

Functional Group

Experiment - 1

- 1 Aim: To identify the functional group present in the given sample of organic compound.
- 2 Preliminary Test:
 - a Physical State: Liquid
 - b Colour: colourless
 - c Odour: Vinegar like smell
 - d Solubility: Soluble in water
 - e Nature: Acidic (blue litmus turns into red) → may be carboxylic or phenolic.
 - f Burning Test: Aliphatic (organic compound burns with blue non-sooty flame)

3 Observation Table:

S.No	Experiment	Observation	Inference
1	Element (nitrogen) test LS + 2 ml freshly prepared $FeSO_4$ sol ⁿ + heat than cool + 2 drop of conc. H_2SO_4	No green or prussian blue colour appears	N absent.

Teacher's Signature : _____

S.No	Experiment	Observation	Inference
2	Functional group test		
(a)	Sodium bicarbonate test: Organic compound + NaHCO_3	Brist effervescence produce	Carboxylic acid ($-\text{COOH}$) group present
(b)	Ester test Organic compound + 1 ml $\text{C}_2\text{H}_5\text{OH}$ + 2 drop conc. H_2SO_4	Fruity smell appear	Carboxylic acid ($-\text{COOH}$) group present.

4 Result:

In given organic compound functional group carboxylic group ($-\text{COOH}$) is present.

Teacher's Signature : _____

Experiment No. 2

1 Aim: To identify the functional group present in the given sample of organic compound.

2 Preliminary Test:

a Physical State: Solid crystalline

b Colour: colourless

c odour: characteristic smell

d Solubility: insoluble in water

e Nature: Acidic (blue litmus turns into red) →
maybe carboxylic or phenolic

f Burning Test: Aromatic (organic compound burns with sooty flame)

3. Observation Table:

S.No	Experiment	Observation	Inference
1	Element (nitrogen) test LS + 2 ml freshly prepared $FeSO_4$ sol ⁿ + heat then cool + 2 drop of conc. H_2SO_4	No green or prussian blue colour appears	N absent
2	Functional group test (a) Ferric chloride test Organic compound + Neutral $FeCl_3$	violet colour appears	Phenolic ($Ar-OH$) group present

Teacher's Signature : _____

S.No	Experiment	Observation	Inference
(b)	Liebermann's Test		
(i)	Organic comp + NaNO_2 + heat & cool + few drop conc. H_2SO_4	deep blue or green colour appears	
(ii)	Add water to above sol ⁿ	solution becomes red	
(iii)	Add NaOH to above sol ⁿ	solution turns blue or green again	phenolic (Ar-OH) grp present

4 Result:

In given organic compound functional group phenolic group (Ar-OH) is present.

Teacher's Signature : _____

Experiment No. 3

1 Aim: To identify the functional group present in the given sample of organic compound.

2 Preliminary Test:

a Physical state: Liquid

b Colour: colourless

c Odour: Alcoholic smell

d Solubility: Soluble in water

e Nature: Neutral (Blue or red litmus paper is not affected)

f Burning Test: Aliphatic (organic compound burns with blue non-sooty flame)

3 Observation Table:

S.No	Experiment	Observation	Inference
1	Element (Nitrogen) Test LS + 2 ml freshly prepared solution + heat then cool + 2 drops of conc. H_2SO_4	No green or prussian blue colour appears	N present
2	Functional group test (a) Sodium metal test Organic compound + a dry piece of Na metal	Brisk effervescence produce	Alcoholic (-OH) group present

Teacher's Signature: _____

S.No	Experiment	Observation	Inference
(b)	Ceric ammonium nitrate test Organic compound + 2 drops of ceric ammonium nitrate sol ⁿ	Red colouration appears	Alcoholic (-OH) group present.
(c)	Ester Test Organic Compound + CH_3COOH + 2 drops of conc. H_2SO_4	Fruity smell	Alcoholic (-OH) group present.

4. Result :

In given organic compound functional group Aldehyde group (-CHO) is present.

Teacher's Signature : _____

Experiment No. 4

1. Aim: To identify the functional group present in the given sample of organic compound.

2. Preliminary Test:

a. Physical State: liquid

b. Colour: colourless

c. odour: Pungent smell

d. Solubility: Soluble in water

e. Nature: Neutral (Blue or red litmus paper is not affected)

f. Burning Test: Aliphatic (organic compound burns with non-sooty flame)

3. Observation Table:

S.No	Experiment	Observation	Inference
1	Element (Nitrogen) test LS + 2 ml freshly prepared FeSO_4 sol ⁿ + heat then cool + 2 drop conc. H_2SO_4	No green or prussian blue colour appears	N absent
2	Functional group test (a) 2,4 DNP test Organic compound + few drops of 2,4,	yellow ppt	carbonyl ($-\text{CO}-$) group present.

Teacher's Signature: _____

S.No	Experiment	Observation	Inference
	dinitro phenyl hydrazine		
(b)	Schiff's test Organic compound + 2 drop of schiff's reagent	Red colouration appears	Aldehyde (-CHO) grp present
(c)	Tollen's Test Organic compound + 2 drops of Tollen's reagent than heat	Silver mirror formed	Aldehyde (-CHO) present

Result:

In given organic compound functional group
Aldehyde group (-CHO) is present.

Teacher's Signature : _____

Experiment No. 5

1. Aim: To identify the functional group present in the given sample of organic compound.

2. Preliminary Test:

a. Physical State: liquid

b. Colour: colourless

c. odour: Pleasant smell

d. Solubility: Soluble in water

e. Nature: Neutral (Blue or red litmus paper is not affected)

f. Burning Test: Aliphatic (organic compound burns with blue non-sooty flame).

3. Observation Table:

S.No	Experiment	Observation	Inference
1	Element (nitrogen) Test LS + 2 ml freshly prepared FeSO ₄ sol ⁿ + heat then cool + 2 drop of conc H ₂ SO ₄	No green or prussian blue colour appears	N absent
2	Functional group test (a) 2,4-DNP test Organic compound + few drops of 2,4 dinitrophenyl	yellow ppt forms	carbonyl (-CO-) group present

Teacher's Signature: _____

S.No	Experiment	Observation	Inference
	hydrazine		
(b)	Sodium nitroprusside test		
	Organic compound + 2 drops of sodium nitroprusside sol ⁿ + NaOH	Red colouration appears	Ketonic (-CO-) group present
(c)	m-dinitrobenzene test		
	Organic Compound + m-dinitrobenzene + NaOH	Violet colouration appears	Ketonic (-CO-) group present

Result:

In given organic compound functional group ketonic group (-CO-) is present.

