

# [CLASS XII CHEMISTRY PRACTICALS]

## TERM- 1 Evaluation Scheme) 2021-2022 Examination Marks

Volumetric Analysis	04
Salt Analysis	04
Content Based Experiment	02
Class record and viva	05

**Total 15**

## TERM- 2 Evaluation Scheme) 2021-2022 Examination Marks

Volumetric Analysis	04
Salt Analysis	04
Content Based Experiment	02
Project and viva	05

**Total 15**

- Note:-**
1. Term-1 Practical's (1 to 13)
  2. Term-2 Practical's ( 14 to 24)
  3. Chemical Equations of Experiment 3 to 7 (Term – 1) and 14 to 17 (Term-2) are to written on blank pages.
  4. Observation table of experiment 9, 10, 18, 19 are to be drawn on blank pages.
  5. Leave one page after Term-1 Practical's and then write Term-2 Practical's.
  6. Start each experiment from a new page.

**7. Investigatory Project work is also included in the practical syllabus in Term-2.**

**For project work contact  
the teacher for the topic.**

8. Project report and note book should be hand written.

### EXPERIMENT – 1 Classification of Anions

Group	Group Reagent	Observation	Inference
A	Dilute H <sub>2</sub> SO <sub>4</sub>	a) Colourless, odourless gas with brisk effervescence (CO <sub>2</sub> ) which turn lime water milky. b) Colourless gas with rotten egg like smell (H <sub>2</sub> S) which turns lead acetate paper black. c) Colourless gas with smell of burning sulphur (SO <sub>2</sub> ) which turns acidified dichromate paper green. d) Brown coloured gas (NO <sub>2</sub> ) which turns ferrous sulphate solution black or brown. e) Colourless gas with vinegar like smell.	CO <sub>3</sub> <sup>2-</sup> (Carbonate) S <sup>2-</sup> (sulphide) SO <sub>3</sub> <sup>2-</sup> (Sulphite) NO <sub>2</sub> <sup>-</sup> (Nitrite) CH <sub>3</sub> COO <sup>-</sup> (Acetate)
B	Conc. H <sub>2</sub> SO <sub>4</sub>	a) Colourless pungent smelling gas (HCl) which gives white dense fumes with glass rod dipped in NH <sub>4</sub> OH. b) Violet coloured vapours (I <sub>2</sub> ) which turns starch paper blue. c) Reddish brown gas (NO <sub>2</sub> ) having pungent smell (On adding copper turning, fumes becomes intense) d) Brown colour gas with pungent smell (Br <sub>2</sub> ) which turns starch paper yellow. e) Colourless, odourless gas with brisk effervescence (CO + CO <sub>2</sub> ) which turns lime water milky and burns on the mouth of test tube with blue flame.	Cl <sup>-</sup> (Chloride) I <sup>-</sup> (Iodide) NO <sub>3</sub> <sup>-</sup> (Nitrate) Br <sup>-</sup> (Bromide) C <sub>2</sub> O <sub>4</sub> <sup>2-</sup> (Oxalate)
C	BaCl <sub>2</sub>	White ppt. of BaSO <sub>4</sub> is formed.	SO <sub>4</sub> <sup>2-</sup> (sulphate)
D	Ammonium molybdate 3 (NH <sub>3</sub> ) <sub>4</sub> MoO <sub>4</sub>	Cannary yellow ppt. of phospho ammonium molybdate (NH <sub>4</sub> ) <sub>3</sub> PO <sub>4</sub> .12 MoO <sub>3</sub> . 6H <sub>2</sub> O	PO <sub>4</sub> <sup>3-</sup> (phosphate)

**EXPERIMENT – 2**  
**Classification of Cations**

Group	Group Reagent	Radical	Ppt/Smell	Colour
Zero	NaOH	$NH_4^+$	Smell of $NH_3$	-
I	Dil. HCl	$Pb^{2+}$	$PbCl_2$	White
II	$H_2S$ gas in acidic Medium	$Pb^{2+}$	$PbS$	Black
		$As^{3+}$	$As_2S_3$	Yellow
		$Cu^{2+}$	$CuS$	Black
		$Cd^{2+}$	$CdS$	Yellow
III	$NH_4Cl$ (s) in presence of $NH_4OH$	$Fe^{2+}$	$Fe(OH)_2$	Light green
		$Fe^{3+}$	$Fe(OH)_3$	Reddish brown
		$Al^{3+}$	$Al(OH)_3$	Gelatinous white
IV	$H_2S$ gas in basic medium	$Ni^{2+}$	$NiS$	Black
		$Co^{2+}$	$CoS$	Black
		$Mn^{2+}$	$MnS$	Flesh colour
		$Zn^{2+}$	$ZnS$	Dirty white
V	$(NH_4)_2CO_3$ in presence of $NH_4OH$	$Ba^{2+}$	$BaCO_3$	White
		$Ca^{2+}$	$CaCO_3$	White
		$Sr^{2+}$	$SrCO_3$	White
VI	$Na_2HPO_4$ in presence of $NH_4OH$	$Mg^{2+}$	$MgNH_4PO_4$	White

**EXPERIMENT – 3**

**Aim :-** To analyse the given inorganic salt for acidic and basic radicals.

**Preliminary Investigation**

Physical State Colour Odour Solubility Flame Test	Solid White ( $Cu^{2+}$ , $Fe^{2+}$ , $Fe^{3+}$ , $Ni^{2+}$ , $Mn^{2+}$ , $Co^{2+}$ absent) Ammonium smell (may be $NH_4^+$ ) Soluble in water No Characteristic flame ( $Pb^{2+}$ , $Cu^{2+}$ , $Ca^{2+}$ , $Sr^{2+}$ , $Ba^{2+}$ , $Zn^{2+}$ absent)
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**(A) Identification of Acidic Radical**

**(a) Preliminary test :**

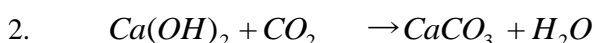
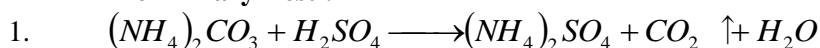
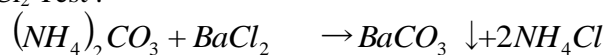
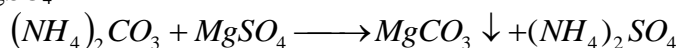
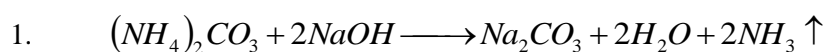
Experiment	Observation	Inference
1. Salt solution + dil $H_2SO_4$	Colourless, colourless gas with brisk effervescence which turn lime water milky	Group A anion ( $CO_3^{2-}$ may be present)
<b>Confirmative test :</b>		
1. $BaCl_2$ Test : Salt solution + $BaCl_2$	White ppt of $BaCO_3$	$CO_3^{2-}$ Confirmed
2. $MgSO_4$ Test : Salt solution + $MgSO_4$	White ppt of $MgCO_3$	$CO_3^{2-}$ Confirmed

**(B) Identification of Basic Radical****a) Preliminary Test**

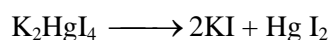
Experiment	Observation	Inference
1. Salt Solution + NaOH+ Heat	Smell of NH <sub>3</sub>	
2. Place a red litmus on the mouth of test tube.	Red litmus turns blue	Zero group present ( <i>NH<sub>4</sub><sup>+</sup> may be</i> )

**Confirmative test**

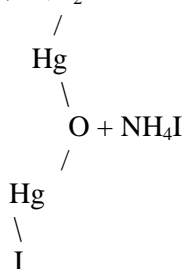
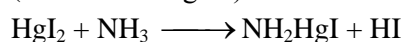
Experiment	Observation	Inference
1. Nessler's reagent test : Salt + Solution + NaOH + Nessler's Reagent	Reddish brown ppt. is formed	<i>NH<sub>4</sub><sup>+</sup></i> confirmed.
2. NaOH test : Salt Solution + NaOH + Heat. Bring a glass rod dipped in conc. HCl	Smell of NH <sub>3</sub> Dense white fumes of NH <sub>4</sub> Cl are formed.	<i>NH<sub>4</sub><sup>+</sup></i> Confirmed.

**Chemical Reactions : -****Acidic Radical****Preliminary Test :-****Confirmative Test**1. BaCl<sub>2</sub> Test :2- MgSO<sub>4</sub>**2. Basic Radical****(a) Preliminary Test :-**NH<sub>3</sub> + Red litmus -----> Litmus turns blue**(b) Confirmative test :-**

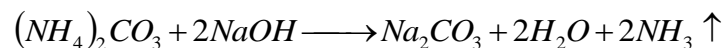
1. Nessler's Test :



(Nessler's Reagent)



2. NaOH Test

**Result :** The given inorganic salt contains followingAcidic Radical : - CO<sub>3</sub><sup>2-</sup>Basic Radical : NH<sub>4</sub><sup>+</sup>

## EXPERIMENT – 4

Aim : To analyze the given inorganic salt for acidic and basic radical.

### Preliminary Investigation

Physical state	:	Solid
Colour	:	Creamish white ( $\text{Cu}^{2+}$ , $\text{Co}^{2+}$ , $\text{Ni}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Fe}^{3+}$ absent)
Odour	:	No characteristic odour ( $\text{NH}_4^+$ , $\text{S}^{2-}$ , $\text{CH}_3\text{COO}^-$ absent)
Solubility	:	Soluble in water
Flame Test	:	Dull Bluish white flame is obtained ( $\text{Pb}^{2+}$ may be)

### (A) Identification of Acidic Radical

#### a- Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil $\text{H}_2\text{SO}_4$ solution	No gas is evolved	Group A ( $\text{CO}_3^{2-}$ , $\text{CH}_3\text{COO}^-$ , $\text{NO}_2^-$ , $\text{SO}_3^{2-}$ , $\text{S}^{2-}$ , absent)
2	Salt + Conc <sup>n</sup> $\text{H}_2\text{SO}_4$ + Heat	Brown Colourled gas ( $\text{NO}_2$ ) is evolved	Group B ( $\text{NO}_3^-$ may be present)

#### (b) Confirmative test:

	Experiment	Observation	Inference
1	Diphenyl amine test : salt + Conc <sup>n</sup> $\text{H}_2\text{SO}_4$ + diphenyl amine	Deep blue coloured solution	$\text{NO}_3^-$ - confirmed
2	Ring Test : Salt + Freshly prepared $\text{FeSO}_4$ + Conc <sup>n</sup> $\text{H}_2\text{SO}_4$ along the side of the test tube	Brown ring is formed at the junction of two liquids	$\text{NO}_3^-$ - confirmed

### Identification of Basic Radical

#### a- Preliminary test :

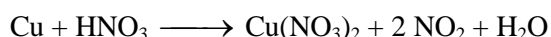
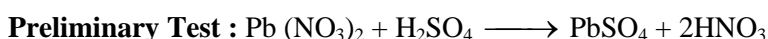
	Experiment	Observation	Inference
1	Salt solution + NaOH	No Smell of ammonia	Zero group [ $\text{NH}_4^+$ ] absent
2	Salt Solution + dil HCl Filter the above ppt and boil it with water and divide into parts.	White ppt of $\text{PbCl}_2$ is formed	I group [ $\text{Pb}^{2+}$ may be]

