and MnO_2 with Conc. H_2SO_4. e.g:- $2NaCl + MnO_2 + H_2SO_4 \longrightarrow Na_2SO_4 + MnSO_4 + Cl_2 + 2H_2O$.	Yellowish green fumes of Cl_2 evolved.	Cl^- confirmed.

NO.	Experiment	Observation	Inference
	SODIUM RADICAL Na^+		
	Dry Tests :-		
	(i) Note the colour of salt.	White	Coloured radicals Cu^{2+}, Fe^{2+}, Co^{2+}, Mn^{2+}, Cr^{3+}, Fe^{3+}, Ni^{2+} are absent.
	(ii) Flame Test		
	Make the paste of Salt with conc. HCl and apply to flame with the help of Pt wire.	Persistence golden yellow flame, invisible through blue glass.	Na^+ indicated.
	(iii) Filter ash Test		
	To the O.S add $Co(NO_3)_2$ solution and few drops of conc. HNO_3, Dip a piece of filter paper in the above mixture, Dry and ignite. Note colour of ash formed.	No characteristics colour of ash.	Mg^{2+}, Sn^{2+}, Zn^{2+} Al^{3+} are absent.
	Group Identification		
1.	To the O.S add dil HCl.	No ppt.	1st group (Ag^+ Pb^{2+} Hg_2^{2+}) is absent.

	Observation	Inference
2- To the O.S. add dil. HCl and passes H_2S gas.	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3- To the O.S add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No ppt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4- Make two portions of above solution. To one portions add pass H_2S.	No PPt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5- To the second portion add $(NH_4)_2CO_3$ solution.	No PPt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.

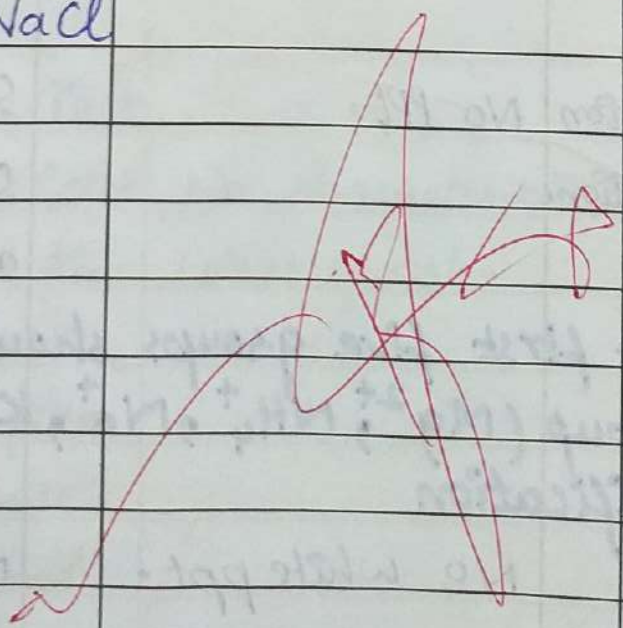
The absence of first five groups shows the presence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+)

Radical Identification

1. To the O.S. add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$	NO white ppt.	Mg^{2+} absent.
2. Heath the solution with NaOH solution	NO smell of NH_3	NH_4^+ absent.

	Experiment	Observation	Inference
8-	To O.S add tartaric acid.	No white ppt.	K^+ absent and hence Na^+ indicated.
	CONFIRMATORY TEST		
9-	To O.S add KOH and Solution of potassium pyroantimonate.	White ppt of sodium pyroantimonate.	Na^+ confirmed.
10-	To O.S add zinc uranyl acetate solution.	Yellow ppt. of sodium zinc uranyl acetate.	Na^+ confirmed.