Teacher's Signature : _____

Experiment No. 6

1 Aim: To identify the functional group present in the given sample of organic compound

2 Preliminary Test:

a Physical State : liquid

b Colour : red brown

c odour : Pleasant smell

d Solubility : Insoluble in water

e Nature : Basic (red litmus turns into blue)

f Burning Test : Aromatic (organic compound burns with sooty flame)

3 Observation Table:

S.No	Experiment	Observation	Inference
(1)	Element (nitrogen) Test LS + 2 ml freshly prepared $FeSO_4$ solution + heat then cool + 2 drops of conc. H_2SO_4	prussian blue colour appears	N present
2.	Functional group test		
(a)	Di azo test Organic compound + 1 ml dil. HCl + aq. sol ⁿ of $NaNO_2$ + cool it +	Organic red dye formed	Amine ($-NH_2$) present

Teacher's Signature : _____

S.No	Experiment	Observation	Inference
	ice cooled β naphthal sol ⁿ		
(b)	Carbylamine Test organic compound + $\text{CHCl}_3 + \text{KOH}$	Unpleasant odour appears	Amine ($-\text{NH}_2$) present

Result :

In given organic compound functional group amine
group ($-\text{NH}_2$) is present.

Teacher's Signature : _____

Experiment No. 7

Aim: Prepare $\frac{M}{20}$ ferrous ammonium sulphate solⁿ Mohr's salt with the help of this solution find out the molarity of given $KMnO_4$ solution.

Apparatus: Burette, pipette, conical flask, test tube, $KMnO_4$ solution & ferrous ammonium sulphate, and conc. H_2SO_4 .

Theory:

It is a redox titration in which $KMnO_4$ act as an oxidising agent and oxidise Fe^{+2} ions into Fe^{+3} ions in acidic medium. And itself get reduced to Mn^{+2} 1 mole of $KMnO_4$ oxidises 5 moles of ferrous ammonium sulphate.

Preparation of Standard FAS solution:

Molar mass of FAS = 392

Mass of FAS to prepare 250 cc of $\frac{M}{20}$ solⁿ.

$$M = \frac{W}{M.Wt} \times \frac{1000}{V_{cc}}$$

$$\frac{1}{20} = \frac{W}{392} \times \frac{1000}{250}$$

$$W = 0.49 \times 10 = 4.9 \text{ g}$$

Teacher's Signature : _____

* OBSERVATION TABLE :-

S.No.	Volume of FAS taken by pipette	Burette Reading		Volume of $KMnO_4$ solution	Concordant Volume
		Initial	Final		
1	20.0 ml	0.0	16.5	16.5 ml	
2	20.0 ml	0.0	16.0	16.0 ml	16.0 ml
3	20.0 ml	0.0	16.0	16.0 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS solⁿ

[A] Molarity of unknown $KMnO_4$ solⁿ :

$$\frac{M_1 V_1}{a} = \frac{M_2 V_2}{b}$$

M_1 = Molarity of FAS solution = $M/20$

M_2 = Molarity of unknown $KMnO_4$ solution = ?

V_1 = Volume of FAS solution = 20 ml

V_2 = Volume of $KMnO_4$ solution = 16 ml

a = no. of moles of FAS = 10

b = no. of moles of $KMnO_4$ = 2

$$\Rightarrow \frac{1}{20} \times \frac{20}{10} = \frac{M_2 \times 16}{2}$$

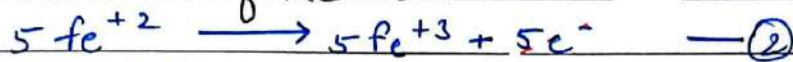
$$M_2 = \frac{2}{10 \times 16} \Rightarrow 0.0125 \text{ moles/litre}$$

Ionic Reaction :-

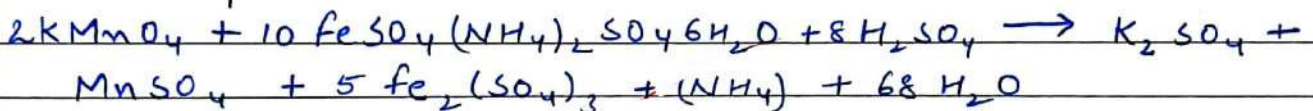
(a) Reduction Half Reaction :-



(b) Oxidation Half Reaction :-



Add (1) & (2)

Molar Equation :-

Indicator and End Point :- KMnO_4 act as a self indicator and end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted KMnO_4 .

Procedure :-

- (1) Weight exactly 4.9 g of Mohr salt on a watch glass and prepare 250 ml of $\frac{M}{20}$ FAS solution by dissolving 4.9 g Mohr salt in water.
- (2) Rinse and fill the burette with the given KMnO_4 solution.
- (3) Rinse the pipette with the prepared Mohr salt solution and pipette out 20 ml of it in a washed titration flask.

Teacher's Signature : _____

- (4) Add one test tube (20 ml) full of dil. H_2SO_4 (2M) to solution in titration flask.
- (5) Note the initial reading of burette.
- (6) Now add $KMnO_4$ solution from the burette till a permanent light pink colour is imparted to the solution in the titration flask.
- (7) Note the final reading of burette.
- (8) Repeat the above step for the two concordant reading.

Result:

The molarity of given $KMnO_4$ solution is 0.0125 moles/litre.

Precautions:

- (1) Use the glass apparatus carefully.
- (2) Rinse the burette and pipette properly before use.
- (3) Note the reading while putting the setup at eye-level.
- (4) $KMnO_4$ solution is coloured, its upper meniscus should be recorded.
- (5) Put the appropriate amount of H_2SO_4 .

Teacher's Signature : _____

Experiment No. 8.

Aim: To prepare a solution of ferrous ammonium sulphate containing exactly 17 gm in 1 litre of solution and with the help of this solution determine the molarity and strength of KMnO_4 in given solⁿ.

Apparatus: - Burette, pipette, conical flask, test tube, KMnO_4 solⁿ and ferrous ammonium sulphate solⁿ of conc. H_2SO_4 .

Theory: -

It is a redox titration in which KMnO_4 act as a oxidising agent and oxidizes Fe^{+2} ions into Fe^{+3} ions in acidic medium and itself get reduce to Mn^{+2} .
1 mole of KMnO_4 oxidises 5 mole of FAS.

