LABORATORY MANUAL

ON

ENGINEERING CHEMISTRY

Pr – 2 (b)

FOR 1ST AND 2ND SEMESTER

COMMON TO ALL BRANCHES

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EXPERIMENT NO. 01

Aim of the Experiment: Preparation of Carbon Dioxide gas and study its properties in laboratory.

Objectives of the Experiments:

At the end of this experiment the students will be able to:

1. Specify the apparatus and chemicals to be used for the preparation of CO_2 gas in the laboratory.
2. Detect the presence of CO_2 gas.
3. Know the physical and chemical properties of CO_2 gas.

Apparatus Required:

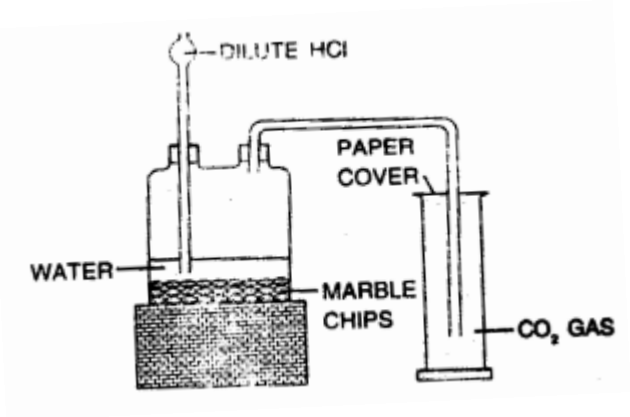
1. Woulf's bottle
2. Thistle funnel
3. Gas jar with lid
4. Delivery tube
5. Rubber Cork for fitting
6. Few test tubes for conducting tests.

Chemicals Required:

1. Marble Chips ($CaCO_3$)
2. Dilute HCl
3. Blue Litmus Paper
4. Lime water
5. Magnesium ribbon
6. Phenolphthalein solution.

Theory: In laboratory carbon dioxide gas is prepared by the action of Dil. HCl on marble chips ($CaCO_3$).

Chemical Equations: $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2\uparrow$



Procedure:

- Take a Woulf's bottle fitted with a rubber cork, thistle funnel and a delivery tube.
- Ensure that fisting of cork is air tight, if required wax or grease may be used.
- Add a few marble chips and cover them water.
- Ensure that the lower end of the thistle funnel is dipped in water and not touching the bottom of the Woulf's bottle.
- Add dil. HCl through the thistle funnel.
- Collect carbon dioxide gas by the upward displacement of air.
- Study the properties of the gas by collecting the gas in different test tubes.

Safety Precautions:

(a) The fittings should be air tight.
(b) The narrower end of the thistle funnel must remain deep inside the solution.
(c) Addition of excess of acid should be avoided
(d) The gas should be collected for study after removing air from the apparatus.

Physical Properties

Sl No	Experiment	Observation	Inference
1	Observe the colour of the gas.		
2	Observe the odour of the gas.		
3	Enter a glowing splinter into a test full of CO_2 gas.		
4	Invert a test tube full of CO_2 gas over another empty test tube containing air. Then add a little lime water into the test tube containing air initially.		
5	Collect the gas in a test tube half-filled with water. Shake the test tube vigorously by putting the thumb at its mouth and remove the thumb and observe the level/volume of water in the test tube.		

Chemical Properties

Sl No	Experiment	Observation	Inference
1	Show a piece of moist blue litmus paper to the gas.		
2	Pass the gas through 2 – 3 ml of a very dilute solution of NaOH containing a drop of phenolphthalein solution and observe he colour change.		
3	(a) Pass the gas through lime water. (b) Pass the gas in excess. (c) Boil the solution.		
4	Introduce a burning magnesium ribbon into a jar containing CO_2		

EXPERIMENT NO. 02

Aim of the Experiment: Preparation of ammonia gas and study its Properties in laboratory.

Objectives of the Experiments:

At the end of this experiment the students will be able to:

1. Specify the apparatus and chemicals to be used for the preparation of NH_3 gas in the laboratory.
2. Detect the presence of NH_3 gas.
3. Know the physical and chemical properties of NH_3 gas.

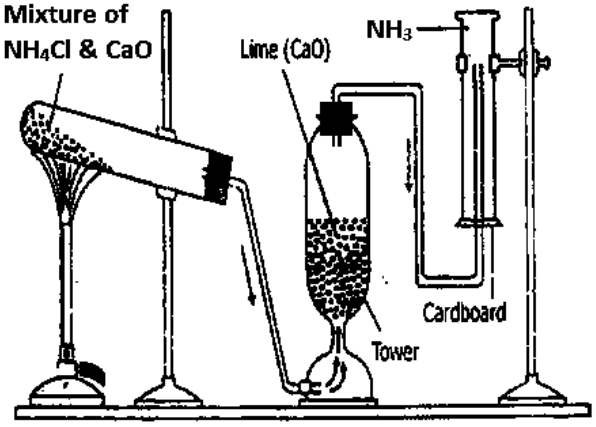
Apparatus Required:

1. Hard glass test tube
2. Delivery tube.
3. Gas jar with lid
4. Delivery tube
5. Rubber Cork for fitting
6. Few test tubes for conducting tests.
7. Bunsen burner.

Chemicals Required:

1. Solid ammonium chloride (NH_4Cl)
2. Dry slaked like [$Ca(OH)_2$] or quick lime (CaO)

Theory: In laboratory ammonia gas is prepared by heating solid ammonium chloride with dry slaked lime or quicklime in 1:3 ratio. The gas is collected by the downward displacement of air.



Chemical Equations:

$$2NH_4Cl + Ca(OH)_2 \xrightarrow{\Delta} CaCl_2 + 2H_2O + 2NH_3\uparrow$$

$$2NH_4Cl + CaO \xrightarrow{\Delta} CaCl_2 + H_2O + 2NH_3\uparrow$$

Procedure:

- Take a mixture of ammonium chloride (NH_4Cl) and Quick lime (CaO) or dry slaked lime in a ratio of 1:3 in a mortar and mix them thoroughly and take the mixture in a hard glass test tube.
- The hard glass test tube should be half-filled with the mixture.
- Fit the cork along with the delivery tube into the mouth of the hard glass test tube.
- Clamp the hard glass test tube in the clamp stand.
- Heat the hard glass test tube continuously.
- Collect the gas by the downward displacement of air.

Safety Precautions:

- ✓ The mixture of chemicals should be prepared with proper ratio.
- ✓ The hard glass test tube should be fitted slightly inclined with the mouth downward so that water droplets, which will be produced during the reaction, are collected at the mouth of the test tube.

EXPERIMENT NO. 03

AIM OF THE EXPERIMENT: Crystallization of copper sulphate from copper carbonate.