Result = NaCl



Experiment	Observation	Inference
BROMIDE Br^-		
1- Treat the salt with dil. H_2SO_4 in a test tube and heat.	No gas evovoled	Dilute acid group (CO_3^{2-} HCO_3^- SO^{2-} $SO_2O_3^{2-}$ NO_2^- S^{3-}) is absent.
2- To the salt add conc. H_2SO_4 and heat.	White fumes of HBr along reddish brown vapours having pungent smell is evolved.	Conc. H_2SO_4 group (Cl^- Br^- I^- NO_3^- $C_2O_4^{2-}$ $(CH_3COO)^-$) is present. May be Br_2 gas.
3- Pass the gas through $FeSO_4$ solution.	No effect on $FeSO_4$ solution.	Br^- is indicated.
CONFIRMATORY TEST		
4- To the O.S add $AgNO_3$ solution	Light yellow ppt. soluble in dil. HNO_3 but partially soluble in NH_4OH	Br^- is confirmed.
5- **Layer Test** To the O.S add CS_2, $KMnO_4$ crystals and dil H_2SO_4 and shake.	CS_2 layer turns orange.	Br^- is confirmed
6- To the salt add MnO_2 and conc. H_2SO_4 & heat.	Deep reddish brown Br_2 gas, is evolved from the bottom test.	Br^- confirmed.

NO.	Experiment	Observation	Inference
	POTASSIUM RADICAL K^+		
	Dry Tests		
	(i) Note the colour of the salt.	White	Coloured radicals Cu^{2+}, Fe^{2+} Mn^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, CO^{2+} are absent.
	(ii) Flame Test		
	Make the paste of salt with conc. HCl and apply to flame with help of Pt wire.	Violet flame, pink through blue glass.	K^+ indicated.
	(iii) Filter Ash Test		
	To the O.S. add Co $(NO_3)_2$ solution and few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	No characteristics colour of ash.	Mg^{2+} Sn^{2+}, Zn^{2+} Al^{3+} are absent.
	Group Identification		
1-	To the O.S add dil. HCl	No ppt.	1st group (Ag^+ Pb^{2+} Hg_2^{2+}) is absent

		Observation	Inference
2-	To the O·S add dil. HCl and pass H_2S gas.	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3-	To the O·S. add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No ppt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portions pass H_2S.	No ppt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5-	To the second portion add $(NH_4)_2CO_3$.	No ppt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
The absence of first five groups show the presence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+).			
Radical Identification			
1-	To the O·S add KOH and solution of potassium pyroantimonate.	No white ppt.	Na^+ absent.
2-	To the O·S add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$	No white ppt.	Mg^{2+} absent.

NO.	Experiment	Observation	Inference
8-	Heat the solution with NaOH solution.	No smell of NH_3.	NH_4^+ absent.
9-	To O.S add tartaric acid.	White ppt. of potassium tartarate.	K^+ indicated.
	CONFIRMATORY TEST		
10-	To O.S add picric acid solution.	Yellow needle like ppt of potassium picrate.	K^+ confirmed.
11-	To O.S add acetic acid and sodium cobaltinitite.	Yellow ppt of $K_3[CO(NO_2)_6]$	K^+ confirmed.
	Result : KBr		

Experiment	Observation	Inference
SULPHATE SO_4^{2-}		
1- Treat the salt with dil. H_2SO_4 in a test tube and heat.	No gas evolved.	Dilute acid group (CO_3^{2-} HCO_3^- SO_3^{2-} $S_2O_3^-$ NO_2^- S^{2-}) is absent.
2- To the salt add conc. H_2SO_4 and heat.	No gas evolved.	Conc. H_2SO_4 group (Cl^- Br^- I^- NO_3^- $C_2O_4^{2-}$ CH_3COO^-) is absent.
3- To the O.S add $BaCl_2$ solution.	White ppt. insoluble in Conc. HCl	SO_4^{2-} indicated.
CONFIRMATORY TEST		
4- To the O.S add lead acetate $(CH_3COO)_2Pb$ solution.	White ppt. of $PbSO_4$ soluble in ammonium acetate.	SO_4^{2-} confirmed.
5- To the O.S add $SrCl_2$ solution.	White ppt. of $SrSO_4$ soluble in all acids.	SO_4^{2-} confirmed.