### Identification of Basic Radical

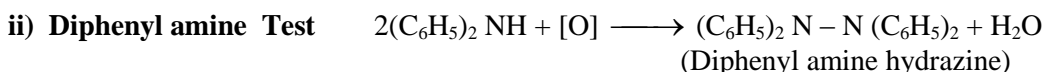
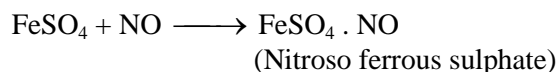
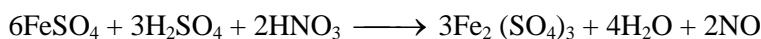
#### a- Confirmative test :

	Experiment	Observation	Inference
1	KI test : 1 <sup>st</sup> part + KI	$\text{PbI}_2$ (Yellow Ppt)	$\text{Pb}^{2+}$ Confirmed
2	$\text{K}_2\text{CrO}_4$ Test : 2 <sup>nd</sup> part + $\text{K}_2\text{CrO}_4$	Yellow ppt of $\text{PbCrO}_4$ is formed	$\text{Pb}^{2+}$ Confirmed

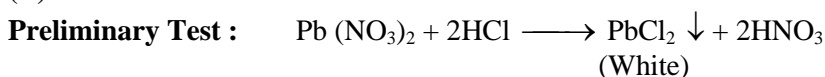
### Chemical reaction for Acidic Radical



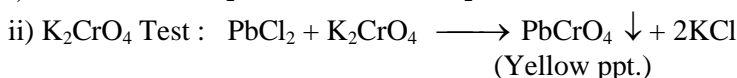
### Confirmative Test :



### (B) Identification of Basic Radical



### Confirmative Test :



**Result :** The given inorganic salt contains Acidic Radical  $\text{NO}_3^-$

Basic Radical  $\text{Pb}^{+2}$

## EXPERIMENT – 5

**Aim :** To analyze the given inorganic salt for acidic and basic radical.

### Preliminary Investigation

Physical state	:	Solid
Colour	:	Blue (Cu <sup>2+</sup> may be)
Qdour	:	No characteristic odour ( absence of NH <sub>4</sub> <sup>+</sup> , S <sup>2-</sup> , CH <sub>3</sub> COO <sup>-</sup> )
Solubility	:	Soluble in water.
Flame Test	:	Bluish green flame (Cu <sup>2+</sup> may be)

### (A) Identification of Acidic Radical

#### a- Preliminary test :

	Experiment	Observation	Inference
1	Salt solution + dil H <sub>2</sub> SO <sub>4</sub> solution	No gas is evolved	Group A (CO <sub>3</sub> <sup>2-</sup> , S <sup>2-</sup> , SO <sub>3</sub> <sup>2-</sup> , NO <sub>2</sub> <sup>-</sup> , CH <sub>3</sub> COO <sup>-</sup> absent)
2	Salt + Conc <sup>n</sup> H <sub>2</sub> SO <sub>4</sub> + Heat	No gas evolved	Group B anions (Cl <sup>-</sup> , Br <sup>-</sup> , I <sup>-</sup> , NO <sub>3</sub> <sup>-</sup> , C <sub>2</sub> O <sub>4</sub> <sup>2-</sup> are absent)
3	Salt solution + BaCl <sub>2</sub> solution	White Ppt	Group C (SO <sub>4</sub> <sup>2-</sup> ) May be

#### (b) Confirmative test :

	Experiment	Observation	Inference
1	BaCl <sub>2</sub> test : Salt Solution + BaCl <sub>2</sub> Solution Add dil. HCl or dil HNO <sub>3</sub>	White Ppt formed  Ppt remains insoluble	SO <sub>4</sub> <sup>2-</sup> confirmed
2	Lead Acetate Test : - Salt Solution + lead acetate solution Add ammonium acetate Solution (CH <sub>3</sub> COONH <sub>4</sub> ) to above ppt.	White ppt. formed  Ppt becomes soluble	SO <sub>4</sub> <sup>2-</sup> confirmed

### Identification of basic Radical

#### a- Preliminary test :

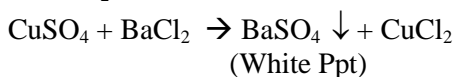
	Experiment	Observation	Inference
1	Salt solution + NaOH + heat	No smell of ammonia	Zero Group, (NH <sub>4</sub> <sup>+</sup> absent)
2	Salt solution + dil . HCl	No white Ppt	Group I, (Pb <sup>2+</sup> absent)
3	Above solution + H <sub>2</sub> S gas	Black Ppt is formed	Group II, (Cu <sup>2+</sup> / Pb <sup>2+</sup> may be present )
4	Dissolve above ppt in HNO <sub>3</sub>	Solution turns bluish green	
5	Divide the above solution in 2 parts .		

#### (b) Confirmative test :

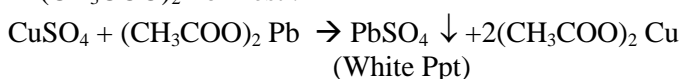
	Experiment	Observation	Inference
1	NH <sub>4</sub> OH test : 1 <sup>st</sup> part + NH <sub>4</sub> OH	Deep blue colour	Cu <sup>2+</sup> confirmed
2	Potassium ferrocyanide test : IInd part + K <sub>4</sub> [Fe(CN) <sub>6</sub> ]	Chocolate brown ppt of Copper ferrocyanide is formed	Cu <sup>2+</sup> confirmed

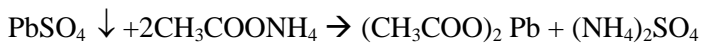
### Acidic Radical

#### 1- BaCl<sub>2</sub> Test:

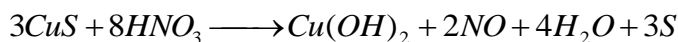
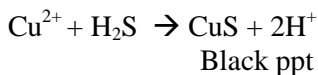


#### 2- (CH<sub>3</sub>COO)<sub>2</sub> Pb Test :

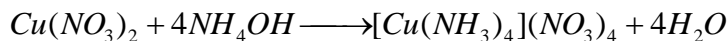




**(b) Basic radical**

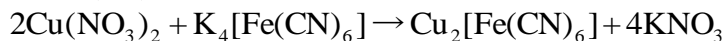


1.  $\text{NH}_4\text{OH}$  test



*Deep blue ppt*

2.  $\text{K}_4[\text{Fe}(\text{CN})_6]$  test



**Result : The given inorganic salt contains.      Acidic Radical –  $\text{SO}_4^{2-}$**

**Basic Radical  $\text{Cu}^{2+}$**

### EXPERIMENT – 6

**Aim :** To analyze the given inorganic salt for acidic and basic radical.

#### Preliminary Investigation

Physical state	:	Solid
Colour	:	White ( $\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ are absent)
Qdour	:	No characteristic above ( $\text{S}^{2-}$ , $\text{NH}_4^+$ , $\text{CH}_3\text{COO}^-$ ) absent
Solubility	:	Soluble in water.
Flame Test	:	Green flashes ( $\text{Zn}^{2+}$ may be)

#### (A) Identification of Acidic Radical

##### a- Preliminary test :

	Experiment	Observation	Inference
1	Salt solution + dil $\text{H}_2\text{SO}_4$	No gas is evolved	Group A ( $\text{CO}_3^{2-}$ , $\text{S}^{2-}$ , $\text{SO}_3^{2-}$ , $\text{NO}_2^-$ , $\text{CH}_3\text{COO}^-$ absent)
2	Salt + Conc <sup>n</sup> $\text{H}_2\text{SO}_4$ + Heat	Colourless gas having pungent smell which gives white dense fumes with glass rod dipped in $\text{NH}_4\text{OH}$	Group B anions ( $\text{Cl}^-$ may be)

##### (b) Confirmative test :

	Experiment	Observation	Inference
1	Chromyl chloride test : Salt + $\text{K}_2\text{Cr}_2\text{O}_7$ (1 : 2) + conc. $\text{H}_2\text{SO}_4$ + heat  Pass the vapour in a test tube containing $\text{NaOH}$ solution Add $(\text{CH}_3\text{COOH} + (\text{CH}_3\text{COO})_2\text{Pb}$ into above solution	Orangish red or reddish orange vapour of chromyl chloride are evolved  Yellow solution of $\text{Na}_2\text{CrO}_4$ is obtained Yellow ppt of lead chromate is formed	$\text{Cl}^-$ Confirmed
2	$\text{AgNO}_3$ Test : Salt Solution + $\text{AgNO}_3$  Dissolve ppt. in $\text{NH}_4\text{OH}$	White ppt.  ppt becomes soluble.	$\text{Cl}^-$ confirmed

## B- Identification of Basic Radical

### (a) Preliminary test :

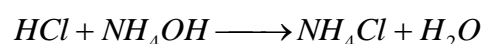
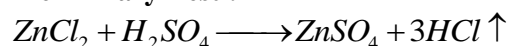
	Experiment	Observation	Inference
1	Salt solution + NaOH + heat	No smell of NH <sub>3</sub>	Zero Group, (NH <sub>4</sub> <sup>+</sup> absent)
2	Salt solution + dil . HCl	No white Ppt	Group I (Pb <sup>2+</sup> absent)
3	To the above solution pass H <sub>2</sub> S gas	No ppt.	Group II, (Cu <sup>2+</sup> , As <sup>+3</sup> , Cd <sup>+2</sup> , Pb <sup>+2</sup> absent)
4	Boil above solution to remove H <sub>2</sub> S and add NH <sub>4</sub> Cl (s) + NH <sub>4</sub> OH in excess.	No ppt.	Group III [Fe <sup>2+</sup> , Fe <sup>3+</sup> , Al <sup>3+</sup> absent ]
5	To above test tube pass H <sub>2</sub> S gas Dissolve the white ppt in HCl and divide it into 2 parts.	White ppt is obtained	Group IV [Zn <sup>2+</sup> may be]

### (b) Confirmative test :

	Experiment	Observation	Inference
1	K <sub>4</sub> [Fe(CN) <sub>6</sub> ] Test : 1 <sup>st</sup> part + K <sub>4</sub> [Fe(CN) <sub>6</sub> ]	White ppt of zinc ferrocyanide	Zn <sup>+2</sup> conformed
2	NaOH Test : 2 <sup>nd</sup> part + NaOH	Bluish white ppt.	Zn <sup>+2</sup> confirmed

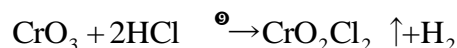
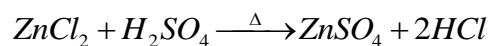
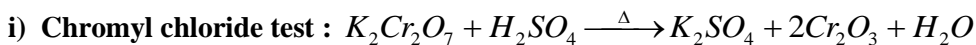
### Chemical reaction for Acidic Radical