Preparation of standard solution: -

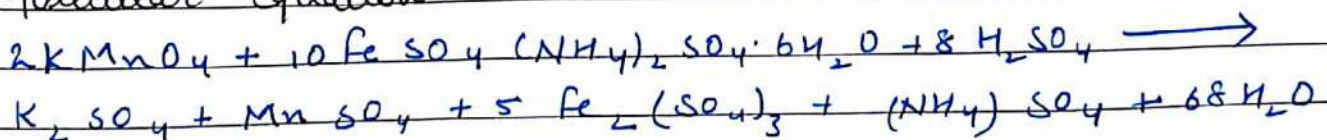
To prepare 1 litre of solution amount

amount of ferrous ammonium sulphate = 17g

To prepare 250 ml solⁿ amount of FAS = $\frac{17 \times 250}{1000}$

= 4.25 gm

Molecular equation: -



Teacher's Signature : _____

* OBSERVATION TABLE :-

S.No	Volume of FAS taken by pipette	Burette Reading		Volume of KMnO_4 sol ⁿ used	Concordant Reading.
		Initial	final		
1	20.0 ml	0.0	19.0 ml	19.0 ml	
2	20.0 ml	0.0	18.4 ml	18.4 ml	18.4 ml
3	20.0 ml	0.0	18.4 ml	18.4 ml	

* CALCULATION :-

Two moles of KMnO_4 react with 10 moles of FAS solⁿ.

[A] Molarity of unknown KMnO_4 solution :-

$$\frac{M_1 V_1}{a} = \frac{M_2 V_2}{b}$$

M_1 = Molarity of FAS solution = 17/392

M_2 = Molarity of KMnO_4 = ?

V_1 = Volume of FAS solution = 20 ml

V_2 = Volume of KMnO_4 solution = 18.4 ml

a = no. of moles of FAS = 10

b = no. of moles of KMnO_4 = 2

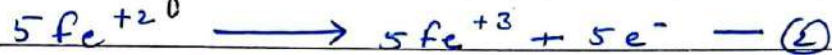
$$\Rightarrow \frac{17}{392} \times \frac{20}{10} = \frac{M_2 \times 18.4}{2}$$

Ionic Equation :-

(a) Reduction Half Reaⁿ:



(b) Oxidation Half Reaⁿ:



Add eqⁿ (1) & (2)



Indicator and End Point :-

KMnO_4 act as self indicator and the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted KMnO_4 .

Procedure :-

- (1) Weigh exactly 4.25g of Mohr salt on a watch glass and prepare 250 ml of M/20 FAS solution by dissolving 4.25g of Mohr salt in water.
- (2) Rinse and fill the burette with the given KMnO_4 solⁿ.
- (3) Rinse the pipette with the prepared Mohr salt solution and pipette out 20ml of it in a washed titration flask.
- (4) Add one test tube (20ml) full of dil H_2SO_4 (2M) to a solution in titration flask.
- (5) Note the initial reading of burette.
- (6) Now add KMnO_4 solution from burette till a permanent light pink colour is imparted to the solⁿ in titration flask.

Teacher's Signature : _____

$$M_2 = 0.0094 \text{ mole / litre}$$

[13] Strength of KMnO_4 solution = Molarity of KMnO_4 x
Molecular weight

$$= 0.0094 \times 158$$

$$= M_2 \times 158 \text{ g/mole}$$

$$= 1.4852 \text{ g}$$

- (7) Note the final reading of burette.
- (8) Repeat the above steps for the two concordant readings.

Result :

The strength of given KMnO_4 solⁿ is 1.4852 g/litre.

Precautions :-

- (1) Use the glass apparatus carefully.
- (2) Rinse the burette and pipette properly before use.
- (3) Note the reading while putting the set up at eye-level.
- (4) KMnO_4 solⁿ is coloured its upper-meniscus should be recorded.
- (5) Put the appropriate amount of H_2SO_4 .

Teacher's Signature : _____

Experiment No. 9

Aim: Find out the percentage purity of impure KMnO_4 sample 2g of which have been dissolved in 1 litre of solⁿ. For this purpose you have to prepare a standard solⁿ of crystalline FAS of molarity $\text{M}/20$.

Apparatus: - Burette, pipette, conical flask, test tube, KMnO_4 solⁿ and ferrous ammonium sulphate solⁿ & conc. H_2SO_4 .

Theory: -

It is a redox titration in which KMnO_4 act as self indicator and oxidises Fe^{+2} ions into Fe^{+3} ions in acidic medium and itself get reduce to Mn^{+2} .
1 mole of KMnO_4 oxidises 5 mole of FAS.

Preparation of standard FAS solution :-

To prepare 2.1 litre of solⁿ amount of FAS = 17g

To prepare 250 ml of solⁿ amount of FAS = $\frac{17}{1000} \times 250 = \frac{17}{4}$

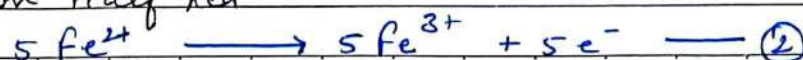
= 4.25 gram

Ionic equation :-

(a) Reduction Half Reaⁿ:



(b) Oxidation Half Reaⁿ:



Teacher's Signature : _____

* OBSERVATION TABLES :-

S.No	Volume of FAS taken by pipette	Burette Reading		Volume of $KMnO_4$ used	Concordant Volume
		Initial	Final		
1	20 ml	0.0	18.8 ml	18.8 ml	
2	20 ml	0.0	18.6 ml	18.6 ml	18.6 ml
3	20 ml	0.0	18.6 ml	18.6 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS solution

[A] Molarity of $KMnO_4$ solution :

$$\frac{M_1 V_1}{a} = \frac{M_2 V_2}{b}$$

M_1 = Molarity of FAS solⁿ = $M/20$

M_2 = Molarity of $KMnO_4$ solⁿ = ?

V_1 = Volume of FAS solⁿ = 20 ml

V_2 = Volume of $KMnO_4$ solⁿ = 18.6 ml

a = no. of moles of FAS = 10

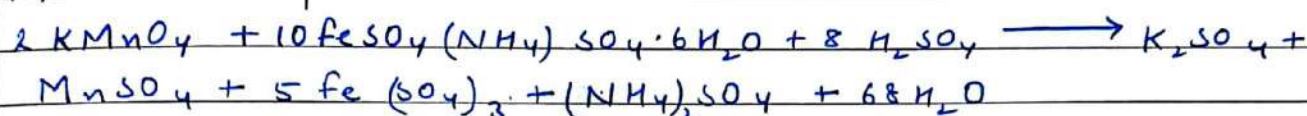
b = no. of moles of $KMnO_4$ = 2

$$\Rightarrow \frac{1}{20} \times \frac{20}{10} = \frac{M_2 \times 18.6}{2}$$

Add eqⁿ ① & ②



Molecular Equation :-



Indicator and End Point :-

KMnO_4 act as self indicator and the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted KMnO_4 .

Procedure :-

- (1) Weigh exactly 4.9 g of Mohr salt on a watch glass and prepared 250 ml of M/20 FAS solⁿ by dissolving 4.9 g of Mohr salt in water.
- (2) Rinse and fill the burette with the given KMnO_4 solⁿ.
- (3) Rinse the pipette with the prepared Mohr salt solⁿ and pipette out 20 ml of it in a washed titration flask.
- (4) Add one test tube (20 ml) full of dil H_2SO_4 (2M) to solⁿ in titration flask.
- (5) Note the initial reading of burette.
- (6) Now add KMnO_4 solⁿ from burette till a permanent light pink colour is imparted to the solⁿ in titration flask.
- (7) Note the final reading of burette.
- (8) Repeat the above steps for the two concordant reading.