NO.	Experiment	Observation	Inference
	FERRIC RADICAL Fe^{2+}		
	Dry Tests		
(i)	Note the colour of salts.	light green.	Fe^{2+} indicated.
(ii)	**Flame Test**		
	Make the paste of salt with conc. HCl and apply to flame with the help of Pt wire.	No characteristic colour of flame.	Ca^{2+}, Ba^{2+}, Sr^{2+}, Na^{+}, K^{+} are absent.
(iii)	**Filter Ash test**		
	To the O.S add $CO(NO_3)_2$ solution and few drops of solution and few drops of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	No characteristics colour of ash.	Sn^{2+} Al^{3+} Zn^{2+} Mg^{2+} are absent
	Group Identification		
1-	To the O.S add dil HCl.	No ppt.	1st group (Ag^{+} Pb^{2+} Hg_2^{2+}) is absent.
2-	To the O.S add dil HCl. and pass H_2S gas.	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.

Experiment	Observation	Inference
3. To the O.S add 2-3 drops of HNO_3 Boil, add 1-2 gm solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	Reddish brown ppt of $Fe(OH)_3$.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is present. May be Fe^{2+} or Fe^{3+}.
Radical Identification		
1. To the fresh O.S add $K_3[Fe(CN)_6]$ solution.	Dark blue ppt of $Fe_3[Fe(CN)_6]_2$	Fe^{2+} indicated, and confirmed.
CONFIRMATORY TEST		
1. To the O.S add NaOH solution.	Greenish white ppt of $Fe(OH)_2$.	Fe^{2+} confirmed.
2. To the O.S add Na_2CO_3	White ppt of $FeCO_3$	Fe^{2+} confirmed.
Result = $FeSO_4$		

NO.	Experiment	Observation	Inference
	CHLORIDE Cl^-		
1-	Treat the salt with dil. H_2SO_4 in a test tube and heat.	No gas evolved.	Dilute acid group (CO_3^{2-} HCO_3^- SO_3^{2-} NO_2^- S^{2-}) is absent.
2-	To the salt add conc. H_2SO_4 and heat.	A gas which is colourless with irritating smell evolved.	Conc. H_2SO_4 group (Cl^- Br^- I^- NO_3^- $C_2O_4^-$ CH_3COO^-) is present. May be HCl gas.
3-	Test the gas with a rod dipped in NH_4OH solution.	White dense fumes of NH_4Cl.	Cl^- is indicated.
	CONFIRMATORY TEST		
4-	To the O.S add $AgNO_3$ solution.	White ppt soluble in NH_4OH but insoluble in dil HNO_3.	Cl^- confirmed.
5-	**Chromyl Chloride test**		
	To small amount of solid salt, add equal amount of solid $K_2Cr_2O_7$ + 1 ml of Conc. H_2SO_4. Heat the mixture. Orange	Yellow ppt. of lead Chromate $PbCrO_4$.	Cl^- confirmed.

Experiment	Observation	Inference
brown fumes will be evolved. Dissolve orange brown fumes of chromyl chloride (CrO_2Cl_2 in NaOH solution and then add lead acetate solution).		
6- Heat solid mixture of salt and MnO_2 with Conc. H_2SO_4	Yellowish green fumes of Cl_2 evolved.	Cl^- confirmed.

e.g:-

$$2NaCl + MnO_2 + H_2SO_4 \longrightarrow Na_2SO_4 + MnSO_4 + Cl_2 + 2H_2O$$

NO.	Experiment	Observation	Inference
	FERRIC RADICAL Fe^{3+}		
	Dry Tests		
	(i) Note the colour of the salt.	Yellow or dark brownish yellow.	Fe^{3+} indicated.
	(ii) Flame Test		
	Make the paste of salt with conc. HCl and apply to flame with help of Pt wire.	No Characteristics colour of flame.	Ca^{2+}, Ba^{2+}, Sr^{2+}, Na^{+}, K^{+} are absent.
	(iii) Filter Ash Test		
	To the O.S. add $Co(NO_3)_2$ solution & few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash form.	No Characteristics colour of ash.	Sn^{2+} Al^{3+} Zn^{2+} Mg^{2+} are absent.
	Group Identification		
1-	To the O.S add dil. HCl.	No ppt.	1st group (Ag^{+} Pb^{2+} Hg_2^{2+}) is absent.
2-	To the O.S add dil. HCl and pass H_2S gas	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is