#### Preliminary Test :

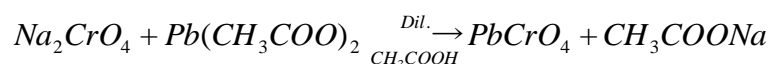
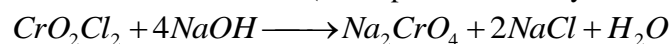


(White dense fumes )

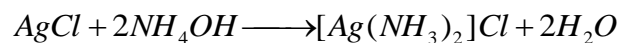
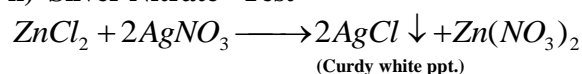
#### Confirmative Test :



(red vapours of chromyl chloride)



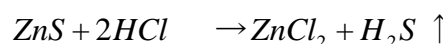
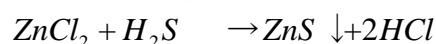
#### ii) Silver Nitrate Test



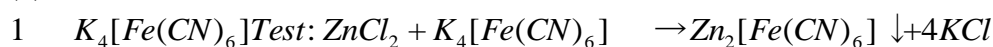
[Diammine silver (I) chloride ] {Soluble complex}

### Chemical reaction for Basic Radical

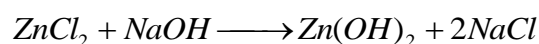
#### (a) Preliminary Test :



#### (b) Confirmative Test :



2. NaOH test :



**Result :** The given inorganic salt contains.

Acidic Radical  $Cl^-$

Basic Radical  $Zn^{+2}$

## EXPERIMENT – 7

**Aim :** To analyze the given inorganic salt for acidic and basic radical.

### Preliminary Investigation

Physical state	:	Solid
Colour	:	Green ( $Ni^{2+}$ may be)
Qdour	:	No characteristic odour (absence of $CH_3COO^-$ , $NH_4^+$ , $S^{2-}$ )
Solubility	:	Soluble in water.
Flame Test	:	No Characteristic flame [absence of $Cu^{2+}$ , $Pb^{+2}$ , $Zn^{2+}$ , $Cu^{2+}$ , $Br^{+2}$ ]

### (a) Identification of Acidic Radical

#### a- Preliminary test :

	Experiment	Observation	Inference
1	Salt solution + dil HCl	No gas is evolved	Group A ( $CO_3^{2-}$ , $S^{2-}$ , $SO_3^{2-}$ , $NO_2^-$ , $CH_3COO^-$ absent)
2	Salt + Conc <sup>n</sup> $H_2SO_4$ + Heat	Colourless pungent smelling gas (HCl) is evolved which gives white dense fumes of $NH_4Cl$ .	Group B anions $Cl^-$ may be present

#### (b) Confirmative test :

	Experiment	Observation	Inference
1	$AgNO_3$ Test : Salt Solution + $AgNO_3$ Dissolve ppt. in $NH_4OH$	Curdy white ppt  Ppt become soluble	$Cl^-$ confirmed
2	Chromyl chloride test : Salt + $Kr_2Cr_2O_7(s)$ (1:2) + conc. $H_2SO_4$ + heat  Pass the vapour in a test tube containing NaOH Solution  Add ( $CH_3COOH$ + $Pb(CH_3COO)_2$ )	Reddish orange vapours of chromyl chloride are evolved  Solution becomes Yellow  Yellow ppt of lead chromate is formed	$Cl^-$ confirmed

### B- Identification of Basic Radical

#### Preliminary test :

	Experiment	Observation	Inference
1	Salt solution + NaOH + Heat	No smell of $NH_3$	Zero Group, ( $NH_4^+$ absent)
2	Salt solution + dil . HCl	No white Ppt	Group I, $Pb^{2+}$ absent
3	Pass $H_2S$ gas through above $NH_4Cl$	No ppt.	Group II, ( $Cu^{2+}$ , $As^{+3}$ , $Cd^{+2}$ , $Pb^{+2}$ ) absent
4	Remove $H_2S$ gas by boiling & add $NH_4Cl$ (s) + $NH_4OH$ in excess.	No ppt.	Group III [ $Fe^{2+}$ , $Fe^{3+}$ , $Al^{3+}$ absent ]
5	Pass $H_2S$ gas through above solution Dissolve the ppt by boiling with aqua regia [Conc HCl + Conc. $HNO_3$ ] evaporate to dryness & add water & divide in 2 parts .	Black ppt.	Group IV [ $Ni^{+2}$ or $Co^{+2}$ May be present]

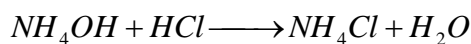
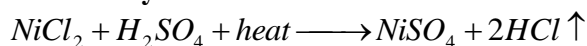
#### (b) Confirmative test :

	Experiment	Observation	Inference
1	DMG test : I part + DMG	Rose pink ppt.	$Ni^{+2}$ conformed
2	NaOH Test : 2 <sup>nd</sup> part + NaOH	Apple green ppt	$Ni^{+}$ confirmed



### Chemical reaction for Acidic Radical

#### Preliminary Test :

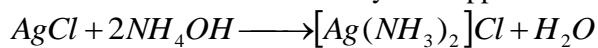


(White dense fumes)

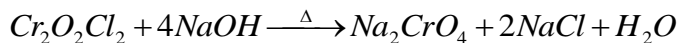
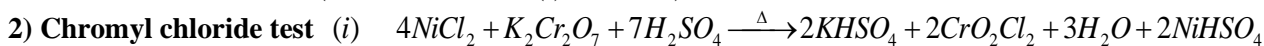
#### Confirmative Test :



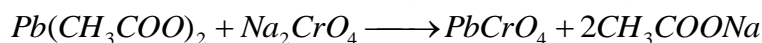
Curdy white ppt



(Diammine Silver (I) Chloride)



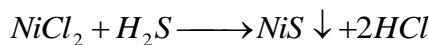
(Sodium Chromate)



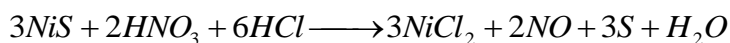
Yellow Ppt

### Identification of Basic Radical

#### Preliminary Test :

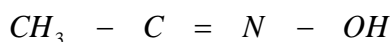


(black ppt.)

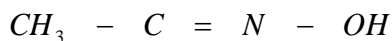


#### Confirmative Test :

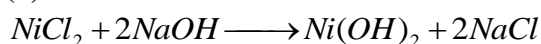
i) DMG test



|



(ii) **NaOH Test :**



**Result :** The given inorganic salt contains.

Acidic Radical  $Cl^-$

Basic Radical  $Ni^{+2}$

## EXPERIMENT – 8

**Aim :** To prepare 250 ml of 0.02 M (M/50) Mohr's Salt solution.

**Apparatus Required :** Chemical balance, weight box, beaker (250 ml), watch glass, volumetric flask (250 ml) glass rod, funnel, test tube.

**Chemical required :-** Mohr's salt, conc. H<sub>2</sub>SO<sub>4</sub>, Distilled water.

**Theory :** Molecular formula of Mohr's salt – FeSO<sub>4</sub>[NH<sub>4</sub>]<sub>2</sub>SO<sub>4</sub>.6H<sub>2</sub>O

It is primary standard, hence its solution can be prepared by direct weighing.

Molecular weight of Mohr's salt :  $56+32+4\times 16+2(14+4)+32+4\times 16+6\times 18 = 392$  g.

Thus to prepare 1000 ml of 1M Mohr's salt solution, 392 g of Mohr's salt is needed. To prepare

250ml of 1 M Mohr's salt  $\frac{392}{1000} \times 250$  ie  $\frac{392}{4}$  g of mohr's salt is need.

To prepare 250 ml of 0.02 of Mohr's salt solution  $\left(\frac{392}{4} \times 0.02\right)$  g of salt is needed. Mohr's salt required = 1.9600 g of mohr's salt.

### Observation :

1- Weight of empty watch galss (W<sub>1</sub>) = 21.7200 g

2- Weight of empty watch glass + mohrs salt (W<sub>2</sub>) = 21.7200 + 1.9600 = 23.6800 g

3- Weight of Mohr's Salt [W<sub>2</sub> – W<sub>1</sub>] = 23.6800 – 21.7200 = 1.9600 g

4- Volume of solution = 250 ml.

6. Morality of solution = M/50

**Result :** 250 ml of M/50 solution of Mohr's salt is prepared.

### Precautions :

- 1- Add 2-3 ml of conc. H<sub>2</sub>SO<sub>4</sub> to prevent hydrolysis of FeSO<sub>4</sub> before making solution of 250 ml.
- 2- Weighing should be done accurately.
3. Apparatus should be clean.

## EXPERIMENT – 9

**Aim :** To prepare a standard solution of M/50 Mohr's salt solution. With its help, determine molarity and strength of  $\text{KMnO}_4$  Solution.

**Apparatus Required :** Burette, conical flask, pipette, burette stand, test tube, white tile, watch glass, volumetric flask (250ml) beaker, funnel glass rod, weight box, wash bottle.

**Chemical Required :**

Mohr's Salt,  $\text{KMnO}_4$  solution, dil  $\text{H}_2\text{SO}_4$ , conc.  $\text{H}_2\text{SO}_4$  and water.

**Theory :**

(a) Preparation of standard or known solution of M/50 Mohr's salt solution - Mohr's salt is a primary standard solution. Hence its solution can be prepared by direct weighting.

Molecular weight of mohr's salt : 392 g/mol

Thus to prepare 1000 ml of 1M Mohr's salt solution,

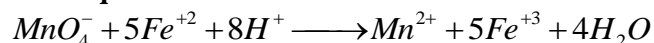
392 g of Mohr's salt is needed.

To prepare 250ml of 1 M Mohr's salt  $\frac{392}{100} \times 250$  ie  $\frac{392}{4}$  g of mohr's salt is need.

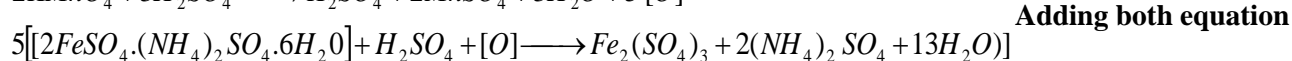
To prepare 250 ml of 0.02 of Mohr's salt solution  $\left(\frac{392}{4} \times 0.02\right)$  g of salt is needed. Mohr's salt required = 1.9600 g of mohr's salt.