APPARATUS REQUIRED:

1. Beaker (500 ml) : 1 no.
2. Glass Funnel : 1 no
3. Glass rod : 1 no
4. Porcelain Basin: 1 no
5. Tripod stand: 1 no
6. Wire gauge : 1 no
7. Bunsen burner : 1 no
8. Filter paper 2 – 3 pieces.
9. Filter stand: 1 no

CHEMICAL REQUIRED:

a. Solid Copper carbonate ($CuCO_3$) b. Dilute H_2SO_4 solution

THEORY:

$CuSO_4.5H_2O$ is known as blue vitriol. It can be prepared by reacting cupper carbonate ($CuCO_3$) with dilute H_2SO_4. It results the formation of soluble $CuSO_4$ and CO_2 gas is evolved. The solution is evaporated to get the crystals of $CuSO_4$.

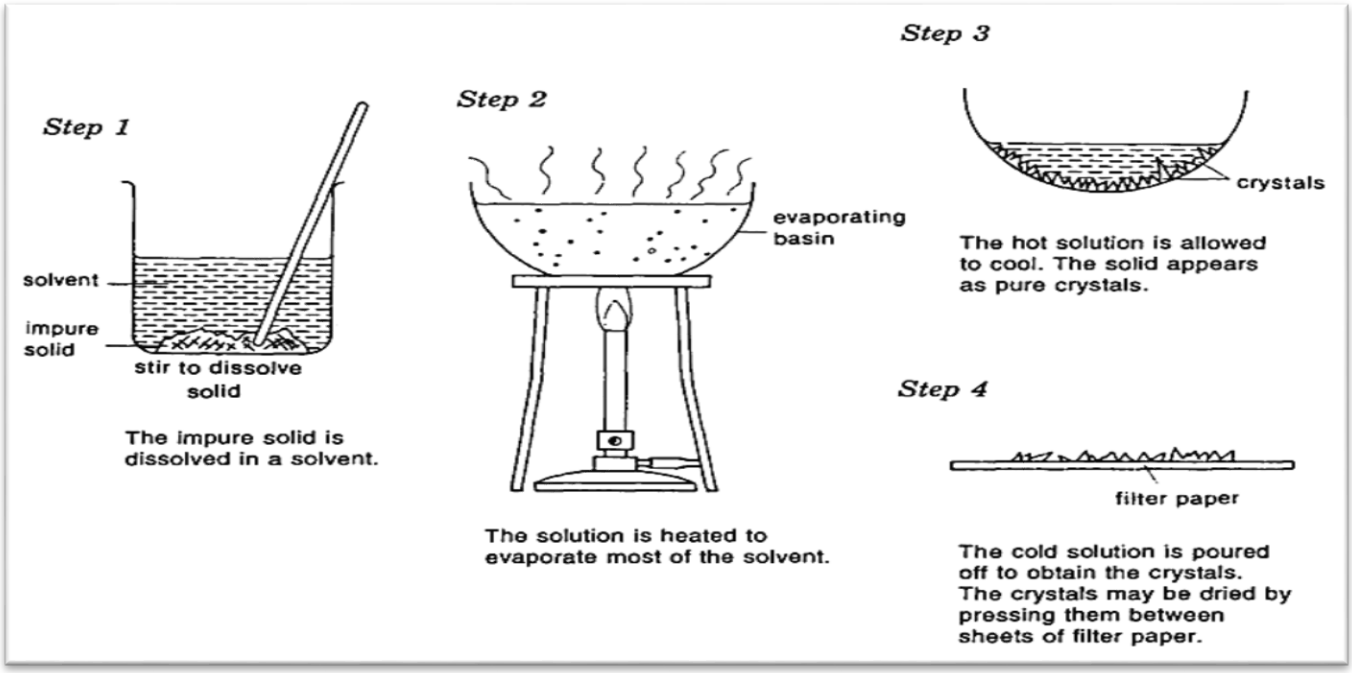
$$CuCO_3 + H_2SO_4 \xrightarrow{\Delta} CuSO_4 + CO_2 + H_2O\uparrow$$

$$CuSO_4 + 5H_2O \rightarrow CuSO_4.5H_2O$$

PROCEDURE:

1. Take about 50 ml of dilute sulfuric acid in a beaker.
2. Add the supplied copper carbonate pinch by pinch with continuously stirring till a small quantity of solid left undissolved.
3. Filter the solution and collect the filtrate in a porcelain basin.
4. Add one to two drops of dilute sulphuric acid to the filtrate in order to check hydrolysis of salt.
5. Heat the filtrate in an oxidizing flame with constant stirring with the help of a glass rod.
6. Blow the tip of the glass rod in due intervals of times till solid substances get adhered to it.

7. Stop heating, remove the basin from the flame and allow to cool slowly at room temperature about an hour without disturbing the basin during cooling.



8. Decant off the mother liquor and collect the bluish crystals of hydrated $CuSO_4$ in a filter paper.
9. Dry the crystals in pressing them in between the folds of a filter paper.

RESULT:

1.Colour of the crystal:_____

2.Shape of the crystal:_____

ASSIGNMENT QUESTIONS

1. What is the chemical formula of Blue vitriol?
2. What is the shape of copper sulphate Crystal?
3. What is Crystallization point?
4. Dilute H2SO4 is added to the mother liquor after filtration to prevent what?
5. How saturated solution of copper sulphate can be prepared?
6. What happens when Blue vitro is heated?
7. What is water of crystallization?
8. Fehling solution contains……solution of copper sulphate with……. salt?
9. What are the uses of Fehling solution?

EXPERIMENT NO. 04
(i. Acidimetry)

AIM OF THE EXPERIMENT :

Titration of N/10 solution of an alkali by using a standard solution of an Acid (Acidimetry).

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the students will able to:

a. Perform the different type of titration by using different type of indicators.

b. Calculate the strength of the given acid solution.

c. Acquire knowledge about acidimetry, standard solution, normal solution and different types of indicators.

d. Know about neutralization reaction and end point of titration.

Apparatus Required:

SL. NO.	NAME OF THE APPARATUS	SPECIFICSTION/TYPE	QUANTITY
01	Burette	50 ml.	1 No
02	Pipette	10 ml.	1No
03	Conical flask	250 ml.	2Nos
04	Beaker	500 ml.	2Nos
05	Wash Bottle		1No
06	Burette stand with clamp		1Set
07	Funnel		1No
08	Dropper		2Nos
09	Anti- parallax card		1No
10	White glazed porcelain tile		1No

Chemicals Required:

01	(N/10) Alkali	02	Unknown Strength of Acid
03	Indicator: Methyl orange	04	Filter Paper

THEORY:

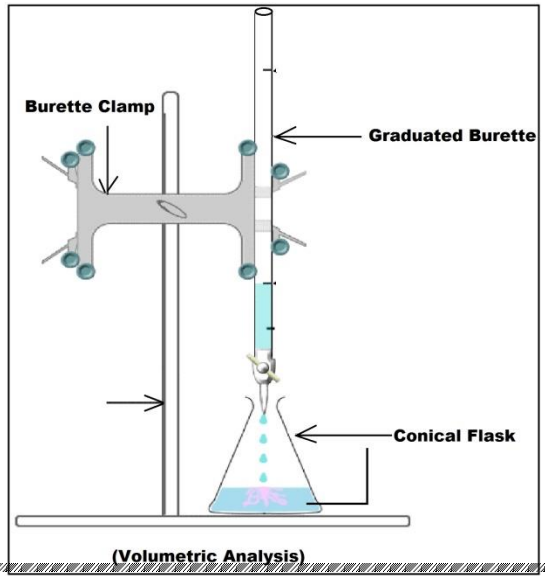
The principle of acidimetric is VA X SA = VB X SB where

VA = Volume of used Acid i.e. Burette reading

SA = strength of unknown Acid.