Experiment	Observation	Inference
3. To the O.S add 2-3 drops of HNO_3. Boil, add 1-2 gm solid NH_4Cl boil, cool and then NH_4OH till smell of NH_3.	Reddish brown ppt of $Fe(OH)_3$.	absent. III rd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is present. May be Fe^{2+} or Fe^{3+}
Radical Identification		
4. To the fresh O.S. add $K_4[Fe(CN)_6]$ sol.	Prussian blue ppt. of $Fe_4[Fe(CN)_6]_3$.	Fe^{3+} indicated and confirmed.
CONFIRMATORY TESTS		
1. To the O.S add NaOH solution.	Reddish brown ppt of $Fe(OH)_3$.	Fe^{3+} confirmed.
4. To the O.S add ammonium thiocyanate	Blood red colouration of $[Fe(SCN)_3]$.	Fe^{3+} confirmed.

Result = $FeCl_3$

NO.	Experiment	Observation	Inference
	ACETATE CH_3COO^-		
1-	Treat the salt with dil. H_2SO_4 in a test tube and heat.	No gas evolved.	Dilute acid group (CO_3^{2-} HCO_3^- SO_3^{2-} $S_2O_3^{2-}$ NO_2^- S^{2-}) is absent.
2-	To the salt add conc. H_2SO_4 and heat.	Colourless vapours with vinegar like smell evolves.	Conc. H_2SO_4 group (Cl^- Br^- I^- NO_3^- $C_2O_4^{2-}$ CH_3COO^-) is present. CH_3COO^- is indicated.
	CONFIRMATORY TEST		
3-	To the O.S add neutral $FeCl_3$ sol.	Red colour produced.	CH_3COO^- confirmed.
4-	To one portion of the above solution, add water and heat	Red ppt of basic ferric acetate.	CH_3COO^- confirmed.
5-	To the O.S + C_2H_5OH + Conc. H_2SO_4 warm gently on a water bath and pour out the liquid into cold water.	Fruity smell of ethyl acetate $CH_3COOC_2H_5$.	CH_3COO^- confirmed.

AMMONIUM CHLORIDE NH_4^+

	Observation	Inference
Dry Tests		
(i) Note the colour of the salt.	White.	Coloured radicals Cu^{2+}, Fe^{2+}, Mn^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, Co^{2+} are absent.
(ii) Flame Test		
Make the paste of salt with conc. HCl and apply to flame with help of Pt wire.	No characteristic colour of flame.	Ca^{2+}, Ba^{2+}, Sr^{2+}, Na^+, K^+ are absent.
(iii) Filter Ash Test		
To the O.S. add Co $(NO_3)_2$ solution and few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	No characteristics colour of ash.	Mg^{2+} Sn^{2+}, Zn^{2+} Al^{3+} are absent.
Group Identification		
To the O.S add dil. HCl.	No ppt.	1st group (Ag^+ Pb^{2+} Hg_2^{2+}) is absent.
To the O.S add dil. HCl and pass H_2S gas	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+}

NO.	Experiment	Observation	Interence
			Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3-	To the O.S add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No ppt.	III 3rd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portions pass H_2S.	No ppt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5-	To the second portion add $(NH_4)_2CO_3$ sol.	No ppt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
	The absence of first five groups shows the prezence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+)		
	Radical Identification		
6-	To the O.S add KOH and solution of potassium pyroantimonate	No white ppt.	Na^+ absent.
7-	To O.S add tartaric acid.	No white ppt.	K^+ absent.
8-	To O.S add solid NH_4Cl boil, cool & add NH_4OH.	No white ppt.	Mg^{2+} absent.

	Experiment	Observation	Inference
1-	Heat with the sol NaOH.	A pungent smell of NH_3 comes which gives white dense fumes with HCl.	NH_4^+ indicated
	CONFIRMATORY TEST		
2-	To O.S add NaOH and Nessler's reagent K_2HgI_4.	Reddish brown ppt.	NH_4^+ confirmed.
11-	To O.S. add picric acid solution.	Yellow needle like ppt. solube in dil H_2SO_4.	NH_4^+ confirmed.
12-	To O.S add sodium cobaltinitite solution.	Yellow ppt.	NH_4^+ confirmed.