(b) Titration of Mohr's salt Sol (standard solution) with  $\text{KMnO}_4$  (unknown solution) -  $\text{KMnO}_4$  is strong and versatile oxidizing agent. When its treated with Mohr's salt solution in sufficiently acidic medium  $\text{Fe}^{2+}$  ion are oxidised to  $\text{Fe}^{3+}$  in cold according to reaction :

**Ionic equation :**



**Molecular equation**



Indicator  $\longrightarrow$   $\text{KMnO}_4$  is a self indicator

End point  $\longrightarrow$  colourless to pink

**Observations:-**

1. Preparation of standard solution :-

Weight of empty water glass ( $W_1$ ) 21.7200 g

Weight of watch glass + Mohr's salt ( $W_2$ ) = 23.6800 g

Weight of Mohr's salt =  $W_2 - W_1 = (23.6800 - 21.7200)$  g = 1.9600 g

Volume of mohr's salt = 250 ml

Volume of mohr's salt taken for each titration ( $V_2$ ) = 20 ml

2. Titration of standard solution with  $\text{KMnO}_4$  Solution :-

S.no.	Volume of Mohr's salt used ( $V_1$ ) ml	Burette initial	Reading final	Volume of $\text{KMnO}_4$ used	Concordant Reading
1	20ml	0.0	14.8	14.8	
2	20 ml	0.0	14.6	14.6	14.6
3	20 ml	0.0	14.6	14.6	

**Calculation :**

$$M_1V_1 = \frac{1}{5} M_2V_2$$

$$M_1 \times 14.6 = \frac{1}{5} \times \frac{M}{50} \times 20$$

$$M_1 = 0.0068 \text{ M}$$

$$\text{Strength} = 158 \times M = 158 \times 0.0068 \text{ M} = 1.0744 \text{ g/l}$$

**Result**

1. Molarity of the given solution = 0.0068 M      2. Strength of the given solution = 1.0744 g/l

**Precaution :**

- Weighting should be accurate.
- Add 2 – 3 ml of conc  $\text{H}_2\text{SO}_4$  to prevent hydrolysis of Mohr's Salt solution.
- While titrating, the funnel should not be placed at the top of the burette.

$M_1$  = Molarity of  $\text{KMnO}_4$  Sol<sup>n</sup> = ?  
 $V_1$  = Volume of  $\text{KMnO}_4$  Sol<sup>n</sup> = 14.6 ml  
 $M_2$  = Molarity of Mohr's Salt Sol<sup>n</sup> = M/50  
 $V_2$  = Volume of Mohr's Salt Sol<sup>n</sup> = 20 ml

## EXPERIMENT – 10

**Aim :** To prepare solution of M/40 oxalic acid. With its help determine the molarity and strength of given  $\text{KMnO}_4$  solution.

**Apparatus Required :** Burette, conical flask, pipette, beaker (250 ml), test tube, white tiles, volumetric flask, beaker, funnel, glass rod, weight box, wash bottle.

**Chemical Required :** Oxalic acid, crystal, dil  $\text{H}_2\text{SO}_4$ ,  $\text{KMnO}_4$  solution

**Indicator :**  $\text{KMnO}_4$  act as a self indicator.

**End point :** Colourless to Pink

**Theory :**

**(a) Preparation of standard or known solution :-**

Molecular formula of oxalic acid is  $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ . It is a primary standard solution. Thus its solution can be prepared by direct weighing.

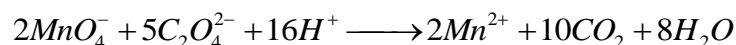
Molecular weight of oxalic acid = 126 g

To prepare 250 ml of 1M oxalic acid solution, 126 of oxalic acid is required. Thus to prepare 250 ml of 1M oxalic acid solution (126/4)g is oxalic acid is required.

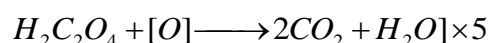
To prepare 250 ml of M/40 oxalic acid solution.

$$\frac{126}{4} \times \frac{M}{40} = 0.7876 \text{ g of oxalic acid is needed}$$

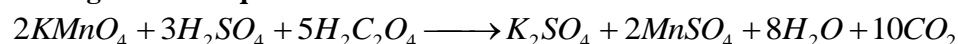
**(b) Titration of standard solution with  $\text{KMnO}_4$  (unknown solution),**  $\text{KMnO}_4$  is strong and versatile oxidising agent. In sufficiently acidic medium, at about  $60^\circ\text{C}$   $\text{KMnO}_4$  oxidises oxalic acid to  $\text{CO}_2$  and itself is reduced into colourless  $\text{Mn}^{2+}$  ion.



**Molecular equation :-**



**Adding both the eqn.**



**Observation Table :-**

1. Preparation of M/40 standard solution :-

Weight of empty watch glass ( $W_1$ ) 21.7260 g

Weight of watch glass + Mohr's salt ( $W_2$ )

$$= 21.7200 + 0.7876 = 22.5076 \text{ g}$$

Weight of oxalic acid =  $W_2 - W_1 = 0.7876 \text{ g}$

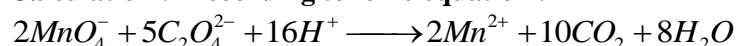
Volume of oxalic acid = 250 ml

Molarity of oxalic acid = M/40

2. **Titration of standard solution with  $\text{KMnO}_4$  Solution :-**

S.no.	Volume of Mohr's salt used ( $V_1$ ) ml	Burette Reading		Volume of $\text{KMnO}_4$ used	Concordant Reading
		Initial	final		
1	20ml	0.0 ml	15.0 ml	15.0 ml	
2	20 ml	0.0 ml	14.9 ml	14.9 ml	14.9 ml
3	20 ml	0.0 ml	14.9 ml	14.9 ml	

**Calculation : According to ionic equation .**



$\therefore$  1 mole of oxalic acid required 2/5 mole of  $\text{KMnO}_4$ .

$$\therefore M_1 V_1 = 2/5 M_2 V_2$$

$M_1$  = molarity of  $\text{KMnO}_4$  solution = ?

$V_1$  = molarity of  $\text{KMnO}_4$  solution = 14.9 ml

$M_2$  = molarity of oxalic acid solution = M/40

$V_2$  = volume of oxalic acid solution. = 20 ml

$$M_1 \times 14.9 = \frac{2}{5} \times \frac{1}{40} \times 20 \Rightarrow M_1 = 0.0135 \text{ M}$$

Strength of  $\text{KMnO}_4$  = Molarity  $\times$  Mol.wt. =  $0.0135 \text{ M} \times 158 = 2.1345 \text{ g/L}$

**Result**

1. Molarity of the given  $\text{KMnO}_4$  solution = 0.0135 M

2. Strength of the given  $\text{KMnO}_4$  solution = 2.1345 g/L

**Precaution:** 1. Oxalic acid should not be heated about  $60^\circ\text{C}$ . 2. weighing should be accurate.

## EXPERIMENT – 11

**Aim :** To detect the given food stuff.

**Apparatus required :** Test tube, test tube stand, test tube holder, burner etc.

**Theory :** Carbohydrates are Polyhydroxy aldehydes or polyhydroxy ketones, their derivatives and the substance which yield them on hydrolysis carbohydrates are classified as sugars and non sugars. Sugars like glucose, fructose and cane sugar are crystalline. Among sugars, glucose, fructose and lactose are reducing while sucrose is non reducing sugar.

**Test :**

	<b>Experiment</b>	<b>Observation</b>	<b>Inference</b>
1	<b>Conc. H<sub>2</sub>SO<sub>4</sub> test:</b> Sample + Conc. H <sub>2</sub> SO <sub>4</sub> + Heat	Charring with burnt sugar smell.	Carbohydrates present.
2	<b>Molisch test :</b> Aq. Solution of sample + 2 drops of 1% $\alpha$ naphthol + conc. H <sub>2</sub> SO <sub>4</sub> .	Reddish purple ring is formed at the junction of 2 layers	Carbohydrates present.
3	<b>Fehling solution test :</b> Sample solution + 1 ml of fehling A + 1 ml of Fehling B + $\Delta$	Red ppt	Reading Sugar present
4	<b>Tollens reagent :</b> Aq. Solution of sample + 2 ml of Tollens reagent + $\Delta$	Silver mirror is formed along the surface of test tube.	Reducing sugar present.
5	<b>Benedict's Solution test:</b> Aq solution of sample + Benedict's reagent + Heat	Red ppt	Reducing sugar present
6	<b>Iodine test :</b> Sample Solution + few drops of iodine solution	Violet colour	Starch is present.

**Result :** Carbohydrates is present.

## EXPERIMENT – 12

**Aim :** To detect the given food stuff.

**Apparatus required :** Test tube stand, test tube holder, burner etc.

**Theory :** Fats and oil are esters of long chain fatty acids and glycerol and thus also called glycerides. Fats contains saturated fatty acids while oil contain unsaturated fatty acids.

**Test :**

<b>S.no.</b>	<b>Experiment</b>	<b>Observation</b>	<b>Inference</b>
1	<b>Spot Test :</b> Put a small amount of sample on a filter paper and press with another filter paper .	Translucent spot appears on the filter paper	Fat is present.
2	<b>Acrolein test :</b> Take a few drops of sample in a test tube. Add few drops of potassium bisulphite to it and Heat.	Irritating smell appears due to the form of acrolein vapours.	Fat is present
3	<b>Solubility test :</b> Take a small amount of sample in 3 test tubes. Add water, alcohol and chloroform in 1, 2, 3 test tube respectively.	Sample does not dissolve in H <sub>2</sub> O but is soluble in alcohol on heating and soluble in chloroform.	Fat is present

**Result :** Fat is present.

### EXPERIMENT – 13

**Aim :** To detect the given food stuff.

**Apparatus required :** Test tube stand, test tube holder, glass rod, burner etc.

**Theory :** Proteins are high molecular mass, long chain polymers composed of  $\alpha$  amino acid. Amino acids are molecule that have both  $-NH_2$  and  $-COOH$  group.

**Test :**

S.no.	Experiment	Observation	Inference
1.	<b>Biuret test :</b> Sample + NaOH + Dil $CuSO_4$ solution	Bluish violet colour appears	Protein is present
2.	<b>Xanthoprotein test :</b> Sample + few drops of conc. $HNO_3$ + $\Delta$	Yellow ppt.	Protein is present
3.	<b>Million's test :</b> Sample + 2 drops of millions reagent + $\Delta$	White ppt which changes to brick red on boiling	Protein is present
4.	<b>Ninhydrin test :</b> Protein sample + Few drops of ninhydrin solution + Boil the contents for 1 minute	Blue colour appear	Protein is present

**Result :** Protein is present.

**CHEMISTRY**

***TERM - 2***  
***PRACTICAL'S***

## EXPERIMENT – 14

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

### Preliminary Investigation

<b>Physical state</b>	:	Solid
<b>Colour</b>	:	white ( $\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ absent)
<b>Odour</b>	:	Ammonium smell ( $\text{NH}_4^+$ may be present)
<b>Solubility</b>	:	Soluble in water
<b>Flame Test</b>	:	No characteristic flame ( $\text{Cu}^{2+}$ , $\text{Ca}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Sr}^{2+}$ , $\text{Pb}^{2+}$ , $\text{Zn}^{2+}$ absent)

### (A) Identification of Acidic Radical

#### a- Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil $\text{H}_2\text{SO}_4$ solution	No gas is evolved	Group A anion ( $\text{CO}_3^{2-}$ , $\text{CH}_3\text{COO}^-$ , $\text{NO}_2^-$ , $\text{SO}_3^{2-}$ , $\text{S}^{2-}$ , absent)
2	Salt + Conc $\text{H}_2\text{SO}_4$ + Heat Bring a glass rod dipped in $\text{NH}_4\text{OH}$	Colourless gas with pungent smell which gives dense white fumes of $\text{NH}_4\text{Cl}$	Group B anion ( $\text{Cl}^-$ may be)

#### (b) Confirmative Test:

	Experiment	Observation	Inference
1	<b><math>\text{AgNO}_3</math> test :</b> Salt Solution + $\text{AgNO}_3$ . Dissolve the ppt in $\text{NH}_4\text{OH}$	Curdy white ppt  White ppt soluble in $\text{NH}_4\text{OH}$	$\text{Cl}^-$ confirmed
2	<b>Chromyl chloride Test:</b> a) Salt + Solid $\text{K}_2\text{Cr}_2\text{O}_7$ (1:2) + conc. $\text{H}_2\text{SO}_4$ + Heat b) Pass these vapour through $\text{NaOH}$ c) Add acetic acid and lead acetate to yellow solution	Reddish orange gas is evolved  Solution becomes yellow Yellow ppt of lead chromate is formed.	$\text{Cl}^-$ confirmed

### Identification of Basic Radical

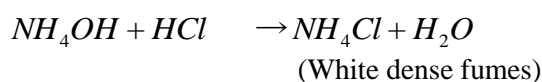
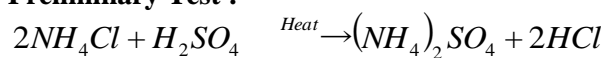
#### Preliminary Test:

	Experiment	Observation	Inference
1	Salt solution + $\text{NaOH}$ + Heat	Smell of Ammonia	Zero group ( $\text{NH}_4^+$ ) May be
2	Place a red litmus on the mouth of test tube	Red litmus turns blue	

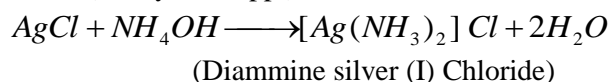
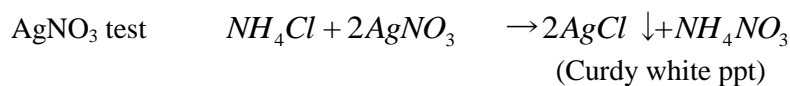
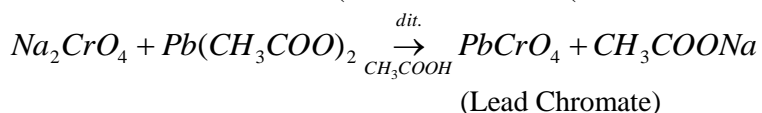
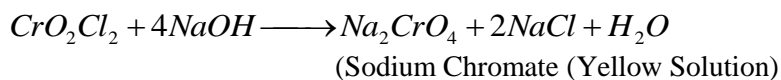
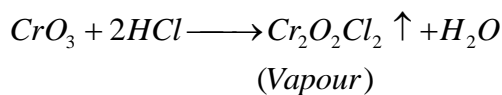
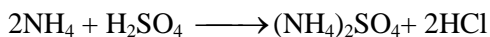
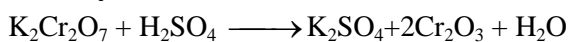
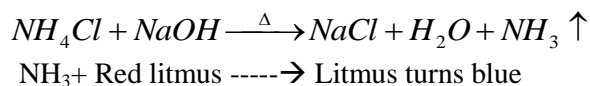
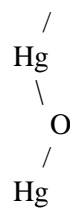
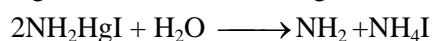
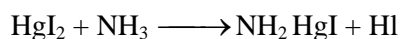
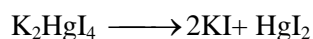
#### Confirmative Test:

	Experiment	Observation	Inference
1	Nessler Test: Salt solution + $\text{NaOH}$ + Nessler's reagent	Reddish brown ppt is formed	$\text{NH}_4^+$ Confirmed
2	$\text{NaOH}$ Test : Salt Solution + $\text{NaOH}$ + Heat Bring a glass rod dipped in dil $\text{HCl}$	Smell of $\text{NH}_3$  white dense fumes of $\text{NH}_4\text{Cl}$ are formed	$\text{NH}_4^+$ Confirmed

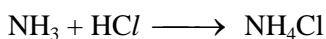
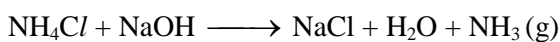
#### Preliminary Test :





**Confirmative Test :****Chromyl Chloride Test :****Chemical Reaction for Basic Radical****Preliminary Test :****Confirmative Test :****Nessler's Test :**

I (Iodide of millon base)

**NaOH Test :**

(Dense white fumes)

**Result :** The given inorganic salt contains

Acidic Radical  $\text{Cl}^-$   
Basic Radical  $\text{NH}_4^+$

## EXPERIMENT – 15

**Aim :** To analyze the given inorganic salt for acidic and basic radical.

### Preliminary Investigation

Physical state	:	Solid
Colour	:	White ( $\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ absent)
Qdour	:	No characteristic odour (absence of $\text{NH}_4^+$ , $\text{S}^{2-}$ , $\text{CH}_3\text{COO}^-$ )
Solubility	:	Soluble in water.
Flame Test	:	No characteristics flame ( $\text{Pb}^{+2}$ , $\text{Sr}^{+2}$ , $\text{Cu}^{+2}$ , $\text{Ca}^{+2}$ , $\text{Ba}^{+2}$ , $\text{Ni}^{+2}$ , $\text{Zn}^{+2}$ absent)

### (A) Identification of Acidic Radical

#### a- Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil $\text{H}_2\text{SO}_4$	No gas is evolved	Group A ( $\text{CO}_3^{2-}$ , $\text{S}^{2-}$ , $\text{SO}_3^{2-}$ , $\text{NO}_2^-$ , $\text{CH}_3\text{COO}^-$ ) Absent
2	Salt + Conc <sup>n</sup> $\text{H}_2\text{SO}_4$ + Heat	No gas evolved	Group B anions ( $\text{Cl}^-$ , $\text{Br}^-$ , $\text{I}^-$ , $\text{NO}_3^-$ , $\text{C}_2\text{O}_4^{2-}$ absent)
3.	Salt + $\text{BaCl}_2$	White ppt is formed	Group C anion ( $\text{SO}_4^{2-}$ may be)

#### (b) Confirmative test :

	Experiment	Observation	Inference
1	$\text{BaCl}_2$ test :Salt Solution + $\text{BaCl}_2$ Add dil HCl to above ppt	White Ppt Ppt remains insoluble	$\text{SO}_4^{2-}$ confirmed
2	Lead Acetate Test : - Salt Solution + $(\text{CH}_3\text{COO})_2 \text{Pb}$ solution Add $\text{CH}_3\text{COO NH}_4$ to above ppt.	White ppt. Ppt dissolves in ammonium acetate.	$\text{SO}_4^{2-}$ confirmed

### B- Identification of Basic Radical

#### (a) Preliminary test :

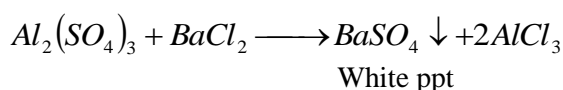
	Experiment	Observation	Inference
1	Salt solution + NaOH + heat	No smell of $\text{NH}_3$	Zero Group, ( $\text{NH}_4^+$ absent)
2	Salt solution + dil . HCl	No Ppt	Group I, ( $\text{Pb}^{2+}$ absent)
3	To the above solution pass $\text{H}_2\text{S}$ gas	No ppt.	Group II ( $\text{Cd}^{2+}$ , $\text{Pb}^{2+}$ , $\text{As}^{2+}$ , $\text{Cu}^{2+}$ absent)
4	Boil $\text{H}_2\text{S}$ gas and add $\text{NH}_4\text{Cl}$ + $\text{NH}_4\text{OH}$ & divide the Solution in two parts.	White gelatinous ppt.	Group III ( $\text{Al}^{3+}$ may be)

#### (b) Confirmative test:

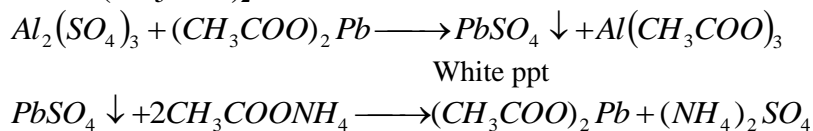
	Experiment	Observation	Inference
1	Take test : 1 <sup>st</sup> part + dil + HCl + 2 drops of blue litmus + $\text{NH}_4\text{OH}$	Blue ppt.floats over colourless solution	$\text{Al}^{3+}$ confirmed
2	Ammonium chloride Test : IInd part + $\text{NH}_4\text{Cl}$ + Boil the solution	Formation of white gelatinous ppt.	$\text{Al}^{3+}$ confirmed

### Acidic Radical

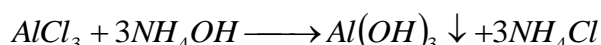
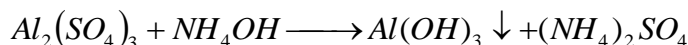
#### 1. BaCl<sub>2</sub> test :



#### 2. (CH<sub>3</sub>COO)<sub>2</sub>Pb test :



### Basic Radical



White ppt

**Result :** The given inorganic salt contains. Acidic Radical – SO<sub>4</sub><sup>2-</sup>

Basic Radical Al<sup>+3</sup>

## EXPERIMENT – 16

**Aim :** To analyze the given inorganic salt for acidic and basic radical.

### Preliminary Investigation

Physical state	:	Solid
Colour	:	White (Cu <sup>2+</sup> , Fe <sup>2+</sup> , Fe <sup>3+</sup> , Ni <sup>+2</sup> , Mn <sup>+2</sup> , CO <sup>+2</sup> are absent)
Qdour	:	No characteristic adour (NH <sub>4</sub> <sup>+</sup> , CH <sub>3</sub> COO <sup>-</sup> , S <sup>2-</sup> )absent
Solubility	:	Soluble in water.
Flam Test	:	Apple green flam

#### (A) Identification of Acidic Radical

##### a- Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil H <sub>2</sub> SO <sub>4</sub>	No gas is evolved	Group A (CO <sub>3</sub> <sup>2-</sup> , S <sup>2-</sup> , SO <sub>3</sub> <sup>2-</sup> , NO <sub>2</sub> <sup>-</sup> , CH <sub>3</sub> COO <sup>-</sup> absent)
2	Salt + Conc H <sub>2</sub> SO <sub>4</sub> + Heat	Reddish orange vapours which turns starch paper yellow	Group B anion (Br <sup>-</sup> may be)

##### (b) Confirmative test:

	Experiment	Observation	Inference
1	AgNO <sub>3</sub> Test : Salt Solution + AgNO <sub>3</sub>  Dissolve ppt. in NH <sub>4</sub> OH	Yellow ppt.  Ppt. remains partially soluble	Br <sup>-</sup> confirmed
2	MnO <sub>2</sub> Test : Salt Solution + MnO <sub>2</sub> + Conc. H <sub>2</sub> SO <sub>4</sub> + Heat	Orange red vapour of Br <sub>2</sub>	Br <sup>-</sup> confirmed

## B- Identification of Basic Radical

### (a) Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + NaOH + heat	No smell of NH <sub>3</sub>	Zero Group, (NH <sub>4</sub> <sup>+</sup> absent)
2	Salt solution + dil . HCl	No white Ppt	Group I (Pb <sup>2+</sup> absent)
3	To the above solution pass H <sub>2</sub> S gas	No ppt.	Group II (Cu <sup>2+</sup> , As <sup>+3</sup> , Cd <sup>+2</sup> , Pb <sup>+2</sup> absent )
4	Boil above solution to remove H <sub>2</sub> S and add NH <sub>4</sub> Cl (s) + NH <sub>4</sub> OH in excess.	No ppt.	Group III [Fe <sup>2+</sup> , Fe <sup>3+</sup> , Al <sup>3+</sup> absent ]
5	To above test tube pass H <sub>2</sub> S gas	No ppt	Group IV [Zn <sup>2+</sup> , Co <sup>+2</sup> , Ni <sup>+2</sup> , Mn <sup>+2</sup> absent]
6	Remove H <sub>2</sub> S gas by boiling. Add [NH <sub>4</sub> ] <sub>2</sub> CO <sub>3</sub> to it.	White ppt	V group (Ca <sup>2+</sup> , Ba <sup>2+</sup> , Sr <sup>2+</sup> may be)

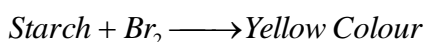
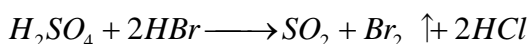
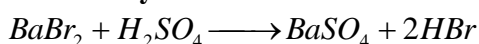
Dissolved the ppt in CH<sub>3</sub>COOH and divide in three part

### (b) Confirmative test:

	Experiment	Observation	Inference
1	Potassium chromate test : I <sup>st</sup> part + K <sub>2</sub> CrO <sub>4</sub>	Yellow ppt	Ba <sup>2+</sup> confirmed
2	Ammonium sulphate Test : IInd part + (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	No ppt	Sr <sup>2+</sup> absent
3	Ammonium oxalate Test: IIIrd part + ammonium oxalate test (NH <sub>4</sub> ) <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	No ppt	Ca <sup>2+</sup> absent
4.	Flame test : Perform flame test with salt.	Apple green flame	Ba <sup>2+</sup> confirmed

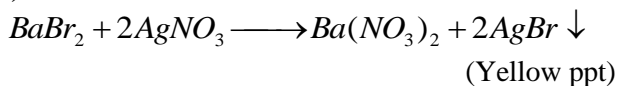
### Chemical reaction for Acidic Radical

#### Preliminary Test:



#### Confirmative Test:

##### i) Silver Nitrate test

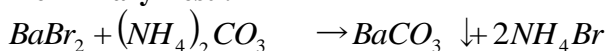


##### ii) MnO<sub>2</sub> Test :-

$$BaBr_2 + MnO_2 + 2H_2SO_4 \longrightarrow BaSO_4 + MnSO_4 + 2H_2O + Br_2 \uparrow$$

### Chemical reaction for Basic Radical

#### Preliminary Test :



#### Confirmative Test :

$$BaCO_3 + 2CH_3COOH \longrightarrow (CH_3COO)_2Ba + CO_2 \uparrow + H_2O$$

$$(CH_3COO)_2Ba + K_2CrO_4 \longrightarrow 2CH_3COOK + BaCrO_4 \downarrow$$

1K<sub>2</sub>CrO<sub>4</sub> Test : (Yellow ppt)

Result : The given inorganic salt contains.

Acidic Radical Br<sup>-</sup>  
Basic Radical Ba<sup>2+</sup>

## EXPERIMENT – 17

**Aim :** To analyze the given inorganic salt for acidic and basic radical.

### Preliminary Investigation

Physical state	:	Solid
Colour	:	White ( $\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ are absent)
Qdour	:	No characteristic adour ( $\text{NH}_4^+$ , $\text{S}^{2-}$ , $\text{CH}_3\text{COO}^-$ absent )
Solubility	:	Soluble in water.
Flame Test	:	No characteristic flame ( $\text{Ca}^{+2}$ , $\text{Sr}^{+2}$ , $\text{Ba}^{+2}$ , $\text{Pb}^{+2}$ , $\text{Cu}^{+2}$ , $\text{Zn}^{+2}$ absent )

### (A) Identification of Acidic Radical

#### a- Preliminary test :

	Experiment	Observation	Inference
1	Salt solution + dil $\text{H}_2\text{SO}_4$ + heat	No gas is evolved	Group A ( $\text{CO}_3^{2-}$ , $\text{S}^{2-}$ , $\text{SO}_3^{2-}$ , $\text{NO}_2^-$ , $\text{CH}_3\text{COO}^-$ absent )
2	Salt + Conc <sup>n</sup> $\text{H}_2\text{SO}_4$ + Heat	Colourless, odourless, mixture of gas which turns lime water milky & burns on the mouth of test tube water with blue flame	Group B ( $\text{C}_2\text{O}_4^{2-}$ , may be )

#### (b) Confirmative test :

	Experiment	Observation	Inference
1	Calcium Chloride Test : Salt Solution + $\text{CaCl}_2$	White ppt. of calcium oxalate is formed	( $\text{C}_2\text{O}_4^{2-}$ ) confirmed
2	$\text{KMnO}_4$ Test : Above ppt + dil $\text{H}_2\text{SO}_4$ + Heat Add very dil solution of $\text{KMnO}_4$	Pink colour of $\text{KMnO}_4$ is discharged with evolution of $\text{CO}_2$ gas.	( $\text{C}_2\text{O}_4^{2-}$ ) Confirmed

### B- Identification of Basic Radical

#### (a) Preliminary test:

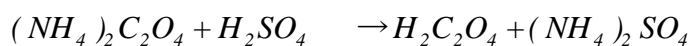
	Experiment	Observation	Inference
1	Salt solution + $\text{NaOH}$ + heat Place red litmus paper on mouth to test tube	Smell of $\text{NH}_3$  Red litmus turns blue	Zero Group, ( $\text{NH}_4^+$ present )

#### (b) Confirmative test:

	Experiment	Observation	Inference
1	To above solution, bring on glass rod dipped in conc. $\text{HCl}$ near mouth of test tube.	White dense of $\text{NH}_4\text{Cl}$ are formed	( $\text{NH}_4^+$ ) confirmed
2	Nessler's Test : Solution + $\text{NaOH}$ + Nessler's reagent	Reddish brown ppt is formed	( $\text{NH}_4^+$ ) confirmed

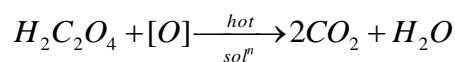
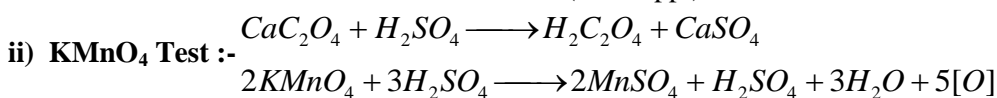
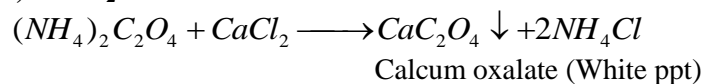
## Chemical reaction for Acidic Radical

### Preliminary Test :



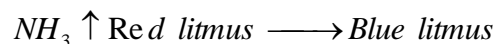
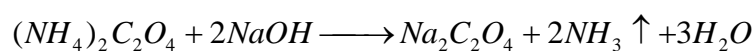
### Confirmative Test :

#### i) CaCl<sub>2</sub> test



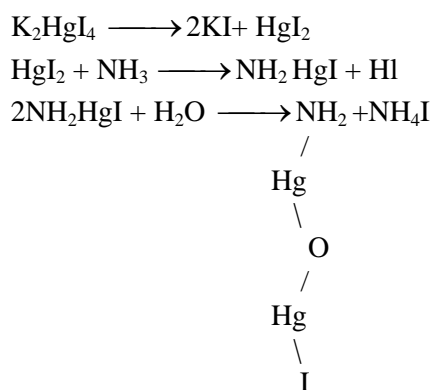
## Basic Radical

### a) Preliminary test



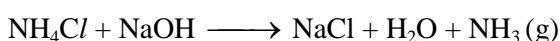
### Confirmative Test :

#### Nessler's Test :



(Iodide of millon base)

#### NaOH Test :



**Result : The given inorganic salt contains.**

**Acidic Radical** –  $C_2O_4^{2-}$

**Basic Radical** ( $NH_4^+$ )

## EXPERIMENT – 18

**Aim :** To prepare solution of M/30 (250 ml) Mohr's salt solution. With its help, determine molarity and strength of KMnO<sub>4</sub> solution.

**Apparatus Required :** Burette, conical flask, pipette, burette stand, test tube, white tile, watch glass, volumetric flask (250ml) beaker, funnel glass rod, weight box, wash bottle.

#### Chemical Required :

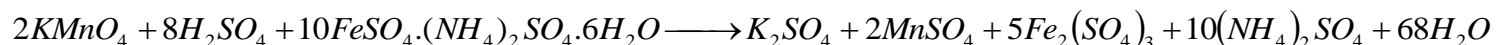
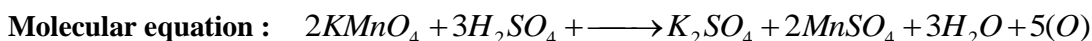
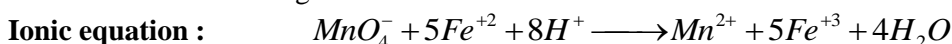
Mohr's Salt, [FeSO<sub>4</sub>. (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub>.6H<sub>2</sub>O], KMnO<sub>4</sub>, dil H<sub>2</sub>SO<sub>4</sub>, conc. H<sub>2</sub>SO<sub>4</sub>

**Indicator :** KMnO<sub>4</sub> is a self indicator

**End point :** Colourless to pink

**Theory :**

(a) Preparation of standard solution of M/30 mohr's salt

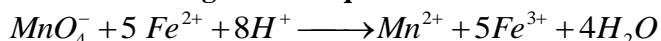
Molecular formula of mohr's salt :  $\text{FeSO}_4 \cdot (\text{NH}_4)_2 \text{SO}_4 \cdot 6\text{H}_2\text{O}$ . mohr's salt is a primary standard . Hence its solution can be prepared by direct weighing.Thus to prepare 1000 ml of 1M Mohr's salt solution,  
392 g of Mohr's salt is needed.To prepare 250ml of 1 M Mohr's salt  $\frac{392}{1000} \times 250$  ie  $\frac{392}{4}$  g of mohr's salt is need.Thus to prepare 250 ml of M/30 mohr's salt solution,  $\frac{392}{4} \times \frac{1}{30}$  i.e, 3.2670 g of mohr's salt is needed.**(b) Titration of Mohr's salt Sol (standard solution) with  $\text{KMnO}_4$  (unknown solution),  $\text{KMnO}_4$  is strong and versatile oxidising agent . When its treated with mohr's salt solution in sufficiently acidic medium,  $\text{Fe}^{2+}$  ion are oxidise to  $\text{Fe}^{3+}$  according to reaction.****Observation Table:-****1. Preparation of standard solution:-**Weight of empty watch glass ( $W_1$ ) 21.7200 gWeight of watch glass + Mohr's salt ( $W_2$ ) = 21.7200+3.2670 = 24.9870gWeight of Mohr's salt =  $W_2 - W_1 = 24.9870 - 21.7200 = 3.2670$  g