Teacher's Signature : _____

$$\therefore M_2 = \frac{1}{93} \Rightarrow 0.01074 \text{ mole / litre.}$$

[B] Strength of given KMnO_4 solⁿ = Molarity of $\text{KMnO}_4 \times$
Molar mass of weight

$$= 0.01074 \times 158$$

$$= 1.69692 \text{ g}$$

[C] Percentage purity of given KMnO_4 solⁿ:
$$= \frac{\text{Strength of } \text{KMnO}_4 \text{ (observed)}}{\text{Strength of } \text{KMnO}_4 \text{ (given)}} \times 100$$

$$= \frac{1.69692}{2} \cdot \%$$

$$= 84.8\%$$

Result :

The percentage purity of unknown KMnO_4 solution is 84.8 %

Precautions :-

- (1) Use the glass apparatus carefully.
- (2) Rinse the burette and pipette properly before use.
- (3) Note the reading while putting the set up at eye-level.
- (4) KMnO_4 solⁿ is coloured its upper-meniscus should be recorded.
- (5) Put the appropriate amount of H_2SO_4 .

Teacher's Signature : _____

Experiment No. 10

Aim: Find out the strength of KMnO_4 solⁿ for this purpose you have to prepare a standard solⁿ of crystalline FAS containing 19.606 g of salt per litre.

Apparatus: - Burette, pipette, conical flask, test tube, KMnO_4 solⁿ and ferrous ammonium sulphate solⁿ & conc. H_2SO_4 .

Theory: -

It is a redox titration in which KMnO_4 act as oxidising agent and oxidises Fe^{+2} ions into Fe^{+3} ions in acidic medium and itself gets reduce to Mn^{+2} .
1 mole of KMnO_4 oxidises 5 mole of FAS.

Preparation of FAS solution: -

Amount of FAS required in 1 litre = 19.606 g

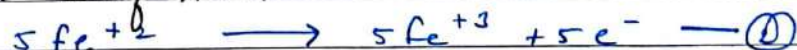
For 250 ml of solⁿ amount of FAS = $\frac{19.606}{1000} \times 250$
= 4.901 g

Ionic Equation: -

(a) Reduction Half Reaction:



(b) Oxidation Half Reaction:



Teacher's Signature : _____

* OBSERVATION TABLE :

S.No	Volume of FAS taken by pipette	Burette Reading		Volume of KMnO_4 used	Concordant Reading.
		Initial	Final		
1	20 ml	0.0	23.8 ml	23.8 ml	
2	20 ml	0.0	23.3 ml	23.3 ml	23.3 ml
3	20 ml	0.0	23.3 ml	23.3 ml	

* CALCULATION :-

Two moles of KMnO_4 react with 10 mole of FAS solution

[A] Molarity of unknown KMnO_4 solution :

$$\frac{M_1 V_1}{a} = \frac{M_2 V_2}{b}$$

M_1 = Molarity of FAS solⁿ = $19.606/392$

M_2 = Molarity of KMnO_4 solⁿ = ?

V_1 = Volume of FAS = 20 ml

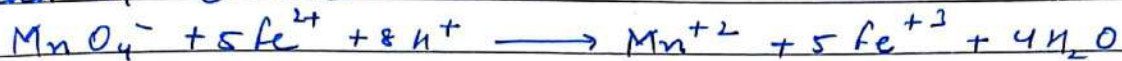
V_2 = Volume of KMnO_4 = 23.3 ml

a = no. of moles of FAS = 10

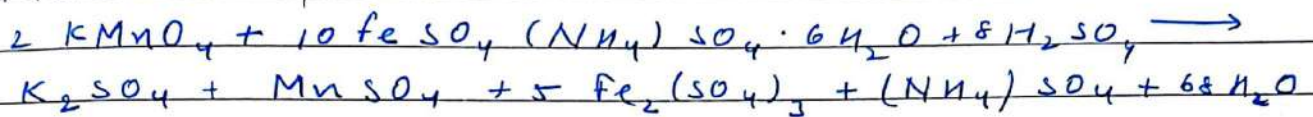
b = no. of moles of KMnO_4 = 2

$$\frac{19.606}{392} \times \frac{20}{10} = \frac{M_2 \times 23.3}{2} = 0.0085 \text{ mole/litre.}$$

Add eqⁿ (1) & (2)



Molecular equation :-



Indicator and end point :-

KMnO_4 act as self indicator and the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted KMnO_4 .

Procedure :-

- (1) Weigh exactly 4.9 g of Mohr salt on a watch glass & prepare 250 ml of $\text{M}/20$ FAS solⁿ by dissolving 4.9 g of Mohr salt in water.
- (2) Rinse and fill the burette with the given KMnO_4 solⁿ
- (3) Rinse the pipette with the prepared Mohr salt solⁿ & pipette out 250 ml of it in a washed titration flask.
- (4) Add one test tube full of dil H_2SO_4 (2M) to the solⁿ in titration flask.
- (5) Note the initial reading of burette.
- (6) Now add KMnO_4 solⁿ from burette till a permanent light pink colour is imparted to the solⁿ in the titration flask.
- (7) Note the final reading of burette.

Teacher's Signature : _____

$$\begin{aligned} \text{[B] Strength of unknown } \text{KMnO}_4 \text{ solution:} \\ &= \text{Molarity of } \text{KMnO}_4 \times \text{Molecular weight} \\ &\quad \text{of } \text{KMnO}_4. \\ &= 0.0085 \times 158 \\ &= 1.343 \text{ g/liter} \end{aligned}$$

(8) Repeat the above step for the two concordant reading.

Result:

The strength of unknown KMnO_4 solⁿ is 1.343 gram.

Precautions:

- (1) Use the glass apparatus carefully.
- (2) Rinse the burette and pipette properly before use.
- (3) Note the reading while putting the set up at eye-level.
- (4) KMnO_4 is coloured so its upper meniscus should be recorded.
- (5) Put the appropriate amount of H_2SO_4 .

Experiment No-11.

Aim: Prepare a standard solⁿ of M/20 oxalic acid with the help of this solution determine the molarity and strength of given KMnO_4 solution.

Apparatus:- Burette, pipette, conical flask, test tube, KMnO_4 , oxalic acid, conc. H_2SO_4 .

Theory:

It is a redox titration in which KMnO_4 act as an oxidising agent and oxidises $\text{C}_2\text{O}_4^{2-}$ ions into CO_2 in acidic medium and itself reduce to Mn^{+2} ions. 2 mole of KMnO_4 oxidise 5 mole of oxalic acid.