Result = CH_3COONH_4

	Experiment	Observation	Inference
	CHLORIDE Cl^-		
1-	Treat the salt with dil. H_2SO_4 in a test tube and heat.	No gas evolved	Dilute acid group (CO_3^{2-} HCO_3^- SO_3^{-2} NO_2^- S^{2-}) is absent.
2-	To the salt add conc. H_2SO_4 and heat.	A gas which is colourless with irritating smell evolved.	Conc. H_2SO_4 group (Cl^- Br^- I^- NO_3^- $C_2O_4^-$ CH_3COO^-) is present. May be HCl gas.
3-	Test the gas with a rod dipped in NH_4OH solution.	White dense fumes of NH_4Cl.	Cl^- is indicated.
	CONFIRMATORY TEST		
4-	To the O.S add $AgNO_3$ solution.	White ppt soluble in NH_4OH but insoluble in dil HNO_3.	Cl^- confirmed.
5-	**Chromyl Chloride Test**		
	To small amount of solid salt, add equal amount of solid. $K_2Cr_2O_7$ + 1 ml of Conc. H_2SO_4 . Heat the mixture. Orange brown fumes will be evolved. Dissolve	Yellow ppt. of lead chromate $PbCrO_4$.	Cl^- confirmed.

Experiment		Observation	Inference
	orange brown fumes of chromyl chloride CrO_2Cl_2 in NaOH solution and then add lead acetate solution.		
6-	Heat solid mixture of salt and MnO_2 with Conc. H_2SO_4	Yellowish green fumes of Cl_2 evolved.	Cl^- confirmed.

NO.	Experiment	Observation	Inference
	ZINC RADICAL Zn^{2+}		
	Dry Tests		
	(i) Note the colour of the salt.	White	Coloured radicals Cu^{2+}, Fe^{2+} Mn^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, CO^{2+} are absent
	(ii) Flame Test		
	Make the paste of salt with conc. HCl and apply to flame with help of Pt wire.	No characteristic colour of flame.	Ca^{2+}, Ba^{2+}, Sr^{2+}, Na^{+}, K^{+} are absent.
	(iii) Filter Ash Test		
	To the O.S add $CO(NO_3)_2$ solution & few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note the colour of ash formed.	Green coloured ash.	Zn^{2+} indicated.
	Group Identification		
1-	To the O.S add dil. HCl	No ppt.	1st group (Ag^{+} Pb^{2+} Hg_2^{2+}) is absent.

Experiment	Observation	Inference
2. To the O.S add dil. HCl and pass H_2S gas.	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3. To the O.S add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No ppt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4. Pass H_2S to the above solution of (3)	Dirty white ppt. & salt is also white.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is present. Zn^{2+} indicated.
CONFIRMATORY TEST		
1. To the O.S. add NaOH solution.	White ppt. soluble in excess of NaOH.	Zn^{2+} indicated.
2. To the O.S. add di-sodium hydrogen phosphate solution.	White ppt. of $Zn_3(PO_4)_2$.	Zn^{2+} indicated.
3. To the fresh O.S add $K_4[Fe(CN)_6]$ solution.	$Zn_3(PO_4)_2 + 4NaCl + 2HCl$. White ppt.	Zn^{2+} indicated.

Result: $ZnCl_2$

NO.	Experiment	Observation	Inference
	SULPHATE SO_4^{2-}		
1-	Treat the salt with dil. H_2SO_4 in a test tube and heat.	No gas evolved.	Dilute acid group (CO_3^{2-} HCO_3^- SO_3^{2-} $S_2O_3^-$ NO_2^- S^{2-}) is absent.
2-	To the salt add conc. H_2SO_4 and heat.	No gas evolved.	Conc. H_2SO_4 group (Cl^- Br^- I^- NO_3^- $C_2O_4^{2-}$ (H_3COO^-) is absent.
3-	To the O.S add $BaCl_2$ solution.	White ppt. insolube in conc. HCl.	SO_4^{2-} indicated.
	CONFIRMATORY TEST		
4-	To the O.S add lead acetate $(CH_3COO)_2Pb$ solution.	White ppt. of $PbSO_4$ soluble in ammonium acetate.	SO_4^{2-} confirmed.
5-	To the O.S add $SrCl_2$ solution.	White ppt. of $SrSO_4$ soluble in all acids.	SO_4^{2-} confirmed.