VB = Volume of Base

SB = Strength of known Base



(Volumetric Analysis)

EXPERIMENTAL PROCEDURE:

a. Wash the burette several times with distilled water and rinse the burette with the supplied acid solution.

b. Fill the burette with the supplied acid solution to a little above the zero mark, open he stopcock momentarily in order to fill the jet with liquid, such that no air bubbles are in the burette. If necessary, fill burette with acid until the bottom of the meniscus just touches the zero mark of the burette. Now clamp the burette vertically to the burette stand.

c. Wash the beaker several times with water and dry it by shaking.

d. Take a clean 10 ml pipette. Rinse the pipette with the supplied alkali solution thrice.

e. Fill the pipette with alkali solution by sucking up to little above the mark, close the upper end immediately with the index finger firmly , wipeout the adhering liquid from the outside of lower stem with filter paper. Now relax the pressure and collected the alkali in a conical flask slowly. Touch the tip of the stem thrice slowly with the bottom of the flask.

f. Now place the conical flask containing alkali solution on the white glazed tile below the burette. Note down the original reading in the burette.

g. Add 1 to 2 drops of methyl orange indicator to this solution in the beaker. The solution becomes straw yellow color.

h. Then slowly run the acid solution from the burette in to the conical flask until the color becomes faintly pink. This is the end point or neutralization point. Note down the final burette reading.

i. Repeat the process to get three concordant readings.

SL. NO	Volume of(N/10)NaOH solution taken in ml.(V_B)	BURETTE READING			Volume of Acid Consumed in ml.(V_A)	Concordant Reading
		Initial ml.	Final ml.	Difference ml.		
01	10					
02	10					
03	10					
04	10					

CALCULATION:

We know hat, $V_A S_A = V_B S_B$

Here V_A = Burette Reading (Volume of Acid)

V_B = Pipette Reading (Volume of Alkali)

SA = Strength of Acid (Unknown)

SB = Strength of Base or Alkali (Known)

VA X SA = VB X SB

⇨ SA = $\frac{VB \times SB}{VA}$

RESULT:

Strength of Unknown Acid solution = _____ $\frac{N}{10}$

COCLUSION:

From the above titration result, the strength of Unknown acid solution is found to be _____ (N/10).

SAFETY AND PRECAUTIONS:

- To read the correct initial burette reading, use anti-parallax card.
- The air bubbles in the nozzle of the burette must be removed before taking the initial reading.
- Indicator should not be added in excess.
- Alkali should be taken in conical flask and acid in the burette, because if we take acid in conical flask during pipetting out of the acid, it may enter into our mouth and injure the tongue.
- The small amount of the alkali which remains inside the pipetting during transferring the solution from pipette to conical flask should not be blown into the conical flask.
- The conical flask should always be placed under the burette on a white glazed tile.
- Acid must be added to the alkali drop by drop when end point approaches.

ASSIGNMENT QUESTIONS

1. What is standard solution?
2. What is the amount of alkali is needed for preparation of 250 ml. of (N/10) alkali?
3. What is the end point of the titration?
4. Why acid is used in burette not in pipette?
5. What is the normality of a solution?
6. Write down the features of normality of a solution?
7. Define Acidimetric?
8. Which reaction can take place in Acid-Base Titration?
9. What do you mean by Neutralization reaction?
10. Why burette and pipette are rinsed?

11. What do you mean by Acidity and Basicity?
12. Why alkali is taken in burette in the titration of NaOH versus Oxalic acid?
13. Which indicator is mostly used in alkalimetry and acidimetric?

EXPERIMENT NO. 04
(ii. Alkalimetry)

AIM OF THE EXPERIMENT :

Titration of N/10 solution of an acid by using a standard solution of an Alkali (Alkalimetry).

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the students will able to:

a. Perform the different type of titration by using different type of indicators.

b. Calculate the strength of the given alkali solution.

c. Acquire knowledge about alkalimetry, standard solution, normal solution and different types of indicators.

d. Know about neutralization reaction and end point of titration.

Apparatus Required:

SL. NO.	NAME OF THE APPARATUS	SPECIFICSTION/TYPE	QUANTITY
01	Burette	50 ml.	1 No
02	Pipette	10 ml.	1No
03	Conical flask	250 ml.	2Nos
04	Beaker	500 ml.	2Nos
05	Wash Bottle		1No
06	Burette stand with clamp		1Set
07	Funnel		1No
08	Dropper		2Nos
09	Anti- parallax card		1No
10	White glazed porcelain tile		1No

Chemicals Required:

01	(N/10) Acid (Unknown)	02	Known Strength of Acid
03	Indicator: Methyl orange	04	Filter Paper

THEORY:

The principle of acidimetric is VA X SA = VB X SB where

VA = Volume of used Acid i.e. Burette reading

SA = strength of unknown Acid.

VB = Volume of Base

SB = Strength of known Base

EXPERIMENTAL PROCEDURE:

a. Wash the burette several times with distilled water and rinse the burette with the supplied acid solution.

b. Fill the burette with the supplied acid solution to a little above the zero mark, open he stopcock momentarily in order to fill the jet with liquid, such that no air bubbles are in the burette. If necessary, fill burette with acid until the bottom of the meniscus just touches the zero mark of the burette. Now clamp the burette vertically to the burette stand.

c. Wash the beaker several times with water and dry it by shaking.

d. Take a clean 10 ml pipette. Rinse the pipette with the supplied alkali solution thrice.

e. Fill the pipette with alkali solution by sucking up to little above the mark, close the upper end immediately with the index finger firmly , wipeout the adhering liquid from the outside of lower stem with filter paper. Now relax the pressure and collected the alkali in a conical flask slowly. Touch the tip of the stem thrice slowly with the bottom of the flask.

f. Now place the conical flask containing alkali solution on the white glazed tile below the burette. Note down the original reading in the burette.

g. Add 1 to 2 drops of methyl orange indicator to this solution in the beaker. The solution becomes straw yellow color.

h. Then slowly run the acid solution from the burette in to the conical flask until the color becomes faintly pink. This is the end point or neutralization point. Note down the final burette reading.

i. Repeat the process to get three concordant readings.