Preparation of Standard Solution of oxalic acid:

Molar Mass of oxalic acid = 126

$$M = \frac{\text{Weight of solute} \times 1000}{\text{Molecular weight} \times \text{vol}^n \text{ of sol}^n}$$

$$M = \frac{\text{Weight of solute} \times 1000}{\text{Molecular weight} \times \text{vol}^n \text{ of sol}^n}$$

$$\frac{1}{50} = \frac{W_B}{126} \times \frac{1000}{250}$$

$$W_B = \frac{126}{4 \times 50} = \frac{126}{200} = 0.63 \text{ g}$$

ionic Equation :-

(a) Reduction Half Reaⁿ:



Teacher's Signature : _____

* OBSERVATION TABLE :

S.No	Volume of oxalic acid taken by pipette	Burette Reading		Volume of oxalic acid	Concordant Reading
		Initial	Final		
1	20 ml	0.0	22.7 ml	22.7 ml	
2	20 ml	0.0	22.5 ml	22.5 ml	22.5 ml
3	20 ml	0.0	22.5 ml	22.5 ml	

* CALCULATION:-

Two moles of KMnO_4 react with 10 mole of FAS sol^n

[A] Molarity of unknown $\text{KMnO}_4 \text{ sol}^n$:

$$\frac{M_1 V_1}{a} = \frac{M_2 V_2}{b}$$

M_1 = Molarity of standard oxalic acid = $\frac{1}{50}$

M_2 = Molarity of KMnO_4 solution ?

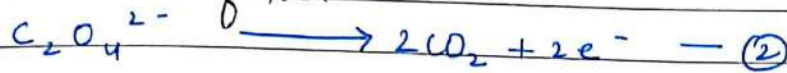
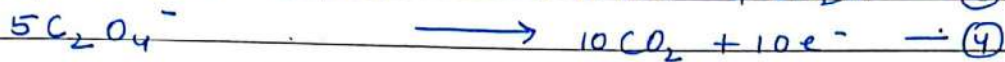
V_1 = Volume of oxalic acid taken by pipette = 20 ml

V_2 = Volume of KMnO_4 solution = 22.5 ml

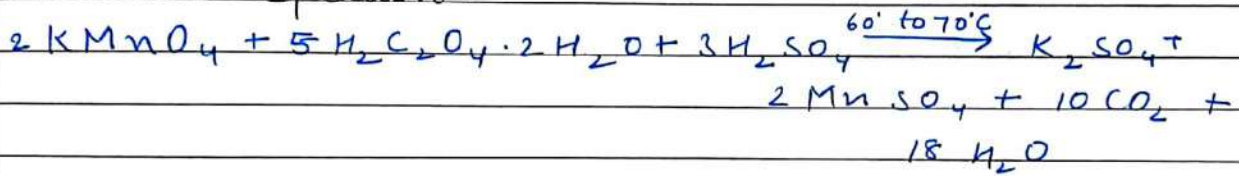
a = no. of moles of oxalic acid = 5

b = no. of moles of KMnO_4 = 2

$$\frac{1}{50} \times \frac{20}{5} = \frac{M_2 \times 22.5}{2}$$

(b) oxidation Half Reaⁿ:① eqⁿ multiply by 2 & ② eqⁿ multiply by 5Add eqⁿ (3) & (4)

Molecular Equation :-



Indicator and End Point :-

KMnO₄ act as self indicator and the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted KMnO₄.

Procedure :-

- (1) weight 0.63 g of oxalic acid crystals on a watch glass and dissolve it in water to prepare 250 ml of M/20 oxalic acid solⁿ.
- (2) Rinse and fill the burette with the KMnO₄ solⁿ
- (3) Rinse & fill the pipette with the prepared oxalic acid solⁿ and pipette out 20.0 ml of it in a titration flask.

Teacher's Signature : _____

$$M_2 = \frac{4}{22.5 \times 25} = 0.0071 \text{ mole / litre.}$$

[B] Strength of KMnO_4 solution = Molarity of KMnO_4 solⁿ ×
Molecular mass

$$= M_2 \times \text{M.wt}$$
$$= 0.0071 \times 158$$
$$= 1.22 \text{ g / litre.}$$

- (4) Add one test tube of dil. H_2SO_4 to the solⁿ in titration flask.
- (5) Note the initial reading of burette.
- (6) Now add the $KMnO_4$ solⁿ from the burette till a permanent light pink colour is imparted to the solⁿ in the titration flask on addition of a last single drop of $KMnO_4$ solⁿ.
- (7) Note the final reading of burette.
- (8) Repeat the above step for the two concordant reading.

Result :

The molarity of given $KMnO_4$ solⁿ is 0.0071 molarity
The strength of given $KMnO_4$ solⁿ is 1.122 g/litre.

Precautions :-

- (1) Use the glass apparatus carefully.
- (2) Rinse the burette & pipette carefully & properly before use.
- (3) Note the reading while putting the set up at eye-level.
- (4) $KMnO_4$ solⁿ is coloured so its upper meniscus should be recorded.
- (5) Put the appropriate amount of H_2SO_4 .

Teacher's Signature : _____

Experiment No. 12.

Aim: Prepare an M/20 oxalic acid solⁿ with the help of this solⁿ determine the percentage purity sample of KMnO_4 4g of which is dissolved in 1 litre of given solⁿ.

Apparatus: - Burette, pipette, conical flask, Test tube, KMnO_4 , oxalic acid, conc. H_2SO_4 .

Theory :-

It is a redox titration in which KMnO_4 act as an oxidising agent & oxidises $\text{C}_2\text{O}_4^{2-}$ ions into CO_2 in acidic medium & itself reduce to Mn^{+2} ions.

2 mole of KMnO_4 oxidise 5 mole of $(\text{C}_2\text{O}_4^{2-})$ oxalic acid.

Preparation of standard solution of Oxalic acid :-

Molar mass of oxalic acid = 126

$$\frac{1}{50} = \frac{w}{126} \times \frac{1000}{250}$$

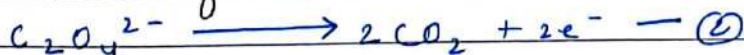
$$w = \frac{126}{50 \times 4} = 0.63 \text{ g}$$

Ionic equation :-

(a) Reduction Half Reaⁿ!



(b) Oxidation Half Reaⁿ!



Teacher's Signature : _____

* OBSERVATION TABLE :

S.No	Volume of oxalic acid taken by pipette	Burette Reading		Volume of oxalic acid used	Concordant Volume
		Initial	Final		
1	20 ml	0.0	19.5 ml	19.5 ml	
2	20 ml	0.0	19.1 ml	19.1 ml	19.1 ml
3	20 ml	0.0	19.1 ml	19.1 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS solution

[A] Molarity of $KMnO_4$ solution :

$$\frac{M_1 V_1}{a} = \frac{M_2 V_2}{b}$$

M_1 = Molarity of oxalic acid = $M/20$

M_2 = Molarity of $KMnO_4$ solⁿ = ?