Experiment	Observation	Inference
MAGNESIUM RADICAL Mg^{2+}		
Dry Test		
(i) Note the colour of the salt.	White.	Coloured radicals Cu^{2+}, Fe^{2+} Mn^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, Co^{2+} are absent.
(ii) Flame Test		
Make the paste of salt with conc. HCl & apply to flame with help of Pt wire.	No characteristics colour of flame.	Ca^{2+}, Ba^{2+}, Sr^{2+}, Na^{+}, K^{+} are absent.
(iii) Filter Ash Test		
To the O.S add $Co(NO_3)_2$ solution and few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	Pink colour ash is formed.	Mg^{2+} indicated.
Group Identification		
To the O.S add dil HCl.	No ppt.	Ist group (Ag^{+} Pb^{2+} Hg_2^{2+}) is absent

NO.	Experiment	Observation	Inference
2-	To the O.S add dil HCl and pass H_2S gas.	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3-	To the O.S add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No ppt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portion pass H_2S.	No ppt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5-	To the second portion add $(NH_4)_2CO_3$ solution.	No ppt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
	The absence of first five groups shows the presence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+).		
	Radical Identification		
6-	Heat the solution with NaOH solution.	No smell of NH_3.	NH_4^+ absent.
7-	To the O.S add KOH and solution of potassium pyroantimonate $K_2H_2Sb_2O_7$	No white ppt.	Na^+ absent.

No.	Experiment	Observation	Inference
8-	To the O·S add tartaric acid	No white ppt.	K^+ absent.
9-	To the O·S add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$	White ppt.	Mg^{2+} indicated.
	CONFIRMATORY TEST		
10-	To O·S add NaOH	White ppt. of $Mg(OH)_2$.	Mg^{2+} indicated.
11-	To O·S add Na_2CO_3	White ppt. of $MgCO_3$	Mg^{2+} confirmed.
12-	Heat the salt with equal quantity of Na_2CO_3 in a cavity, add $Co(NO_3)_2$ to residue left and heat again.	Pink coloured residues.	Mg^{2+} confirmed.

Result = $MgSO_4$.

O.	Experiment	Observation	Inference
	SULPHIDE S^{2-}		
1-	Treat the salt with dil. H_2SO_4 in a test tube.	A colourless gas with a smell of rotten egg evolves.	Dilute acid group (CO_3^{2-} HCO_3^- S^{2-} NO_2^- SO_3^{2-} $S_2O_3^{2-}$) is present. May be H_2S gas.
2-	Pass the gas through lead acetate solution.	Solution turns black.	May be S^{2-}
	CONFIRMATORY TEST		
3-	To the O.S add $AgNO_3$ solution.	Black ppt. which is soluble in dil. nitric acid.	S^{2-} confirmed.
4-	To the O.S. add lead acetate $(CH_3COO)_2Pb$ solution.	A black ppt. of lead sulphide PbS.	S^{2-} confirmed.
5-	To the O.S add NH_4OH and sodium nitroprusside	Violet colouration.	S^{2-} confirmed.

	Observation	
POTASSIUM RADICAL K^+		
Dry Test		
(i) Note the colour of the salt.	White.	Coloured radicals, Cu^{2+}, Fe^{2+}, Mn^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, Co^{2+} are absent.
(ii) Flame Test		
Make the paste of salt with conc. HCl and apply to flame with the help of Pt wire.	Violet flame, pink through blue glass.	K^+ indicated.
(iii) Filter Ash Test		
To the O.S add $Co(NO_3)_2$ solution and few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	No characteristic colour of ash.	Mg^{2+} Sn^{2+}, Zn^{2+} Al^{3+} are absent.
Group Identification.		

NO.	Experiment	Observation	Inference
1-	To the O.S add dil HCl.	No ppt.	1st group (Ag^+ Pb^{2+} Hg_2^{2+}) is absent.
2-	To the O.S add dil HCl and pass H_2S gas.	No ppt.	IInd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3-	To the O.S. add 1-2 gm of solid NH_4Cl boil, cool and then NH_4OH till smell of NH_3.	No ppt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portion pass H_2S solution.	No ppt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5-	To the second portion add $(NH_4)_2CO_3$ solution.	No ppt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
	The absence of first five groups shows the presence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+)		
	Radical Identification		
6-	To the O.S add KOH and solution of potassium pyro antimonate.	No white ppt.	Na^+ absent.