SL. NO	Volume of(N/10)NaOH solution taken in ml.(V_B)	BURETTE READING			Volume of Acid Consumed in ml.(V_A)	Concordant Reading
		Initial ml.	Final ml.	Difference ml.		
01	10					
02	10					
03	10					
04	10					

CALCULATION:

We know hat, $V_A S_A = V_B S_B$

Here V_A = Burette Reading (Volume of Acid)

V_B = Pipette Reading (Volume of Alkali)

SA = Strength of Acid (Unknown)

SB = Strength of Base or Alkali (Known)

VA X SA = VB X SB

⇨ SB $= \frac{VA \times SA}{VB}$

RESULT:

Strength of Unknown Alkali solution = _____ $\frac{N}{10}$

COCLUSION:

From the above titration result, the strength of Unknown alkali solution is found to be _____ (N/10).

SAFETY AND PRECAUTIONS:

- To read the correct initial burette reading, use anti-parallax card.
- The air bubbles in the nozzle of the burette must be removed before taking the initial reading.
- Indicator should not be added in excess.
- Alkali should be taken in conical flask and acid in the burette, because if we take acid in conical flask during pipetting out of the acid, it may enter into our mouth and injure the tongue.
- The small amount of the alkali which remains inside the pipetting during transferring the solution from pipette to conical flask should not be blown into the conical flask.
- The conical flask should always be placed under the burette on a white glazed tile.
- Acid must be added to the alkali drop by drop when end point approaches.

ASSIGNMENT QUESTIONS

1. What do you mean by neutralization reaction?
2. Why acid is used in burette not in pipette?
3. What is the molarity of a solution?
4. Define Alkalimetry?
5. Which reaction takes place in Acid-Base Titration?
6. What do you mean by Neutralization reaction?
7. Why burette and pipette are rinsed?
8. What do you mean by Acidity and Basicity?

EXPERIMENT NO. 05
(Tests for Known Acid Radicals)

1. Tests for Carbonate Ion (CO_3^{2-})

Experiment	Observation	Inference
1. Take 1cc of dilute HCl in a clean test tube. Warm it gently and add to it a little quantity of the supplied salt.	Effervescence takes place with the evolution of a colourless and odourless gas.	CO_3^{2-} may be present.
1. Show a burning match stick is to the evolved gas.	The burning stick extinguishes.	CO_3^{2-} may be present.
2. Add a little more salt to the above test tube and pass the evolved gas through lime water with the help of a delivery tube.	At first white turbidity (milk colour) appears which disappears with excess passing of the gas.	CO_3^{2-}may be present
3. Add a little more salt to the above test tube & pass the evolved gas through acidified potassium dichromate solution with the help of a delivery tube.	No change of the colour takes place.	**CO_3^{2-} confirmed**

2. Tests for Sulphide (S^{2-})

Experiment	Observation	Inference
1. Take 1 cc of dilute HCl in a clean test tube. Warm it gently and add a little quantity of the supplied salt to it.	Effervescence takes place with the evolution of a colourless gas with rotten egg smell.	S^{2-} may be present.
1. Show a filter paper soaked with Lead acetate solution to the mouth of the test tube.	The filter paper turns black.	**S^{2-} Confirmed.**

3. Tests for Chloride (Cl^-)

Experiment	Observation	Inference
1. Take a few drops of conc. H_2SO_4 in a clean and dry test tube. Add a pinch of the supplied salt in to it	A colourless fuming gas with pungent odour is evolved.	Cl^- may be present.

and gently warm the test tube.		
2. Show a glass rod dipped in conc. NH_4OH solution to the gas evolved.	A white dense fume is formed.	Cl^- may be present.
3. Add a pinch of MnO_2 to the above test tube and warm it gently.	A greenish yellow gas is formed which turns starch iodide paper blue.	Cl^- may be present.
4. Take a pinch of the given salt in a clean and dry test tube and acidify it with dil HNO_3 solution. And then add a few drops of silver nitrate ($AgNO_3$) solution into it.	A curdy white ppt. is formed which is soluble in dil NH_4OH and is insoluble in dil HNO_3.	**Cl^- confirmed.**

4. Tests for Nitrate (NO_3^-)

Experiment	Observation	Inference
1. Take a few drops of conc. H_2SO_4 in a clean and dry test tube. Add a pinch of the supplied salt in to it and gently warm the test tube.	A brown fume with pungent smell is observed.	May be **NO_3^-.**
2. Take a pinch of the supplied salt and a few copper turnings in a clean test tube. Add 1 – 2 cc of 50% conc. H_2SO_4 and heat the test tube gently.	Deep brown vapours are formed and the solution turns bluish green or green.	May be **NO_3^-.**
3. Show a piece of filter paper soaked in $FeSO_4$ solution to the evolved gas.	It turns black.	May be **NO_3^-.**
4. Take 1 cc of the supplied salt solution in water. Add equal volume of conc. H_2SO_4 in to the test tube. Cool the test tube under tap water. Add equal volume of freshly prepared ferrous sulphate ($FeSO_4$) solution from the side of the test tube.	A brown ring is formed at the junction of the two liquids. The ring disappears on shaking.	**NO_3^-confirmed.**

5. Tests for Sulphate (SO_4^{2-})

Experiment	Observation	Inference
1. Take 1-2 cc of the salt solution in a clean test tube and acidify it with dil HCl. Add few cc of Barium chloride ($BaCl_2$) solution into it.	A white ppt. is obtained which is insoluble in conc. HCl even on boiling.	**SO_4^{2-} confirmed.**

EXPERIMENT NO. 06
(Tests for Known Basic Radicals)

1. Tests for Ammonium (NH_4^+):

Experiment	Observation	Inference
1. Rub a small quantity of the salt with soda lime and two drops of water in a mortar.	A colourless gas having smell of ammonia which produces dense white fumes with a glass rod dipped in conc. NH_4OH. There is no change in the colour of the residue.	**NH_4^+ confirmed.**
2. Add Nessler's reagent to 1 cc of the salt solution.	A brown ppt. is obtained.	**NH_4^+ confirmed.**

2. Tests for Zinc (Zn^{2+}):

Experiment	Observation	Inference
1. Take 1 – 2 cc of the supplied salt solution and saturate it with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline. Pass H_2S gas through it.	A white ppt. is formed.	May be Zn^{2+}
2. Take 1 -2 cc of the supplied salt solution and add potassium ferrocyanide solution drop by drop and then in excess.	A white ppt is obtained.	May be Zn^{2+}
3. Add di. NaOH solution to 1 cc of the solution drop by drop and then in excess.	A gelatinous white ppt. is formed which is soluble in excess of NaOH solution.	**Zn^{2+} confirmed.**

3. Tests for Mg^{2+}

Experiment	Observation	Inference
1. Take 1 – 2 cc of the supplied salt solution and saturate it with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline. Then add dihydrogen sodium phosphate solution to it.	A white ppt. is formed.	May be Mg^{2+}
2. Acidify 1 cc of the salt solution with dil. HCl and the treat it with a few drops of magneson reagent followed by the addition of excess of dil NaOH solution.	A blue ppt. is obtained.	**Mg^{2+} confirmed.**

4. Tests for Al^{3+}

Experiment	Observation	Inference
1. Take 1 – 2 cc of the supplied salt solution and saturate it with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline.	A white ppt. is formed.	May be Al^{3+}
2. Take 1 – 2 cc of the supplied salt solution and add dil NaOH solution drop wise and then in excess.	A white ppt. of $Al(OH)_3$ is formed which dissolves in excess of the reagent.	May be Al^{3+}
3. To 1 cc of the supplied salt solution add disodium hydrogen phosphate solution.	A gelatinous white ppt. of $AlPO_4$ is formed which is soluble in dil. HCl solution.	**Al^{3+} confirmed.**

5. Tests for Ca^{2+}

Experiment	Observation	Inference
1. Saturate 1 – 2 cc of the supplied salt solution with solid NH_4Cl and then add dil NH_4OH solution till alkaline followed by the addition of saturated solution of ammonium carbonate $(NH_4)_2CO_3$.	A white ppt. of $CaCO_3$ is formed.	May be Ca^{2+}
2. Dissolve the above ppt. in a minimum quantity of dil CH_3COOH. Boil the solution to remove CO_2 and then add ammonium oxalate solution to it.	A white ppt. of CaC_2O_4 is formed which is soluble in dil. HCl but insoluble in CH_3COOH.	May be Ca^{2+}
3. Perform flame test with the white ppt. formed above.	Brick red flame is noticed.	**Ca^{2+} confirmed.**

6. Tests for Na^+

Experiment	Observation	Inference
1. Add potassium pyroantimonate solution to 1 cc of the supplied salt solution.	A white crystalline ppt. is formed.	**Na^+ confirmed.**

7. Tests for K^+

Experiment	Observation	Inference
1. To 1 cc of the salt solution add two drops of cobalt nitrate solution followed by the addition of solid $NaNO_3$ and dil. CH_3COOH solution.	A yellow ppt. is formed.	**K^+ confirmed.**

EXPERIMENT NO. 07
(Tests for Unknown Acid Radicals)

(A) I – TESTS FOR (CO_3^{2-}, S^{2-})

Experiment	Observation	Inference
1. Take 1cc of dilute HCl in a clean test tube. Warm it gently and add to it a little quantity of the supplied salt.	(a) Effervescence takes place with the evolution of a colourless and odourless gas.	(a) CO_3^{2-} may be present.
	(b) Effervescence takes place with the evolution of a colourless gas with rotten egg smell.	(b) S^{2-} may be present.

II - TESTS FOR CHLORIDE (Cl^-)

Experiment	Observation	Inference
1. Take a few drops of conc. H_2SO_4 in a clean and dry test tube. Add a pinch of the supplied salt in to it and gently warm the test tube.	A colourless fuming gas with pungent odour is evolved.	Cl^- may be present.

III - TESTS FOR NITRATE (NO_3^-)

Experiment	Observation	Inference
1. Take a few drops of conc. H_2SO_4 in a clean and dry test tube. Add a pinch of the supplied salt in to it and gently warm the test tube.	A brown fume with pungent smell is observed.	May be **NO_3^-.**

IV - TESTS FOR SULPHATE (SO_4^{2-})

Experiment	Observation	Inference
1. Take 1-2 cc of the salt solution in a clean test tube and acidify it with dil HCl. Add few cc of Barium chloride ($BaCl_2$) solution into it.	A white ppt. is obtained which is insoluble in conc. HCl even on boiling.	**SO_4^{2-} confirmed.**

(B) CONFIRMATORY TESTS:

I – CONFIRMATORY TEST FOR CARBONATE ION (CO_3^{2-})

Experiment	Observation	Inference
1. Show a burning match stick is to the evolved gas.	The burning stick extinguishes.	CO_3^{2-} may be present.
2. Add a little more salt to the above test tube and pass the evolved gas through lime water with the help of a delivery tube.	At first white turbidity (milk colour) appears which disappears with excess passing of the gas.	CO_3^{2-} may be present
3. Add a little more salt to the above test tube & pass the evolved gas through acidified potassium dichromate solution with the help of a delivery tube.	No change of the colour takes place.	**CO_3^{2-} confirmed**

II – CONFIRMATORY TEST FOR SILPHIDE ION (S^{2-})

Experiment	observation	Inference
1. Show a filter paper soaked with Lead acetate solution to the mouth of the test tube.	The filter paper turns black.	**S^{2-} Confirmed.**

III – CONFIRMATORY TEST FOR CHLORIDE ION (Cl^-)

Experiment	Observation	Inference
1. Show a glass rod dipped in conc. NH_4OH solution to the gas evolved.	A white dense fume is formed.	Cl^- may be present.
2. Add a pinch of MnO_2 to the above test tube and warm it gently.	A greenish yellow gas is formed which turns starch iodide paper blue.	Cl^- may be present.
3. Take a pinch of the given salt in a clean and dry test tube and acidify it with dil HNO_3 solution. And then add a few drops of silver nitrate ($AgNO_3$) solution into it.	A curdy white ppt. is formed which is soluble in dil NH_4OH and is insoluble in dil HNO_3.	**Cl^- confirmed.**

IV – CONFIRMATORY TEST FOR NITRATE ION (NO_3^-)

Experiment	Observation	Inference
1. Take a pinch of the supplied salt and a few copper turnings in a clean test tube. Add 1 – 2 cc of 50% conc. H_2SO_4 and heat the test tube gently.	Deep brown vapours are formed and the solution turns bluish green or green.	May be **NO_3^-.**
2. Show a piece of filter paper soaked in $FeSO_4$ solution to the evolved gas.	It turns black.	May be **NO_3^-.**
3. Take 1 cc of the supplied salt solution in water. Add equal volume of conc. H_2SO_4 in to the test tube. Cool the test tube under tap water. Add equal volume of freshly prepared ferrous sulphate ($FeSO_4$) solution from the side of the test tube.	A brown ring is formed at the junction of the two liquids. The ring disappears on shaking.	**NO_3^-confirmed.**

Hence, the acid radical of the supplied salt is _____.

EXPERIMENT NO. 08
(Tests for Unknown Basic Radicals)

1. DRY TEST FOR BASIC RADICALS

Dry Test Tube heating:

Experiment	Observation	Inference
A small quantity of salt is taken in a clean and dry test tube and heated strongly in the hottest part of the non- luminous flame.	(a) A sublimate is formed (Note the colour of the sublimate)	(a) It is volatile salt, (Soda lime test and bulb tube test should be performed.)
	b)Water particles condense at the cooler part of the test	(b) Salt contains water of crystallisation.
	(c) Decripitation or cracking sound is produced.	(c) May be crystalline salt.
	(d) Deflagration takes place.	(d) The salt may be nitrate of alkali or alkaline earth metal.
	(e) The salt changes colour. Yellow when hot and white when cold.	(e) It may be Zinc salt.
	(f) Salt fuses on heating and solidifies on cooling.	(f) May be alkali or alkaline earth metal salt.

2. SODALIME TEST:

Experiment	Observation	Inference
A little of the salt is taken in a clean watch glass along with soda-lime and it is rubbed by adding two drops of water.	A colourless gas evolved with strong smell of ammonia and colour of the mixture is unchanged.	NH_4^+ may be present. (To be confirmed in the wet test)

3. CHARCOAL CAVITY HEATING (OXIDISING FLAME)

Experiment	Observation	Inference
A little of the Salt is taken in the charcoal cavity and heated by oxidizing flame with the help of a blow pipe.	a. The salt decrepitates.	a. Maybe crystalline salt.
	b. The salt deflagrates.	b. May be NO_3^- salt
	c. The salt fuses and sinks into the charcoal cavity.	c. Salt contains alkali or alkaline earth metal. (Flame test should be performed).
	d. Infusible incandescent white residue.	d. Cobalt nitrate test should be performed.

4. COBALT NITRATE TEST

Experiment	Observation	Inference
The salt is taken in the charcoal cavity and heated in the oxidizing flame with the help of a blow pipe till an infusible, incandescent white mass is obtained. Then one drop of cobalt nitrate solution is added to it and heated strongly.	a. Blue mass is obtained.	a. Al^{3+} may be present.
	b. Green mass is obtained.	b. Zn^{2+} may be present.
	c. Rosy mass is obtained.	c. Mg^{2+} may be present.
	d. Grey mass is obtained.	d. Ca^{2+} may be present.

5. FLAME TEST

Experiment	Observation	Inference
The nichrome wire is cleaned with sand paper and dipped in conc. HCI and shown to non-luminous flame. This process is repeated till no colour is imparted to the flame. Then the wire is moistened with conc. HCI and a little of the salt is taken by touching to the salt is taken by touching to the salt and shown to the oxidizing flame.	a. Persistent golden Yellow coloured flame is seen in naked eye and colourless through double blue glass.	a. Na^{+} may be present.
	b. Violet flame is seen in naked eye and red through a pair of blue glass.	b. K^{+} may be present.
	c. Brick red flame is observed.	c. Ca^{2+}may be present.

6. WET TESTS FOR BASIC RADICALS (Group Analysis)

Experiment	Observation	Inference
1. To 1ml. of salt solution in a clean test tube 1 cc. of dil HCI is added.	a. A white precipitate is formed.	a. One of the Gr. I basic radicals (**Pb^{2+}, Ag^{+}**, **Hg_2^{2+}**) may be present (Analysis of Gr. I basic radicals should be performed)
	b. No white precipitate is formed	b. Gr. I basic radicals are absent.
2. To 1ml. of the supplied salt solution in a clean test tube solid NH"CI is added till saturation followed by addition of dil NH4OH till alkaline.	a. A precipitate is obtained, (colour should be noted)	a. One of the Gr III A basic radicals (**Fe^{3+}, Al^{3+}, Cr^{3+}**)may be present (Analysis of Gr III A basic radicals should be performed)
	b. No precipitate is formed.	b. Gr III A basic radicals are absent.
3. Through the contents of the above test tube H_2S gas is passed under pressure.	a. Precipitate is formed (colour should be noted).	a. One of the Gr III B basic radicals (**Zn^{2+},**

		Mn^{2+}, Co^{2+}, Ni^{2+}) may be present(analysis of Gr III B radicals should be performed)
	b. No precipitate is formed	b. Gr III B basic radicals are absent.
4. To 1 cc of the salt solution is taken in a clean test tube solid NH_4Cl is added till saturation followed by addition of dil NH_4OH till alkaline. To this saturated solution of ammonium carbonate is added.	a. Precipitate is formed (colour should be noted).	a. One of the Gr IV basic radicals (**Ba^{2+}, Sr^{2+}, Ca^{2+}**) may be present(analysis of Gr IV radicals should be performed)
	b. No precipitate is formed.	b. Gr. IV basic radicals are absent.

The above basic radicals are absent indicating that one of the Gr. V basic radicals may be present. As there is no specific group reagent for Gr. V test for individual radicals should be performed.

7. ANALYSIS OF BASIC RADICALS (GROUP WISE)

i) Analysis of Gr. IIIA Basic Radicals (Al^{3+})

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline.	A white ppt. is formed.	May be Al^{3+}
2. 1 – 2 cc of the supplied salt solution is treated with dil NaOH solution drop wise and then in excess.	A white ppt. of $Al(OH)_3$ is formed which dissolved in excess of the reagent.	May be Al^{3+}
3. 1 cc of the supplied salt solution, disodium hydrogen phosphate solution is added.	A gelatinous white ppt. of $AlPO_4$ is formed which is soluble in dil. HCl solution.	**Al^{3+} confirmed.**

ii) Analysis of Gr. IIIB Basic Radicals (Zn^{2+})

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl followed by the	A white ppt. is formed.	May be Zn^{2+}

addition of dil NH_4OH solution till alkaline. Then H_2S gas is passed through it.		
2. 1 -2 cc of the supplied salt solution is treated with potassium ferrocyanide solution drop by drop and then in excess.	A white ppt is obtained.	May be Zn^{2+}
3. Dil. NaOH solution is added to 1 cc of the salt solution drop by drop and then in excess.	A gelatinous white ppt. is formed which is soluble in excess of NaOH solution.	**Zn^{2+} confirmed.**

iii) Analysis of Gr. IV Basic Radicals (Ca^{2+})

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl and then made alkaline with dil NH_4OH solution. Then saturated solution of ammonium carbonate $[(NH_4)_2CO_3]$ is added.	A white ppt. of $CaCO_3$ is formed.	May be Ca^{2+}
2. The above ppt. is dissolved in a minimum quantity of dil CH_3COOH. The solution is boiled to remove CO_2 and then ammonium oxalate solution is added to it.	A white ppt. of CaC_2O_4 is formed which is soluble in dil. HCl but insoluble in CH_3COOH.	May be Ca^{2+}
3. Flame test is performed with the white ppt. formed above.	Brick red flame is noticed.	**Ca^{2+} confirmed.**

ii) Analysis of Gr.V Basic Radicals (NH_4^+, Na^+, K^+)

Tests for NH_4^+

Experiment	Observation	Inference
1. A small quantity of the salt is treated with soda lime and two drops of water and then the mixture is rubbed in a mortar.	A colourless gas having smell of ammonia which produced dense white fumes with a glass rod dipped in conc. NH_4OH. There is no change in the colour of the residue.	**NH_4^+ confirmed.**

2. Nessler's reagent is added to 1 cc of the salt solution.	A brown ppt. is obtained.	**NH_4^+ confirmed.**

Tests for Mg^{2+}

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline. Then dihydrogen sodium phosphate solution is added to it.	A white ppt. is formed.	May be Mg^{2+}
2. 1 cc of the salt solution is acidified with dil. HCl and then treated with a few drops of magneson reagent followed by the addition of excess of dil NaOH solution.	A blue ppt. is obtained.	**Mg^{2+} confirmed.**

Tests for Na^+

Experiment	Observation	Inference
1. Potassium pyroantimonate solution is added to 1 cc of the supplied salt solution.	A white crystalline ppt. is formed.	**Na^+ confirmed.**

Tests for K^+

Experiment	Observation	Inference
1. 1 cc of the salt solution is treated with two drops of cobalt nitrate solution followed by the addition of solid $NaNO_3$ and dil. CH_3COOH solution.	A yellow ppt. is formed.	**K^+ confirmed.**

Hence, the basic part of the supplied salt is _____.

EXPERIMENT NO. 09
(Tests for Unknown Salt)

1. Preliminary Test:

- **b. Salt No:**
- **c. Colour of the Salt : Colourless / name of the colour**
- **d. Structure of Salt : Crystalline/ Amorphous**
- **e. Solubility:**
  - **i) Soluble in cold water (if not)**
  - **ii) Soluble in hot water (if not)**
  - **iii) Soluble in dilute HCl (if not)**
  - **iv) Soluble in hot dilute HCl**
  - **v) If not then salt is insoluble (*Salt soluble in dil HCl implies Gr.I basic radicals absent)**

2. DRY TEST FOR BASIC RADICALS

Dry Test Tube heating:

Experiment	Observation	Inference
A small quantity of salt is taken in a clean and dry test tube and heated strongly in the hottest part of the non- luminous flame.	**(a) A sublimate is formed (Note the colour of the sublimate)**	**(a) It is volatile salt, (Soda lime test and bulb tube test should be performed.)**
	b)Water particles condense at the cooler part of the test	**(c) Salt contains water of crystallisation.**
	(c) Decripitation or cracking sound is produced.	**(c) May be crystalline salt.**
	(d) Deflagration takes place.	**(e) The salt may be nitrate of alkali or alkaline earth metal.**
	(e) The salt changes colour. Yellow when hot and white when cold.	**(e) It may be Zinc salt.**
	(g) Salt fuses on heating and solidifies on cooling.	**(g) May be alkali or alkaline earth metal salt.**

3. SODALIME TEST:

Experiment	Observation	Inference
A little of the salt is taken in a clean watch glass along with soda-lime and it is rubbed by adding two drops of water.	A colourless gas evolved with strong smell of ammonia and colour of the mixture is unchanged.	NH_4^+ may be present. (To be confirmed in the wet test)

4. CHARCOAL CAVITY HEATING (OXIDISING FLAME)

Experiment	Observation	Inference
A little of the Salt is taken in the charcoal cavity and heated by oxidizing flame with the help of a blow pipe.	a. The salt decrepitates.	a. Maybe crystalline salt.
	b. The salt deflagrates.	b. May be NO_3^- salt
	c. The salt fuses and sinks into the charcoal cavity.	c. Salt contains alkali or alkaline earth metal. (Flame test should be performed).
	d. Infusible incandescent white residue.	d. Cobalt nitrate test should be performed.

5. COBALT NITRATE TEST

Experiment	Observation	Inference
The salt is taken in the charcoal cavity and heated in the oxidizing flame with the help of a blow pipe till an infusible, incandescent white mass is obtained. Then one drop of cobalt nitrate solution is added to it and heated strongly.	a. Blue mass is obtained.	a. Al^{3+} may be present.
	b. Green mass is obtained.	b. Zn^{2+} may be present.
	c. Rosy mass is obtained.	c. Mg^{2+} may be present.
	d. Grey mass is obtained.	d. Ca^{2+} may be present.

6. FLAME TEST

Experiment	Observation	Inference
The nichrome wire is cleaned with sand paper and dipped in conc. HCl and shown to non-luminous flame. This process is repeated till no colour is imparted to the flame. Then the wire is moistened with conc. HCl and a little of the salt is taken by touching to the salt is taken by touching to the salt and shown to the oxidizing flame.	a. Persistent golden Yellow coloured flame is seen in naked eye and colourless through double blue glass. b) Violet flame is seen in naked eye and red through a pair of blue glass.	a. Na^+ may be present.
	b. Violet flame is seen in naked eye and red through a pair of blue glass.	b. K^+ may be present.
	c. Brick red flame is observed.	c. Ca^{2+}may be present.

7. IDENTIFICATION OF ACID RADICAL

Test for Gr- I acid radicals (Carbonate and Sulphide)

Experiment	Observation	Inference
1 cc dilute HCl taken in d test tube and slightly warmed. To this a pinch of the supplied salt is added.	1. Effervescence took place with the evolution of a colourless odourless gas is evolved.	a. Carbonate (CO_3^{2-}) may be present (other test should be performed for its confirmation.)

	2. Effervescence took place with the evolution of a colourless odourless gas with rotten egg smell is evolved.	a. Sulphide (S^{2-}) may be present (other test should be performed for its confirmation.)

Test for Gr- II acid radicals (Chloride)

Experiment	Observation	Inference
A few drops of conc. H_2SO_4 is taken in a clean and dry test tube, a pinch of the supplied salt is added in to it and is gently warmed.	A colourless fuming gas with pungent odour is evolved.	Cl^- may be present. (Other test should be performed for its confirmation).

Test for Gr- III acid radicals (Nitrate and Sulphate)

TESTS FOR NITRATE (NO_3^-)

Experiment	Observation	Inference
A pinch of the supplied salt is moistened with a few drops of conc. H_2SO_4 is taken in a clean and dry test tube and is gently warmed.	A brown fume with pungent smell is observed.	May be **NO_3^-.** (Other test should be performed for its confirmation).

TESTS FOR SULPHATE (SO_4^{2-})

Experiment	Observation	Inference
1-2 cc of the salt solution is taken in a clean test tube and is acidified with dil HCl. A few cc of Barium chloride ($BaCl_2$) solution is added into it.	A white ppt. is obtained which is insoluble in conc. HCl even on boiling.	**SO_4^{2-} confirmed.**

CONFIRMATORY TESTS FOR CARBONATE (CO_3^{2-})

Experiment	Observation	Inference
1. A burning match stick is shown to the evolved gas.	The burning stick extinguished.	CO_3^{2-} may be present.
2. A little more salt is added to the above test tube and the evolved gas is passed through lime water with the help of a delivery tube.	At first white turbidity (milk colour) appeared which disappeared with excess passing of the gas.	CO_3^{2-} may be present
3. A little more salt is added to the above	No change of the colour took place.	**CO_3^{2-} confirmed**

test tube and the evolved gas is passed through acidified potassium dichromate solution with the help of a delivery tube.		

CONFIRMATORY TESTS FOR SULPHISE (S^{2-})

Experiment	Observation	Inference
A filter paper soaked with Lead acetate solution is shown to the mouth of the test tube.	The filter paper turned black.	**S^{2-} Confirmed.**

CONFIRMATORY TESTS FOR CHLORIDE (Cl^-)

Experiment	Observation	Inference
1. A glass rod dipped in conc. NH_4OH solution is shown to the gas evolved.	A white dense fume is formed.	Cl^- may be present.
2. A pinch of MnO_2 is added to the above test tube and is warmed gently.	A greenish yellow gas is formed which turned starch iodide paper blue.	Cl^- may be present.
3. A pinch of the given salt is taken in a clean and dry test tube and is acidified with dil HNO_3 solution. And a few drops of silver nitrate ($AgNO_3$) solution is added into it.	A curdy white ppt. is formed which is soluble in dil NH_4OH and is insoluble in dil HNO_3.	**Cl^- confirmed.**

CONFIRMATORY TEST FOR NITRATE (NO_3^-)

Experiment	Observation	Inference
1. A pinch of the supplied salt and a few copper turnings are taken in a clean test tube. 1 – 2 cc of 50% conc. H_2SO_4 is added into it and is heated gently.	Deep brown vapours are formed and the solution turned bluish green or green.	May be **NO_3^-.**
2. A piece of filter paper soaked in $FeSO_4$ solution is shown to the evolved gas.	It turned black.	May be **NO_3^-.**
3. 1 cc of the supplied salt solution in water is taken in a clean test tube. Equal volume of conc. H_2SO_4 is added in to the test tube. The test tube is cooled under tap water. And equal volume of freshly prepared ferrous sulphate ($FeSO_4$) solution is added from the side of the test tube.	A brown ring is formed at the junction of the two liquids. The ring disappeared on shaking.	**NO_3^- confirmed.**

8. WET TESTS FOR BASIC RADICALS (Group Analysis)

Experiment	Observation	Inference
1. To 1ml. of salt solution in a clean test tube 1 cc. of dil HCI is added.	a. A white precipitate is formed.	a. One of the Gr. I basic radicals (**Pb^{2+}, Ag^{+}, Hg_2^{2+}**) may be present (Analysis of Gr. I basic radicals should be performed)
	b. No white precipitate is formed	b. Gr. I basic radicals are absent.
2. To 1ml. of the supplied salt solution in a clean test tube solid NH"CI is added till saturation followed by addition of dil NH4OH till alkaline.	a. A precipitate is obtained, (colour should be noted)	a. One of the Gr III A basic radicals (**Fe^{3+}, Al^{3+}, Cr^{3+}**)may be present (Analysis of Gr III A basic radicals should be performed)
	b. No precipitate is formed.	b. Gr III A basic radicals are absent.
3. Through the contents of the above test tube H_2S gas is passed under pressure.	a. Precipitate is formed (colour should be noted).	a. One of the Gr III B basic radicals (**Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}**) may be present(analysis of Gr III B radicals should be performed)
	b. No precipitate is formed	b. Gr III B basic radicals are absent.
4. To 1 cc of the salt solution is taken in a clean test tube solid NH_4Cl is added till saturation followed by addition of dil NH_4OH till alkaline. To this saturated solution of ammonium carbonate is added.	a. Precipitate is formed (colour should be noted).	a. One of the Gr IV basic radicals (**Ba^{2+}, Sr^{2+}, Ca^{2+}**) may be present(analysis of Gr IV radicals should be performed)
	b. No precipitate is formed.	b. Gr. IV basic radicals are absent.

The above basic radicals are absent indicating that one of the Gr. V basic radicals may be present. As there is no specific group reagent for Gr. V test for individual radicals should be performed.

9. ANALYSIS OF BASIC RADICALS (GROUP WISE)

i) Analysis of Gr. IIIA Basic Radicals (Al^{3+})

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline.	A white ppt. is formed.	May be Al^{3+}
2. 1 – 2 cc of the supplied salt solution is treated with dil NaOH solution drop wise and then in excess.	A white ppt. of $Al(OH)_3$ is formed which dissolved in excess of the reagent.	May be Al^{3+}
3. 1 cc of the supplied salt solution, disodium hydrogen phosphate solution is added.	A gelatinous white ppt. of $AlPO_4$ is formed which is soluble in dil. HCl solution.	**Al^{3+} confirmed.**

iv) Analysis of Gr. IIIB Basic Radicals (Zn^{2+})

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline. Then H_2S gas is passed through it.	A white ppt. is formed.	May be Zn^{2+}
2. 1 -2 cc of the supplied salt solution is treated with potassium ferrocyanide solution drop by drop and then in excess.	A white ppt is obtained.	May be Zn^{2+}
3. Dil. NaOH solution is added to 1 cc of the salt solution drop by drop and then in excess.	A gelatinous white ppt. is formed which is soluble in excess of NaOH solution.	**Zn^{2+} confirmed.**

v) Analysis of Gr. IV Basic Radicals (Ca^{2+})

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl and then made	A white ppt. of $CaCO_3$ is formed.	May be Ca^{2+}

alkaline with dil NH_4OH solution. Then saturated solution of ammonium carbonate [$(NH_4)_2CO_3$] is added.		
2. The above ppt. is dissolved in a minimum quantity of dil CH_3COOH. The solution is boiled to remove CO_2 and then ammonium oxalate solution is added to it.	A white ppt. of CaC_2O_4 is formed which is soluble in dil. HCl but insoluble in CH_3COOH.	May be Ca^{2+}
3. Flame test is performed with the white ppt. formed above.	Brick red flame is noticed.	**Ca^{2+} confirmed.**

iii) Analysis of Gr.V Basic Radicals (NH_4^+, Na^+, K^+)

Tests for NH_4^+

Experiment	Observation	Inference
1. A small quantity of the salt is treated with soda lime and two drops of water and then the mixture is rubbed in a mortar.	A colourless gas having smell of ammonia which produced dense white fumes with a glass rod dipped in conc. NH_4OH. There is no change in the colour of the residue.	**NH_4^+ confirmed.**
2. Nessler's reagent is added to 1 cc of the salt solution.	A brown ppt. is obtained.	**NH_4^+ confirmed.**

Tests for Mg^{2+}

Experiment	Observation	Inference
1. 1 – 2 cc of the supplied salt solution is saturated with solid NH_4Cl followed by the addition of dil NH_4OH solution till alkaline. Then dihydrogen sodium phosphate solution is added to it.	A white ppt. is formed.	May be Mg^{2+}
2. 1 cc of the salt solution is acidified with dil. HCl and then treated with a few drops of magneson reagent followed by the addition of excess of dil NaOH solution.	A blue ppt. is obtained.	**Mg^{2+} confirmed.**

Tests for Na^+

Experiment	Observation	Inference
1. Potassium pyroantimonate solution is added to 1 cc of the supplied salt solution.	A white crystalline ppt. is formed.	**Na^+ confirmed.**

Tests for K^+

Experiment	Observation	Inference
1. 1 cc of the salt solution is treated with two drops of cobalt nitrate solution followed by the addition of solid $NaNO_3$ and dil. CH_3COOH solution.	A yellow ppt. is formed.	**K^+ confirmed.**

Hence, the basic part of the supplied salt is _____ and the acid part of the salt is _____.

Thus, the salt supplied is _____.