V_1 = Volume of oxalic acid by pipette = 20 ml

V_2 = Volume of $KMnO_4$ solⁿ = 19.1 ml

a = no. of moles of oxalic acid = 5

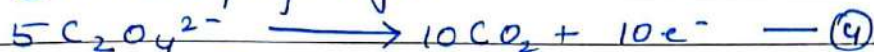
b = no. of moles of $KMnO_4$ = 2.

$$\frac{1}{20} \times \frac{20}{5} = \frac{M_2 \times 19.1}{2}$$

eqⁿ ① Multiply by 2.



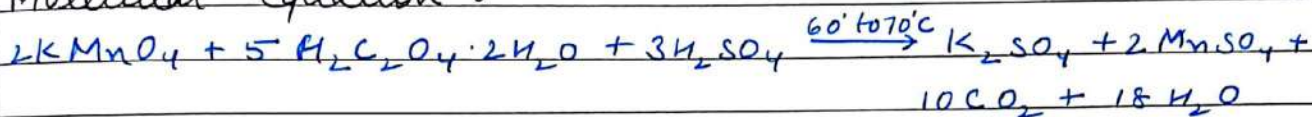
eqⁿ ② Multiply by 5.



Add eqⁿ ③ & ④



Molecular equation :



Indicator and end point :

KMnO_4 act as self indicator & the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted KMnO_4 .

Procedure :-

- (1) Weight 0.63 g of oxalic acid crystals on a watch glass & dissolve it in water to prepare 250 ml of M/20 oxalic acid solution.
- (2) Rinse & fill the burette with KMnO_4 solⁿ.
- (3) Rinse & fill the pipette with prepared oxalic acid solⁿ & pipette out 20.0 ml of it in a titration flask.
- (4) Add one test tube full of dil H_2SO_4 to solⁿ in titration flask.
- (5) Note the initial reading of burette.
- (6) Now add the KMnO_4 solⁿ from burette till a permanent light pink colour is imparted to the solⁿ.

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$$M_2 = \frac{2}{19.1 \times 5} = 0.0209 \text{ mole / litre}$$

[B] Strength of KMnO_4 solution = Molarity of KMnO_4 \times
Molar mass of KMnO_4

$$= M_2 \times 158$$
$$= 0.0209 \times 158$$
$$= 3.302 \text{ g / litre.}$$

[C] Percentage purity of KMnO_4 solⁿ :

$$= \frac{\text{Strength of } \text{KMnO}_4 \text{ sol}^n \text{ (observed)}}{\text{Strength of } \text{KMnO}_4 \text{ sol}^n \text{ (given)}} \times 100$$

$$= \frac{3.302}{4} \times 100\%$$

$$= 82.55\%$$

in the titration flask on addition of a last single drop of KMnO_4 solⁿ.

- (7) Note the final reading of burette.
- (8) Repeat the above steps for the two concordant reading.

Result :

The percentage purity of given KMnO_4 solⁿ is 82.55%.

Precautions :

- (1) Use the glass apparatus carefully.
- (2) Rinse the burette & pipette carefully & properly before use.
- (3) Note the reading while putting the set up at eye-level.
- (4) KMnO_4 solⁿ is coloured so its upper meniscus should be recorded.
- (5) Put the appropriate amount of H_2SO_4 .

Teacher's Signature : _____

Experiment No. 13

Aim: To analyse the acidic and basic radical in given salt.

OBSERVATION TABLE :-

S.No	Experiment	Observation	Inference.
[A]	Acidic Radical		
1	Salt + dil. H_2SO_4	Colourless, odourless gas (CO_2) is evolved with brisk effervescence.	dil H_2SO_4 group present CO_3 may be.
(a)	The gas is passed in lime water.	it turns milky	CO_3^{2-} present
(b)	On passing the gas for some more time (excess)	Milkiness disappear	CO_3^{2-} confirm
[B]	Basic Radical		
1	Salt + NaOH solution and heat	A gas is evolved with ammonia like smell	Znco group present NH_4^+ may be
(a)	A glass rod dipped in conc. HCl is brought at the mouth of test tube	with dense fumes appear	NH_4^+ present
(b)	On passing the gas through nessler's reagent	Red-brown ppt formed	NH_4^+ confirm.

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RESULT:-

In given salt acidic radical is carbonate (CO_3^{2-}) and basic radical is ammonium.

Teacher's Signature : _____

Experiment No. 14

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic Radical		
1.	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent
2.	Salt + cone. H_2SO_4	No reaction	cone. H_2SO_4 group absent
3.	Salt + dil HCl + $BaCl_2$ solution	white ppt. form	SO_4^{2-} present
(a)	Above ppt + cone. HCl or HNO_3	white ppt. remain undissolved	SO_4^{2-} confirm
(b)	Salt solution + CH_3COOH + $(CH_3COO)_2Pb$	white ppt. formed	SO_4^{2-} confirm
[B]	Basic Radical		
1.	Salt + NaOH solution and heat	A gas is evolved with ammonia like smell.	Zeco group present NH_4^+ may be
(a)	A glass rod shaped in cone. HCl is brought at mouth of test tube.	white dense fumes appears.	NH_4^+ present

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(b) On passing the glass

Red brown ppt form NH_4^+ confirm

RESULT:

In the given salt acidic radical sulphate (SO_4^{2-}) and basic radical ammonium (NH_4^+) are present.

Teacher's Signature : _____

Experiment No. 15

Aim: To analyse acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil. H_2SO_4	No reaction	dil. H_2SO_4 group absent.
2	Salt + conc. H_2SO_4	Colourless gas with vinegar like smell.	conc. H_2SO_4 group present CH_3COO^- may be.
(a)	Add 1 ml C_2H_5OH	Fruity odour smell due to ester formation appears	CH_3COO^- confirm.
(b)	Salt solution + neutral $FeCl_3$ (ferric chloride)	Deep red colour appears which turn into brown red ppt on boiling	CH_3COO^- confirm.
(c)	Flame Test \Rightarrow salt + oxalic acid + three drop of H_2O and rub with thumb	smell of vinegar	CH_3COO^- confirm.

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[B]	Basic radical		
1	Salt + NaOH solution and heat	NO smell of ammonia	Zero group NH_4^+ present.
2	O.S (Original solution) + dil HCl Dissolve the ppt in hot water and divide the solution into two parts	white ppt obtain	I group present Pb^{2+} may be
(a)	I part + KI solution	yellow ppt obtain	Pb^{2+} confirm.
(b)	II part + $\text{K}_2\text{Cr}_2\text{O}_7$ solution	yellow ppt obtain	Pb^{2+} confirm.