No.	Experiment	Observation	
7-	To the O.S add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$.	No white ppt.	Mg^{2+} absent.
8-	Heat the solution with NaOH solution	No smell of NH_3.	NH_4^+ absent.
9-	To O.S add tartaric acid.	White ppt. of potassium tartarate.	K^+ indicated
	CONFIRMATORY TEST		
10-	To O.S add picric acid solution.	Yellow needle like ppt of potassium picrate.	K^+ confirmed
11-	To O.S add acetic acid and sodium cobaltinitite solution.	Yellow ppt. of $K_3[Co(NO_2)_6]$	K^+ confirmed.

Result - K_2S.

NO.	Experiment	Observation	Inference
	THIOSULPHATE $S_2O_3^{2-}$		
1-	Treat the salt with dil. H_2SO_4 in a test tube.	A colourless gas with smell of burning sulphur.	Dilute acid group CO_3^{2-} HCO_3^- S^{2-} NO_2^- SO_3^{2-} $S_2O_3^{2-}$ is present. May be SO_2 gas.
2-	Pass the gas through $K_2Cr_2O_7$ solution.	solution turns green.	May be SO_3^{2-} or $S_2O_3^-$.
3-	Note the clour of the contents of the test tube.	Light Yellow ppt. of sulphur.	$S_2O_3^{-2}$ indicated.
	CONFIRMATORY TEST		
4-	To O.S add $AgNO_3$ solution.	White ppt which is changed to yellow, orange, brown and finally black.	$S_2O_3^{-2}$ confirmed.
5-	To the O.S. add $FeCl_3$ solution.	A purple colouration which quickly fades away.	$S_2O_3^{-2}$ confirmed.
6-	To the O.S add lead acetate.	A white ppt. of lead thiosulphate (PbS_2O_3) which blakens on heating due to formation of lead sulphide PbS.	$S_2O_3^{2-}$ confirmed

No.	Experiment	Observation	Inference
1-	To the O·S. add iodine solution dropwise.	The violet colour of iodine disappears due to formation of colourless ion.	$S_2O_3^{2-}$ confirmed

O.	Experiment	Observation	Inference
	SODIUM RADICAL Na^+		
	Dry Test		
	(i) Note the colour of the salt.	White	Coloured radicals Cu^{2+}, Fe^{2+}, Co^{2+}, Mn^{2+}, Cr^{3+}, Fe^{3+}, Ni^{2+} are absent.
	(ii) Flame Test		
	Make the paste of salt with conc. HCl and apply to flame with the help of Pt wire.	Persistence golden yellow flame, invisible through blue glass.	Na^+ indicated.
	(iii) Filter Ash Test		
	To the O.S add Co $(NO_3)_2$ solution and few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash formed.	No characteristic colour of ash.	Mg^{2+} Sn^{2+} Zn^{2+} Al^{3+} are absent.
	Group Identification		
1-	To the O.S add dil HCl.	No ppt	1st group (Ag^+ Pb^{2+} Mg_2^{2+}) is

NO.	Experiment	Observation	Inference
2-	To the O.S add dil HCl and pass H_2S gas.	No ppt.	absent. II nd group (Hg^{2+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent.
3-	To the O.S. add 1-2 gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3	No ppt.	III rd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portions. Pass H_2S.	No PPt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5-	To the second portion add $(NH_4)_2CO_3$ solution	No PPt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
	The absence of first five groups shows the presence of 6th group (Mg^{2+}, NH_4^+, Na^+, K^+)		
	Radical Identification.		
6-	To the O.S. add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$.	No white ppt.	Mg^{2+} absent.
7-	Heat the solution with NaOH solution	No white smell of NH_3.	NH_4^+ absent

NO.	Experiment	Observation	Inference
8-	To O.S add tartaric acid.	No white ppt.	K^+ absent and hence Na^+ indicated.
	CONFIRMATORY TEST		
9-	To O.S add KOH and solution of potassium pyroantimonate.	White ppt. of sodium pyroantimonate.	Na^+ confirmed.
10-	To O.S add zinc uranyl acetate solution.	Yellow ppt. of sodium zinc uranyl acetate.	Na^+ confirmed.