Volume of mohr's salt = 250 ml

Molarity of mohr's salt = M/30

**2. Titration of standard solution with  $\text{KMnO}_4$  Solution :-**

S.no.	Volume of Mohr's salt used ( $V_1$ ) ml	Burette Reading		Volume of $\text{KMnO}_4$ used	Concordant Reading
		Initial	Final		
1	20ml	0.0 ml	14.4 ml	14.4 ml	
2	20 ml	0.0 ml	14.2 ml	14.2 ml	14.2 ml
3	20 ml	0.0 ml	14.2 ml	14.2 ml	

**Calculation : According to ionic eq.**

5 moles of mohr's salt = 1 mole of  $\text{KMnO}_4$   $M_1V_1 = \frac{1}{5} M_2V_2$

 $M_1$  = Molarity of  $\text{KMnO}_4$  = ? $V_1$  = Volume of  $\text{KMnO}_4$  = 14.2 ml $M_2$  = Molarity of Mohr's salt solution = M/30 $V_2$  = Volume of Mohr's salt solution = 20 ml

$$M_1 \times 14.2 = \frac{1}{5} \times \frac{M}{30} \times 20$$

$$M_1 = \frac{1}{5} \times \frac{M}{30} \times \frac{20}{14.2} = 0.00938M$$

Strength of  $\text{KMnO}_4$  = molarity  $\times$  mol.wt. of  $\text{KMnO}_4$ .

= 0.00938  $\times$  158

= 1.48209 g/L

**Result**

- Molarity of the given  $\text{KMnO}_4$  solution = 0.00938 M
- Strength of the given  $\text{KMnO}_4$  solution = 1.48204 g/L

**Precaution :**

1. Weighting should be accurate.
2. Add 2 – 3 ml of conc. H<sub>2</sub>SO<sub>4</sub> to prevent hydrolysis of Mohr's Salt solution during preparation of standard solution.
3. In case of coloured solution (KMnO<sub>4</sub>) upper meniscus is read

**EXPERIMENT – 19**

**Aim :** To prepare solution of M/20 oxalic acid with its help determine the morality and strength of given KMnO<sub>4</sub> solution.

**Apparatus Required :** Burette, conical flask, pipette, beaker, test tube, weight box, white tiles, volumetric flask beaker, funnel glass rod, weight box, wash bottle.

**Chemical Required :** Oxalic acid, crystal, dill H<sub>2</sub>SO<sub>4</sub>, KMnO<sub>4</sub> solution

**Indicator :** KMnO<sub>4</sub> act as a self indicator.

**End point :** Colourless to Pink

**Theory :****(a) Preparation of standard or known solution :-**

Molecular formula of oxalic acid is H<sub>2</sub>C<sub>2</sub>O<sub>4</sub>.2H<sub>2</sub>O. It is a primary standard solution. Thus its solution can be prepared by direct weighting.

Molecular weight of oxalic acid = 126 g

∴ molar mass = 126 g/l

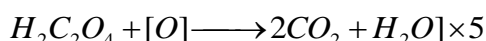
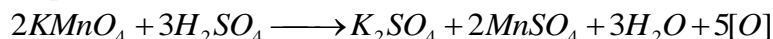
To prepare 1000 ml of 1M oxalic acid solution, 126 of oxalic acid is required

To prepare 250 ml of 1M oxalic acid solution (126/4)g is oxalic acid is required.

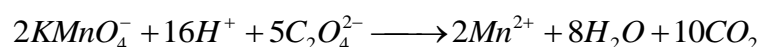
∴ To prepare 250 ml of M/20 oxalic acid solution.

$$\frac{126}{4} \times \frac{1}{20} = 1.5750 \text{ g of oxalic acid is needed}$$

**(b) Titration of standard solution with KMnO<sub>4</sub> (unknown solution):** KMnO<sub>4</sub> is strong and versatile Oxidizing agent. When it is titrated against standard oxalic acid solution (reducing agent) in sufficiently acidic medium at above 60°C, KMnO<sub>4</sub> oxidizes acid into CO<sub>2</sub> and itself gets reduced to colourless Mn<sup>+2</sup> ions.

**Molecular Equation :**

Ionic equation :  $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^{(-)} \longrightarrow \text{Mn}^{2+} + [4\text{H}_2\text{O}] \times 2$

**Observation Table :****a) Preparation of M/20 oxalic acid solution :**

Weight of water glass (W<sub>1</sub>) = 21.7200g

Weight of watch glass + weight of oxalic acid (W<sub>2</sub>) = 23.2950 g

∴ weight of oxalic acid (w<sub>2</sub> – w<sub>1</sub>) = 1.5750g

Volume of oxalic acid used for each titration = 250 ml.

**3. Titration of standard solution with unknown Solution :-**

S.no.	Volume of Mohr's salt used (V <sub>1</sub> ) ml	Burette	Reading	Volume of KMnO <sub>4</sub> used	Concordant Reading
1	2.0 ml	0.0 ml	15.1 ml	15.1 ml	
2	2.0 ml	0.0 ml	14.8 ml	14.8 ml	14.8 ml
3	2.0 ml	0.0 ml	14.8 ml	14.8 ml	



**Calculation :** According to the ionic eq.



∴ 1 mole of oxalic acid required 2/5 mole of  $KMnO_4$ .

$$\therefore M_1V_1 = 2/5 M_2V_2$$

$$\frac{2}{5} \times \frac{M}{20} \times \frac{20}{14.8} = 0.027M$$

$$\text{Strength of } KMnO_4 \text{ used} = \text{Molarity} \times \text{molar mass} = 0.027 \times 158 = 4.2702 \text{ g/l}$$

**Result**

1. Molarity = 0.0270 M
2. Strength = 4.2702 g/L

**Precaution :**

1. Weighting should be accurate .
2. Always remove funnel from burette while titrating the solution.

$$M_1 = \text{Molarity of } KMnO_4 \text{ Sol}^n = ?$$

$$V_1 = \text{Volume of } KMnO_4 \text{ Sol}^n = 14.8 \text{ ml}$$

$$M_2 = \text{Molarity of Oxalic acid Sol}^n = M/20$$

$$V_2 = \text{Volume of Oxalic acid Sol}^n = 20 \text{ ml}$$

## EXPERIMENT – 20

**Aim :** To identify the functional group in the given organic compound.

**Apparatus Required :** Test tube, test tube stand, test tube holder, dropper, litmus (blue),  $NaHCO_3$ , conc.  $H_2SO_4$ ,  $NH_4OH$ ,  $FeCl_3$ .

**Physical Properties:**

State: Solid  
 Colour: White  
 Odour: Vinegar Like  
 Flammability: Burn with non sooty flame (Aliphatic)

**Preliminary test :**

S.no.	Experiment	Observation	Inference
1	Litmus test : Organic compound + 2 drops of litmus solution.	Litmus solution turns from blue to red.	-COOH or – OH may be present
2	Organic compound + $NaHCO_3$ solution.	Colourless, odorless gas with brisk effervescence.	-COOH group may be or – OH (phenol group present).

**Confirmatory test :**

S.no.	Experiment	Observation	Inference
1	Ester test : Organic compound + $C_2H_5OH$ + conc. $H_2SO_4$ + Heat	Fruity smell of ester	$\begin{array}{c} \overline{O} \\    \\ - C - OH \end{array}$ confirmed.
2	$FeCl_3$ Test : Organic compound + dil $FeCl_3$ solution .	Red colour appear	$\begin{array}{c} \overline{O} \\    \\ - C - OH \end{array}$ confirmed

**Chemical Reaction :**  $\text{NaHCO}_3$  Test :  $\text{RCOOH} + \text{NaHCO}_3 \longrightarrow \text{RCOONa} + \text{CO}_2 \uparrow + \text{H}_2\text{O}$

**Ester Test :**  $\text{RCOOH} + \text{R}'\text{-OH} \xrightarrow[\text{H}_2\text{SO}_4]{\text{conc.}} \text{RCOOR}' + \text{H}_2\text{O}$

(Fruity smell ester)

**FeCl<sub>3</sub> Test :**  $\text{RCOOH} + \text{NH}_4\text{OH} \longrightarrow \text{RCOONa}$

$\text{RCOONa} + \text{H}_2\text{O} \longrightarrow$  Ammoniac salt (Soluble)

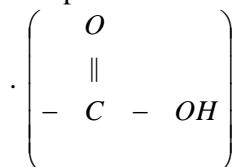
$\text{RCOONH}_4 + \text{FeCl}_3 \longrightarrow (\text{RCOO})_3\text{Fe} + 3\text{NH}_4\text{Cl}$

$(\text{RCOO}_3)\text{Fe} + \text{H}_2\text{O} \longrightarrow \text{Fe}(\text{OH})(\text{RCOO})_2 + \text{RCOOH}$

Basic ferric acetate.

**Result :**

The functional group present in the given organic compound is carboxylic acid



### EXPERIMENT – 21

**Aim :** To identify the functional group in the given organic compound.

**Apparatus Required :** Test tube, test tube stand, test tube holder, dropper litmus (blue) solution, dil HCl, NaOH, Na metal, dil H<sub>2</sub>SO<sub>4</sub>, CH<sub>3</sub>COOH.