RESULT:

In the given salt the basic radical is Pb^{2+} and acidic radical is CH_3COO^- .

Teacher's Signature : _____

Experiment No. 15

Aim: To analyse the acidic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent.
2	Salt + conc. H_2SO_4	Brown fumes evolve	conc. H_2SO_4 present NO_3^- may be.
(a)	Add copper turning (piece of filter paper) in above solution and heat.	Brown fumes become dense	NO_3^- confirm.
(b)	Salt sol ⁿ + freshly prepared $FeSO_4$ + conc. H_2SO_4 by the side of test tube.	Dark brown ring form	NO_3^- confirm
[B]	Basic radical		
1	Salt + NaOH sol ⁿ	No NH_3 like smell	Zero group absent.
2	O.S + dil HCl	no white ppt form	I group absent
3	Pass H_2S gas in above sol ⁿ	no black brown ppt	II group absent

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		or yellow ppt obtain	
4	0.5 + a drop of conc. HNO_3 + heat then cool + NH_4Cl + NH_4OH in excess Dissolve the white ppt in dil. HCl & dissolve it into 3 parts.	white gelatinous ppt form	III group present Al^{+3} may be
(a)	I part + few drop of blue litmus sol ⁿ + NH_4OH sol ⁿ along the side of test tube	a blue floating mass in the colourless sol ⁿ obtain	Al^{+3} confirm
(b)	II part + NaOH sol ⁿ	white gelatinous ppt. soluble in excess of NaOH	Al^{+3} confirm
(c)	Cobalt nitrate test	Blue colour ash is obtain	Al^{+3} confirm

RESULT :

In given salt acidic radical is NO_3^- basic radical is Al^{+3} are present.

Teacher's Signature : _____

Experiment No. 17

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent.
1	Salt + conc. H_2SO_4	Colourless, odourless gas with a pungent smell.	conc. H_2SO_4 group present Cl^- may be Cl^- confirm
(a)	A rod dipped in NH_4OH is brought near the mouth of test tube	white dense fumes appear	Cl^- confirm
(b)	Add a pinch of MnO_2 in the above solution and heat	greenish-yellow gas evolved	Cl^- confirm
(c)	Chromyl chloride test		
(i)	Salt + $K_2Cr_2O_7(s)$ + conc. H_2SO_4 and heat	orange red vapour appear	
(ii)	Above sol ⁿ + CH_3COOH + $(CH_3COO)_2Pb$	yellow ppt appear	Cl^- confirm
[B]	Basic radical		
1	Salt + $NaOH$ sol ⁿ and heat	$NaNO_3$ like smell.	Kero group absent

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1.	O.S + dil HCl	No white ppt form	I group absent
3.	Pass H_2S gas in above sol ⁿ	No black brown ppt	II group absent
4.	O.S + a drop of conc. HNO_3 + heat then cool + NH_4Cl (s) + NH_4OH excess	No ppt form	III group absent
5.	Pass H_2S gas in above sol ⁿ	NO ppt form	IV group absent
6.	O.S + NH_4Cl + NH_4OH sol ⁿ + $(NH_4)_2CO_3$ sol ⁿ Dissolve the ppt in CH_3COOH and divide the sol ⁿ in three parts	white ppt formed	I group present $Ba^{+2}, Sr^{+2}, Ca^{+2}$ may be
(i)	I part + K_2CrO_4	yellow ppt form	Ba^{+2} present
(ii)	Flame test	grassy green flame obtain	Ba^{+2} confirm

RESULT:

In the given salt acidic radical is Cl^- and basic radical is Ba^{+2} .

Teacher's Signature : _____

Experiment No. 18

Aim: In the given salt the acidic and basic radical is to be analysed.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent
2	Salt + conc. H_2SO_4	Brown fumes evolved	conc. H_2SO_4 group present NO_3^- may be
(a)	Add copper turning (a piece of filter paper) in the above sol ⁿ and heat	Brown fumes becomes dense	NO_3^- confirm
(b)	Salt sol ⁿ + freshly prepared $FeSO_4$ + conc. H_2SO_4 by the side of the test tube	Dark brown ring formed	NO_3^- confirm
[B]	Basic radical		
1	Salt + NaOH sol ⁿ and heat	No NH_3 like smell	Zero group absent
2	O.S + dil. HCl	No white ppt form	I group absent
3	Pass the H_2S gas in above sol ⁿ	No black and yellow ppt formed	II group absent

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4	O.S + a drop of conc. HNO_3 + heat and cool $\text{NH}_4\text{Cl}_{(s)}$ + NH_4OH in excess	white gelatinous ppt forms	III group present Al^{+3} may be.
5	Pass H_2S gas in above sol ⁿ and dissolve the sol ⁿ into three part	No ppt formed	II group absent
6	O.S + NH_4Cl + NH_4OH + $(\text{NH}_4)_2\text{C}_2\text{O}_4$ sol ⁿ Dissolve the ppt in CH_3COOH and divide the sol ⁿ in three parts	white ppt formed	I group present Ba^{+2} , Sr^{+2} or Ca^{+2} may be.
(i)	I part + $\text{K}_2\text{Cr}_2\text{O}_7$	No yellow ppt form	Ba^{+2} absent
(ii)	II part + $(\text{NH}_4)_2\text{SO}_4$	No white ppt	Sr^{+2} absent
(iii)	III part + $(\text{NH}_4)_2\text{C}_2\text{O}_4$ (ammonium oxalate)	white ppt form	Ca^{+2} present
(iv)	flame test	Brisk red flame obtained	Ca^{+2} confirm

RESULT:

In the given salt acidic radical is NO_3^- and basic radical is Ca^{+2} .

Teacher's Signature : _____

Experiment No. 19

Aim: To analyse the acidic and basic radical in given salt.

OBSERVATION TABLE :-

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1.	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent
2.	Salt + conc. H_2SO_4	No reaction	conc. H_2SO_4 group absent
3.	Salt + dil HCl + $BaCl_2$ sol ⁿ	white ppt. form	SO_4^{2-} present
(a)	Above white ppt + conc. HCl or HNO_3	white ppt remain undissolved	SO_4^{2-} confirm
(b)	Salt sol ⁿ + CH_3COOH + $(CH_3COO)_2Pb$	white ppt formed	SO_4^{2-} confirm
[B]	Basic radical		
1.	Salt + NaOH and heat	NO NH_3 like smell	Zero group present
2.	O.S + dil HCl	No white ppt form	I group absent
3.	Pass H_2S gas in above sol ⁿ	No black and yellow ppt form	II group absent

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4.	O.S + a drop of conc. HNO_3 + heat & then cool + NH_2Cl + NH_4OH in excess	white gelatinous ppt not obtain	III group absent
5.	Pass H_2S gas in above sol ⁿ	No ppt formed	IV group absent
6.	O.S + $(\text{NH}_4)_2\text{CO}_3$ sol ⁿ	No ppt formed	V group absent
7.	O.S + NH_4Cl (s) + heat and cool + NH_4OH sol ⁿ + Na_2HPO_4	white ppt form	VI group present Mg^{2+} may be
(a)	Above white ppt + NaOH sol ⁿ + Titan yellow reagent	pink ppt obtain	Mg^{2+} confirm
(b)	Cobalt - Nitrate test	Pink coloured ash obtained	Mg^{2+} confirm

RESULT :-

In the given salt acidic radical is SO_4^{2-} and basic radical is Mg^{2+}

Teacher's Signature : _____

Experiment No. 20

Aim: To analyse the acidic and basic radical in given salt.