Result: NaS_2O_3.

Experiment	Observation	
NITRITE NO_2^-		
1- Treat the salt with dil. H_2SO_4 in a test tube.	Reddish brown fumes with pungent smell comes out.	Dilute acid group (CO_3^{2-} HCO_3^- S^{2-} NO_2^- SO_3^{2-} $S_2O_3^{2-}$) present. May be NO_2 gas. May be NO_2^-
2- Pass the gas through ferrous sulphate solution.	$FeSO_4$ solution turns black $[Fe(NO)SO_4]$	
CONFIRMATORY TEST		
3- To the O.S add freshly prepared $FeSO_4$ and then add dil H_2SO_4.	Solution turns black.	NO_2^- confirmed
4- To the O.S add acidified $KMnO_4$ solution.	Colour of $KMnO_4$ is discharged.	NO_2^- confirmed
5- To the O.S. add KI, dil H_2SO_4 & few drops of starch solution.	A deep blue colouration appears due to formation of [Starch-I_2] complex. Blue Colouration.	NO_2^- confirmed
6- To the O.S. add diphenyl amine solution.		

NO.	Experiment	Observation	Inference
	SODIUM RADICAL Na^+		
	Dry Test		
	(i) Note the colour of the salt.	White.	Coloured radicals Cu^{2+}, Fe^{2+} CO^{2+} Mn^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+} are absent.
	(ii) Flame Test		
	Make the paste of salt with conc. HCl and apply to flame with help of Pt wire.	Persistence golden yellow flame, invisible through blue glass.	Na^+ indicated.
	(iii) Filter Ash Test		
	To the O.S. add Co $(NO_3)_2$ solution & few drops of conc. HNO_3. Dip a piece of filter paper in the above mixture, dry and ignite. Note colour of ash form.	No characteristic colour of ash formed.	Mg^{2+} Sn^{2+}, Zn^{2+} Al^{3+} are absent.
	Group Identification		
1-	To the O.S add dil HCl.	No PPt.	1st group (Ag^+, Pb^{2+} Hg_2^{2+}) is absent.

NO.	Experiment		
2-	To the O·S add dil HCl and pass H_2S gas.	No ppt.	IInd group (Hg^{+} Cu^{2+} Bi^{3+} Cd^{2+} As^{3+} Sn^{2+} Sn^{4+} Sb^{3+}) is absent
3-	To the O·S add 1-2gm of solid NH_4Cl boil, cool and then add NH_4OH till smell of NH_3.	No ppt.	IIIrd group (Al^{3+} Fe^{2+} Fe^{3+} Cr^{3+}) is absent.
4-	Make two portions of above solution. To one portion pass H_2S.	No ppt.	4th group (Zn^{2+} Mn^{2+} Ni^{2+} Co^{2+}) is absent.
5-	To the secard portion add $(NH_4)_2CO_3$ solution	No ppt.	5th group (Ba^{2+} Sr^{2+} Ca^{2+}) is absent.
	The absence of first five groups shows the presence of 6th group (Mg^{2+}, NH_4^{+}, Na^{+}, K^{+})		
	Radical Identification		
6-	To the O·S add solid NH_4Cl boil, cool, add NH_4OH and $(NH_4)_2HPO_4$.	No white PPt.	Mg^{2+} absent
7-	Heat the solution with NaOH solution.	No smell of NH_3.	NH_4^{+} absent.

Experiment	Observation	Inference
8- To O·S add tartaric acid.	No white ppt.	K^+ absent and hence Na^+ indicated.
CONFIRMATORY TEST		
9- To O·S add KOH and solution of potassium pyroantimonate.	White ppt. of sodium pyroantimonate.	Na^+ confirmed.
10- To O·S. add zinc uranyl acetate solution.	Yellow ppt. of sodium zinc uranyl acetate.	Na^+ confirmed.

Result = $NaNO_2$ is confirmed.

16/04/22