**Physical Properties:**

State: Liquid  
 Colour: Colourless  
 Odour: Spirit Like  
 Water Solubility: Soluble in Water  
 Flammability: Burn with non-sooty flame (Aliphatic)

**Preliminary test :**

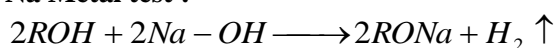
S.no.	Experiment	Observation	Inference
1	Organic compound + blue litmus solution.	No change	-COOH or -OH(Phenol) group absent
2	Organic compound + dil HCl + NaOH	No ppt. or oily layer	-NH <sub>2</sub> grp. Absent
3	Organic comp + Na metal	H <sub>2</sub> gas evolved	-OH (alcohol) Group may be

**Confirmatory test :**

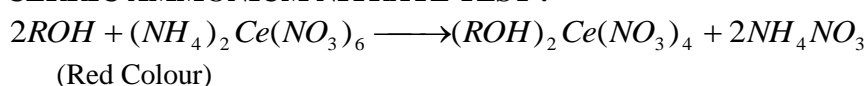
S.no.	Experiment	Observation	Inference
1	Cerric ammonium nitrate Test : Organic compound + cerric ammonium nitrate	Red colour	-OH group. confirmed
2	Ester Test : Organic compound + CH <sub>3</sub> COOH + Conc. H <sub>2</sub> SO <sub>4</sub> (1 – 2 drops) + Heat.	Fruity smell of ester.	-OH grp. confirmed

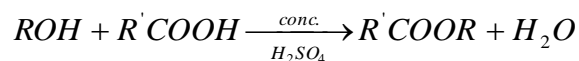
**Chemical reaction :**

**1- Na Metal test :-**



**2- CERRIC AMMONIUM NITRATE TEST :**



**3- Easter Test :**

Alcohol                      acid                      ester

**Result :** The functional group present in organic compound is alcohol group (-OH).

**EXPERIMENT – 22**

**Aim :** To identify the functional group in the given organic compound.

**Apparatus Required :** Test tube, test tube stand, test tube holder, dropper litmus (blue) NaHCO<sub>3</sub>, FeCl<sub>3</sub> Solution, Phthalic anhydride, Con. H<sub>2</sub>SO<sub>4</sub>, NaOH.

**Physical Properties:**

State: Solid  
 Colour: White  
 Odour: Phenolic Smell  
 Water Solubility: Water insoluble  
 Flammability: Burn with non-sooty flame (Aromatic)

**Preliminary test :**

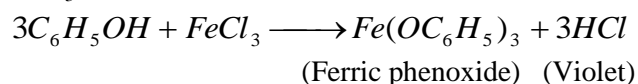
S.no.	Experiment	Observation	Inference
1	Organic compound + blue litmus solution.	Blue litmus turn Red	-COOH or phenolic – (OH) may be
2	NaHCO <sub>3</sub> test : Organic compound + NaHCO <sub>3</sub> solution.	No effervescence	- COOH absent Phenolic group may be

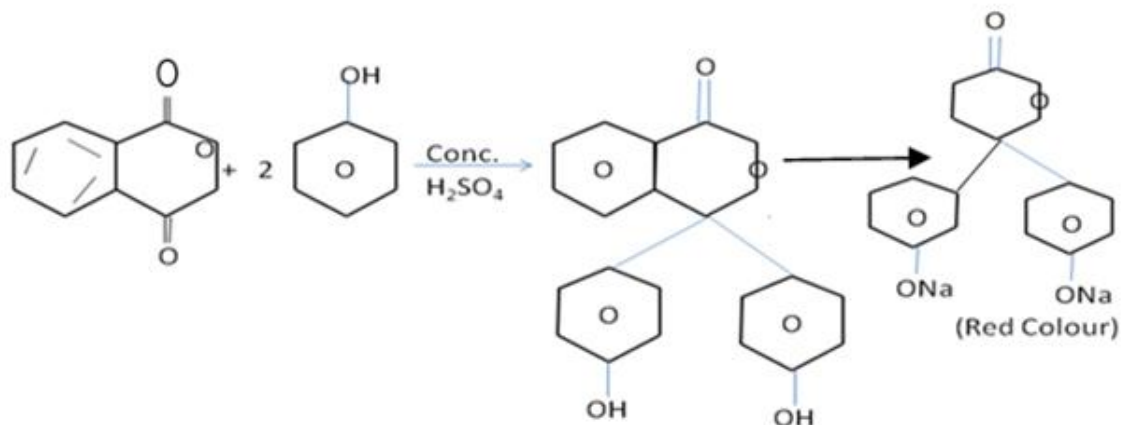
**Confirmatory test :**

S.no.	Experiment	Observation	Inference
1	FeCl <sub>3</sub> Test : Organic compound + FeCl <sub>3</sub>	Green blue or violet colouration	Phenolic (- OH) group. confirmed
2	Phthalic test : Organic compound + phthalic acid + 2-3 drops H <sub>2</sub> SO <sub>4</sub> + Δ .then cool and dil. NaOH	Intense green blue or red colouration	Phenol (- OH) grp. Confirmed

**Chemical Reaction :****Confirmative test :**

FeCl<sub>3</sub> test





**Result :** The given organic comp. contains phenolic (-OH) grp.

### EXPERIMENT – 23

**Aim :** To identify the functional group in present in the given organic compound.

**Apparatus Required :** Test tube, test tube stand, test tube holder, dropper, litmus solution, 2,4 DNP, dil HCl, NaOH, reagent, Fehling solution, Schiff reagent.

#### Physical Properties:

State: Liquid  
 Colour: Colourless  
 Odour: Pungent  
 Water Solubility: Soluble in Water  
 Flammability: Burn with non-sooty flame (Aliphatic)

#### Preliminary test :

S.no.	Experiment	Observation	Inference
1	Organic compound + blue litmus solution.	No change	-COOH or phenolic group absent
2	Organic compound + NaOH+ dil HCl	No ppt or oily layer	- $\text{NH}_2$ gup. Absent
3	Organic comp + 2 ml of 2, 4 DNP shake & allow it to stand.	Orange – red ppt.	- CHO or ketonic - group present.

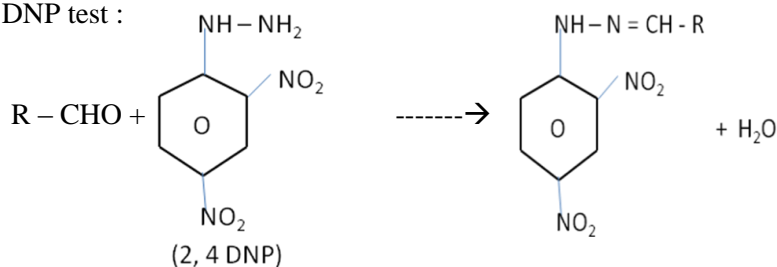
#### Confirmatory test :

S.no.	Experiment	Observation	Inference
1	<b>Schiff's solution test :</b> Organic compound + 2 ml of Schiff's reagent.	Pink colour Obtained	-CHO group present
2	<b>Fehling's solution test :</b> Organic compound + Fehling's solution (A + B) + boil in a water bath	Red ppt.	- CHO grp present.

#### Chemical reaction :

1- Preliminary test :

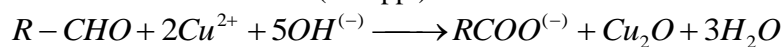
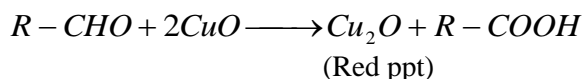
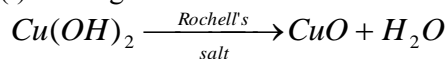
(i) 2, 4 DNP test :



(aldehyde – 2, 4 dil nitro phenyl hydrazone) (Orange – red ppt)

b) **Confirmatory Test :**

(i) Fehling's test : -



**Result :** Given organic compound contains aldehydic grp. (- CHO)

**EXPERIMENT – 24**

**Aim :** To identify the functional group in present in the given organic compound.

**Apparatus Required :** Test tube, test tube stand, test tube holder, dropper, litmus solution, 2,4 DNP, dil HCl, NaOH, sodium, nitro pruside, meta dinitro benzene

**Physical Properties:**

State: Liquid  
 Colour: Colourless  
 Odour: Nail paint remover like  
 Water Solubility: Water soluble  
 Flammability: Burn with non-sooty flame (Aliphatic)

**Preliminary test :**

S.no.	Experiment	Observation	Inference
1	Organic compound + blue litmus solution.	No change	-COOH or phenolic group absent
2	Organic compound + NaOH+ dil HCl	No ppt or oily layer	- NH <sub>2</sub> gup. Absent
3	Organic comp + 2 ml of 2, 4 DNP shake & allow it to stand.	Orange – red ppt.	- CHO or ketonic - group present.

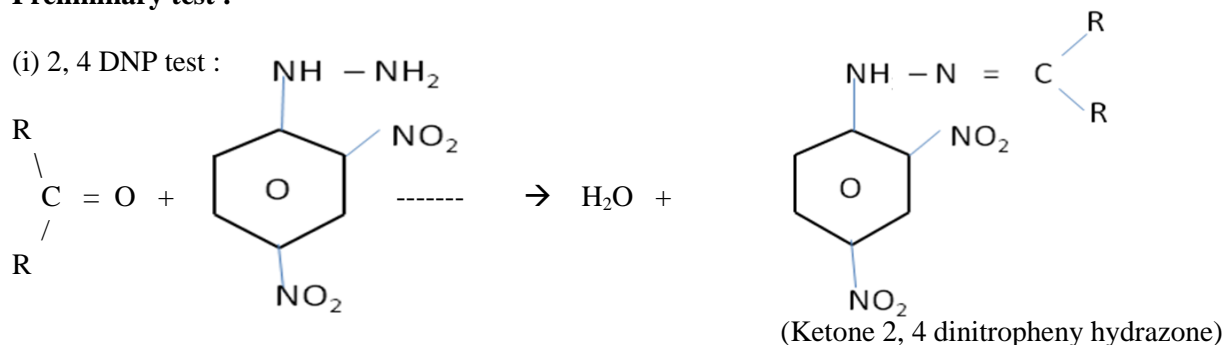
**Confirmatory test :**

S.no.	Experiment	Observation	Inference
1	Organic compound + sodium nitro prusside + 2 – 3 drops of NaOH and shake.	Red colour or wine red colour	-CHO group present
2	Organic compound + Meta dinitrobenzene + NaOH	Violet colour which fades on standing.	Ketonic grp confirmed.

**Chemical reaction :**

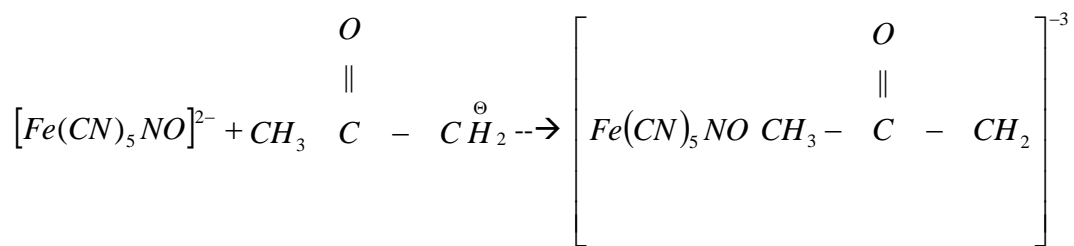
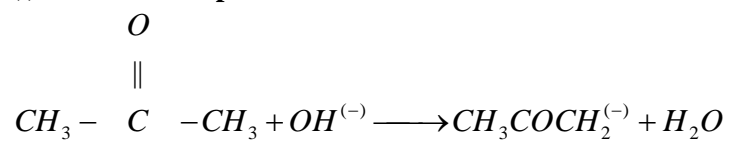
1- **Preliminary test :**

(i) 2, 4 DNP test :



**b- Confirmatory test :**

**(i) Sodium Nitroprusside Test :**



**Result :** Given organic compound contains Ketonic group ( $>C = O$ )