OBSERVATION TABLE :

S.No	Experiment	Observation	Inference
[A]	Acidic Radical		
1	Salt + dil H_2SO_4	No reaction	dil. H_2SO_4 group absent
2	Salt + conc. H_2SO_4	Colourless gas with pungent smell	conc. H_2SO_4 group present Cl^- may be present
(a)	A rod dipped in NH_4OH is brought near the mouth of the test tube	white dense fumes appear	Cl^- present
(b)	Chromyl Chloride test:		
(i)	Salt + $K_2Cr_2O_7(s)$ + conc. H_2SO_4 and heat	orange red vapour appear	
(ii)	Pass the red vapour in $NaOH$ sol ⁿ	$NaOH$ sol ⁿ turns yellow	
(iii)	Above sol ⁿ + CH_3COOH + $(CH_3COO)_2Pb$	yellow ppt appears	Cl^- confirm

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	(B) Basic radical		
1	Salt + NaOH sol ⁿ and heat	NO NH ₃ like smell	Zero group absent
5			
2	O.S + dil HCl	No white ppt obtain	I group absent
3	Pass H ₂ S gas in above sol ⁿ	yellow ppt form	II group present As ⁺³ may be present
10			
(a)	Boil the yellow ppt into yellow ammonium sulphide sol ⁿ	yellow ppt dissolve	As ⁺³ present
(b)	Above sol ⁿ + conc. HNO ₃ + ammonium molybdate sol ⁿ	Canary yellow ppt form	As ⁺³ confirm
15			

RESULT:

20 Acidic radical and basic radical in the given salt are Cl⁻ and As⁺³.

25

Teacher's Signature: _____

Experiment No. 21

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	Colourless, colourless gas evolve with brisk effervescence	del. H_2SO_4 group present CO_3^{2-} may be.
(a)	The gas is passed in lime water	It turns milky	CO_3^{2-} present
(b)	On passing the gas for some more time (excess)	Milkiness disappears	CO_3^{2-} confirm
[B]	Basic radical		
1	Salt + NaOH and heat	No smell of NH_3	Zero group NH_4^+ absent.
2	O.S + dil HCl	No white ppt form	I group absent
3	Pass H_2S gas in above sol ⁿ	No black or yellow ppt form	II group absent.

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4	O.S + a drop of conc. HNO_3 + heat then cool + $\text{NH}_4\text{Cl(s)}$ + NH_4OH (excess)	No ppt form	III group absent
5	Pass H_2S gas in above sol ⁿ	white ppt form	IV group present Zn^{+2} may be.
10	Dissolve the white ppt in dil. HCl and divide the sol ⁿ into two parts.		
(a)	I part + NaOH sol ⁿ	white ppt form which is soluble in excess of NaOH	Zn^{+2} confirm
(b)	II part + NH_4OH sol ⁿ + $\text{K}_4[\text{Fe}(\text{CN})_6]$	a bluish white ppt appear	Zn^{+2} confirm
(c)	Cobalt Nitrate test	Green coloured ash is obtain	Zn^{+2} confirm

RESULT:

In the given salt acidic radical is CO_3^{2-} and basic radical is Zn^{+2} are present.

Experiment No. 22

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No.	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent
2	Salt + conc. H_2SO_4	Brown fumes evolve	conc. H_2SO_4 group present NO_3^- maybe
(a)	Add copper turnings in above sol ⁿ and heat	Brown fumes becomes dense	NO_3^- confirm
(b)	Salt + sol ⁿ + freshly prepared $FeSO_4$ + conc. H_2SO_4 by the side of test tube	Dark brown ring form	NO_3^- confirm
[B]	Basic radical		
1	Salt + NaOH sol ⁿ and heat	No smell of NH_3	Zero group NH_4^+ absent

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2	0.5 + dil HCl	white ppt form	I group present Pb^{+2} may be
(a)	Dissolve the ppt into hot water and divide the sol ⁿ into two parts		
(b)	I part + KI sol ⁿ	yellow ppt obtain	Pb^{+2} confirm
(c)	II part + K_2CrO_4 sol ⁿ	yellow ppt obtain soluble in NaOH	Pb^{+2} confirm
10			

RESULT:

In the given salt acidic radical is NO_3^- and basic radical is Pb^{+2}

20

25

Experiment No. 23

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
(A)	Acidic radical		
1	Salt + dil. H_2SO_4	No reaction	dil H_2SO_4 group absent
2	Salt + conc. H_2SO_4	No reaction	conc. H_2SO_4 group absent
3.	Salt SO_4^{2-} + dil HCl + $BaCl_2$ SO_4^{2-}	white ppt form	SO_4^{2-} present
(a)	Above ppt + conc HCl or HNO_3	white ppt remain undissolved	SO_4^{2-} confirm
(b)	Salt SO_4^{2-} + CH_3COOH + $(CH_3COO)_2Pb$ SO_4^{2-}	white ppt obtain	SO_4^{2-} confirm
(B)	Basic radical		
1	Salt + NaOH and heat	No smell of NH_3	Zero group absent

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2	0.5 + dil HCl	No white ppt form	I group absent
3	Pass H_2S gas in above sol ⁿ	No black or yellow ppt form	II group absent
4	0.5 + a drop of conc. HNO_3 + heat then cool + $NH_4Cl(s)$ + NH_4OH excess	Gelatinous white ppt form	III group present Al^{+3} may be
10	Dissolve the white ppt in dil. HCl & divide it into 3 parts.		
(a)	I part + few drops of blue litmus sol ⁿ + NH_4OH sol ⁿ along the side of test tube	A blue floating mass in the colourless sol ⁿ obtain	Al^{+3} confirm
15	(b) II part + $NaOH$ sol ⁿ	white gelatinous ppt soluble in excess of $NaOH$	
20			

RESULT:

In the given salt acidic radical is SO_4^{2-} and basic radical is Al^{3+} is present.

Teacher's Signature: