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Chemistry Practical Index

Class-XII Term-II (2021-22)

** Write Calculation of Exp. No. 2 & 3 in front of Observation Table on the Blank Page.

** Write Reaction of Exp. No. 4 to 12 in front of Observation Table on the Blank Page.

Experiment No : 1

To prepare a pure sample of ferrous ammonium sulphate (Mohr's salt)

AIM :- To prepare a pure sample of ferrous ammonium sulphate

Apparatus :- Two 250 ml beakers, china dish, funnel, funnel stand, glass rod, tripod stand, wash bottle, wire gauze.

Chemicals :- Ferrous sulphate (7g), Ammonium sulphate (3.5g), Dilute H_2SO_4 (2-3 ml).

Theory :- Mohr's salt is prepared by dissolving equimolar amounts of hydrated ferrous sulphate and ammonium sulphate in minimum quantity of water containing little dilute sulphuric acid. The resultant solution is filtered to remove impurities and evaporated till crystallization point is reached. Cooling of this hot saturated solution yields light bluish green crystals which are separated from the mother liquor and dried.

$$F_eSO_4 7H_2O + (NH_4)SO_4 \rightarrow FeSO_4(NH_4)_2SO_4 6H_2O + H_2O$$

278g 132g 392g

Procedure :- 1. Take a 250ml beaker. Transfer 7g ferrous sulphate and 3.5g ammonium sulphate crystal to it.

2. Add about 2-3ml of dilute sulphuric acid to prevent hydrolysis of ferrous sulphate.

3. In another beaker boil about 20ml of water for about 5 minutes to expel dissolved air.

4. Add the boiling hot water in small instalment to the contents in the first beaker.

5. Stir the contents with a glass rod until the salts have completely dissolved.

6. Filter the solution to remove undissolved impurities and transfer the filtrate to a china dish.

7. Heat the solution in the china dish till saturated point.

8. Allow the contents of china dish to cool by placing the china dish over a beaker containing cold water. On cooling, crystals of Mohr's salt separated out.

9. Decant off the mother liquor and wash the crystals with ethyl alcohol.

10. Dry the crystals between the folds of filter paper. Note the colour and shape.

11. Weigh the crystals on a rough balance.

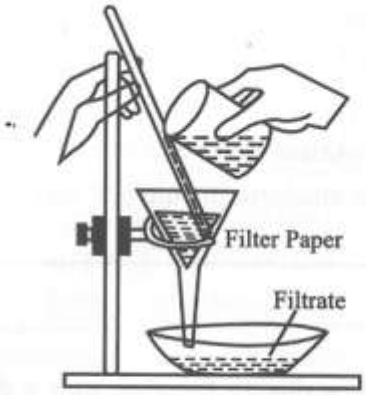


Fig. 6.2.1


Fig. 6.2.2

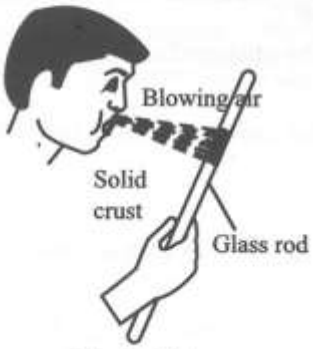


Fig. 6.2.3

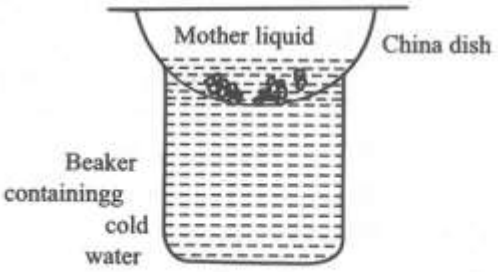


Fig. 6.2.4

Result **:-** 1. Colour of the crystals obtained = Light green.

2. Shape of the crystals = Monoclinic

3. Weight of the crystals =……g.

Precautions **:-** 1. Do not forget to add dil. H_2SO_4.

2. Use boiled water for dissolving the salts otherwise oxidation of ferrous ion will take place.

3. Use only green coloured ferrous sulphate.

Experiment No : 2

Oxidation – Reduction Titration

AIM:- To prepare 250 ml of M/30 standard solution of F.A.S. Using this solution find out the molarity and strength of the given $KMnO_4$ solution.

Theory :- $KMnO_4$ oxidises fe^{++} ions into fe^{+++} ions in acidic medium in cold and itself reduced to colourless Mn^{++} ions

$$2\ KMnO_4 + 10\ Fe\ SO_4\ (NH_4)_2\ SO_4\ 6H_2O + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5\ Fe_2(SO_4)_3 + 10\ (NH_4)_2\ SO_4 + 68\ H_2O$$

Or

$$MnO_4^- + 5\ fe^{++} + 8\ H^+ \rightarrow Mn^{++} + 5\ fe^{+++} + 4\ H_2\ O$$

Molecular Mass of $KMnO_4$ = 158

Molecular Mass of F.A.S. = 392

Mass of required FAS for preparing 250 ml of

M/30 solution = $\frac{392}{30} \times \frac{250}{1000}$ = 3.26 gm

Apparatus: - Chemical balance, weight box, watch glass, measuring flask, funnel, burette, pipette, conical flask, tile, burette stand etc.

Materials- F.A.S Crystals (Mohr's Salt), Dilute H_2SO_4, Distilled H_2O, $KMnO_4$ solution.

Indicator – $KMnO_4$ solution act as a self indicator.

End point – colourless to Permanent pink

Observation – (i) Mass of watch glass (a) = 35.700 gm
(ii) Mass of mohr's salt required (b) = 3.26 gm
(iii) Mass of (a) + (b) = 38.960 gm
(iv) Volume of mohr's salt solution prepared = 250 ml
(v) Molarity of mohr's salt solution = M/30

Observation table –

S.N.	Volume of F.A.S. Solution(v_1 ml)	Reading of $KMnO_4$ solution			Concordant volume of $KMnO_4$ (V_2 ml)
		Initial (a) (ml)	final (b) (ml)	Used (b-a) (ml)	
1	20 ml	0.0	17.1	17.1	
2	20 ml	0.0	16.8	16.8	16.8 ml
3	20 ml	0.0	16.8	16.8	

Calculations- (A) Molarity of $KMnO_4$ solution (M_2) = ? .

Using formula $M_1v_1 = 5\ M_2V_2$

$$M_2 = \frac{M_1V_1}{5\times V_2} = \frac{1}{30} \times \frac{20}{5\times 16.8}$$

M_2 = 0.0079 M

M_1 = M/30

V_1 = 20 Ml

M_2= ?

V_2 = 16.8 ml

(due to 2 moles of $KMnO_4$ reacts with 10 moles of FAS in overall balance equation)

(B) Strength of $KMnO_4$ Solution in gm \lit = ?

= molarity (M_2) × molecular mass

= 0.0079 × 158

= 1.2482 gm /lit

Result – (1) Molarity of the given $KMnO_4$ solution = 0.0079 M

(2) Strength of the given $KMnO_4$ solution = 1.2482 gm/lit.

Precaution

(i) ll the volumetric apparatus should be washed well before use.

(ii) Rinse burette with the solution of $KMnO_4$ and pipette with the solution of FAS. And wash the titration flash with distilled H_2O after every titration

(iii) Always read the upper meniscus in case of coloured solutions.

(iv) Always use freshly prepared $KMnO_4$ as it decomposed on keeping.

(v) Excess of dilute H_2SO_4 should be add in FAS.

Experiment No. 3

Oxidation – Reduction Titration

AIM:- To prepare 250 ml of M/30 standard solution of Oxalic acid.
Using this solution, find out the Molarity and strength of the given $KMnO_4$ solution.

Theory – $KMnO_4$ Oxidises Oxalic acid into CO_2 in acidic medium at a temperature around 60^0 c and itself
get reduced to colourless Mn^{++} ions

$2\ KMnO_4 + 3\ H_2SO_4 + 5\ (COOH)_2 \rightarrow K_2SO_4 + 2\ MnSO_4 + 10\ CO_2 + 8\ H_2O$

OR

$2\ MnO_4^- + 16H^+ + 5\ C_2O_4^{-2} \rightarrow 2\ Mn^{++} + 8\ H_2O + 10\ CO_2$

Molecular mass of $kMnO_4$ = 158
Molecular mass of Oxalic acid = 126
Mass of required Oxalic acid for preparing 250 ml of
M/30 solution = $\frac{126}{30} \times \frac{250}{1000}$ = 1.05 gm

Apparatus: - Chemical balance, weight box, watch glass, measuring flask, funnel, burette, pipette, conical flask, tile, burette stand etc.

Materials- Hydrated oxalic acid Crystals (Mohr's Salt), dilute H_2SO_4, distilled H_2O, $KMnO_4$ solution.

Indicator – $KMnO_4$ solution act as a self indicator.

End point – Colourless to Permanent pink

Observation – (i) Mass of watch glass (a) = 36.700 gm
(ii) Mass of required oxalic acid (b) = 1.05 gm
(iii) Mass of (a) + (b) = 37.750 gm
(iv) Volume of oxalic acid solution prepared = 250 ml
(v) Molarity of oxalic acid solution = M/30

Observation table –

S.N.	Volume of oxalic acid Solution(v_1 ml)	Reading of $KMnO_4$ solution			Concordant volume of $KMnO_4$ (V_2 ml)
		Initial (a) (ml)	final (b) (ml)	Used (b-a) (ml)	
1	20 ml	0.0	18.1	18.1	
2	20 ml	0.0	17.8	17.8	17.8 ml
3	20 ml	0.0	17.8	17.8	

Calculations- (A) Molarity of $KMnO_4$ solution (M_2) = ?

Using formula $2M_1v_1=5\ M_2V_2$

$$M_2 = \frac{2M_1V_1}{5V_2}$$

$$M_2 = \frac{2}{30} \times \frac{20}{5\times17.8}$$

$M_1 = M/30$

$V_1 = 20$ ml

M_2= ?

$V_2 = 17.8$ ml

$M_2 = 0.0149$ M

(due to 2 mole of $Kmno_4$ reacts with 5 moles of oxalic acid in overall balance equation)

(B) Strength of $KMnO_4$ Solution in gm/lit

= Molarity (M_2) × molecular mass.

= 0.0149 × 158

= 2.3542 gm/lit

Result (A) The Molarity of the given $KMnO_4$ solution = 0.0149 M

(B) The Strength of the given $KMnO_4$ solution = 2.3542 gm/lit

Precautions

(i) All the volumetric apparatus should be washed well before use.

(ii) Rinse burette with the solution of oxalic acid and pipette with the solution of oxalic acid and wash the titration flash with distilled H_2O after every titration

(iii) Always read the upper meniscus in case of coloured solution.

(iv) Always use freshly prepared $KMnO_4$ as it decomposes on keeping.

(v) Dilute H_2SO_4 should be add in oxalic acid solution.

(vi) Heat the conical flask should be slowly on a wire gauze unit the moisture appears on the neck of the flask, the temperature of the solution should be between $60^0 – 70^0$ c

Experiment No. 4

AIM – Analayse the given inorganic salt for one anion and one cation.

Preliminary Investigations –
State – solid
Colour – White
Odour – Vinegar like
Solubility in H_2O –soluble

Test for Anion

S.N	Experiment	Observations	Inference
1	Salt + Dil H_2SO_4	Vinegar like smell comes in the solution	Weak group present CH_3COO^- may be
2	**Palm test** Take salt a palm mix it with oxalic acid + H_2O Rub the paste and smell	Vinegar like Smell	CH_3COO^- confirmed
3	**Ester Test** Salt solution + C_2H_5OH + 2-4 drop of conc. $H_2SO_4 \xrightarrow{\Delta}$	Pleasant fruity smell of ester	CH_3COO^- confirmed
4	**$FeCl_3$ test** Salt solution + neutral $feCl_3$ solution	Blood red colour solution if obtained	CH_3COO^- confirmed

$$2\,CH_3COONa + H_2SO_4 \rightarrow 2\,CH_3COOH + Na_2SO_4$$
$$2\,CH_3COONa + (COOH)_2 \rightarrow (COONa)_2 + 2\,CH_3COOH$$
$$CH_3COONa + C_2H_5OH \xrightarrow{H^+} CH_3COOC_2H_5 + H_2O$$
Fruity smell

Test of cation

S.N	Experiment	Observations	Inference
1	Salt + Na OH $\rightarrow$	No reaction	'0' group Absent
2 (a)	O.S. of salt + dil HCl $\rightarrow$	No ppt formed	I Absent
(b)	Pass H_2S gas in above solution $\rightarrow$	No ppt formed	II Absent
(c)	Boil it till H_2S remove and add conc. HNO_3 boil and add NH_4Cl + NH_4OH $\rightarrow$	No ppt Formed	III Absent
1 (a)	Pass H_2s gas in III rd group solution	White ppt is formed	IV group present
(b)	O.S. of salt+ NaOH	White ppt which is dissolved in excess of NaOH	Zn^{++} May be
(C)	O.S. of salt + $K_4[fe(CN)_6]$	Bluish white ppt is formed	Zn^{++} confirmed
(4)	**$CO(No_3)_2$ test**	greenish residue	Zn^{++} confirmed

$Zn\,Cl_2 + H_2S \rightarrow Zns + 2\,HCl$

Result – Anion – CH_3COO^-
Cation – Zn^{++}

Experiment No. 5

AIM – Analayse the given inorganic salt for one anion and one cation.

Preliminary Investigations –

State – solid
Colour – White
Odour – rotten egg
Solubility in H_2O –soluble
Flame test – Not persistent with brick red

Test for Anion

S.N	Experiment	Observations	Inference
1 (a)	Salt + dil H_2So_4	Colourless gas with brisk effervescence	Weak group present CO_3^{2-} may be
(b)	Gas pass in lime water	Turns lime water milky and in excess amount of gas turns colourless	CO_3^{2-} conf.
(c)	Aqueous solution of salt + Mg SO_4	White ppt	CO_3^{2-} conf.
(d)	Aqueous solution of salt + phenolphthalein	Pink colour	CO_3^{2-} conf.

$Ca\ CO_3 + H_2\ SO_4 \rightarrow Ca\ SO_4 + H_2\ O + CO_2 \uparrow$

$Ca\ (OH)_2 + CO_2 \rightarrow Ca\ CO_3 + H_2O \xrightarrow{+CO2} Ca\ (HCO_3)_2$

$Ca\ CO_3 + Mg\ SO_4 \rightarrow Mg\ CO_3 \downarrow + Ca\ SO_4$

Test for Cation

S.N	Experiment	Observations	Inference
1	Salt + NaOH $\rightarrow$	No reaction	'0' group Absent
2 (a)	O.S. of salt + dil HCl $\rightarrow$	No ppt formed	I Absent
(b)	Pass H_2S gas in above solution $\rightarrow$	No ppt formed	II Absent
3	Boil it till H_2S remove and add conc. HNO_3 boil and add $NH_4\ Cl + NH_4\ OH \rightarrow$	No ppt Formed	III Absent
4	Pass H_2S gas in III group solution	no ppt is formed	IV group Absent
5	Boil it till then Smell of H_2 S fallout Add NH_4OH and $(NH_4)_2\ CO_3$	H_2S remove White ppt is formed	V group Present $Ba^{++}/sr^{++}/Ca^{++}$
6	White ppt dissolved in CH_3 COOH and divide into three parts		
(a)	I part + $K_2\ CrO_4$	Yellow ppt is not formed	Ba^{++} Absent
(b)	II Part + $(NH_4)_2\ SO_4$	White ppt is not formed	Sr^{++} Absent
(c)	III part + $(NH_4)_2\ C_2\ O_4$	White ppt is formed	Ca^{++} Present

$Ca\ Cl_2 + (NH_4)_2\ CO_3 \rightarrow 2\ NH_4\ Cl + Ca\ CO_3 \downarrow$

$Ca\ CO_3 + 2\ CH_3\ COOH \rightarrow (CH_3COO)_2\ Ca + CO_2 \uparrow + H_2O$

$(CH_3\ COO)_2\ Ca + (NH_4)_2\ C_2\ O_4 \rightarrow Ca\ SO_4 \downarrow + 2\ CH_3\ COO\ NH_4$

Result – Anion - CO_3^{2-}
Cation – Ca^{++}

Experiment No. 6

AIM – Analayse the given inorganic salt for one anion and one cation.

Preliminary Investigations –

(A) Physical state – Solid
Colour – white
Odour – odour less
Solubility in H_2O - Soluble
Flame test – Persistence grassy green (Apple green)

Test for Anion

S.N	Experiment	Observations	Inference
1	Salt + dil H_2So_4	No reaction	Weak group Absent
2	Salt + conc. H_2So_4 + Δ	Deep violet vapours with pungent smell	Strong group Present I^- May be
3. Ag No_3 test	Soda extract + dil HNo_3 + Ag NO_3	Dark yellow ppt is obtained which is in soluble in NH_4 OH	I^- confirmed
4	**Cl_2 water test**	Layer of again solvent turns violet	I^- confirmed

$KI + H_2 So_4 \rightarrow KH So_4 + H I$
$2 H I + H_2 So_4 \rightarrow So_2 + I_2 \downarrow + 2 H_2o$

$K I + Ag No_3 \rightarrow Ag I + K NO_3$
$2 K I + Cl_2 \rightarrow 2 K Cl \downarrow I_2 \downarrow$

Test for Cation

S.N	Experiment	Observations	Inference
1	Salt + NaOH + Δ	No reaction	0 group absent
2	Aqueous solution of salt + dil. HCl	No ppt.	I group absent
3	Pass H_2S gas in above solution	No ppt.	II group absent
4	Boil the solution for pass out H_2S gas		
5	Add NH_4 Cl in presence of NH_4OH	No ppt.	III group absent
6	Pass H_2 S gas in above solution	No ppt.	IV group absent
7	Add $(NH_4)_2$ Co_3 in presence of NH_4OH	No ppt.	V group absent
8	Add Na_2 HPo_4 in above solution	White ppt is formed	VI group present Mg^{++} may be
9	White ppt dissolved in NaOH then add titan yellow solution and NaOH in excess	Reddish pink ppt is formed	Mg^{++} confirmed
10	Cobalt nitrate test →	Pink mars is obtained	Mg^{++} confirmed

$Mg Cl_2 + NH_4 OH + Na_2 HPa_4 \rightarrow mg (NH_4) Po_4 \downarrow + 2 NaCl + H_2$

Result – Anion I^-
Cation – Mg^{++}

Experiment No. 7

Aim : To identify functional group in the given organic compound.
Apparatus : Test tube, Glass Rod, Beaker, Dropper, Filter paper, wire gauge, Test tube stand etc.
Chemicals: - Na metal, cerric Ammonium Nitrate

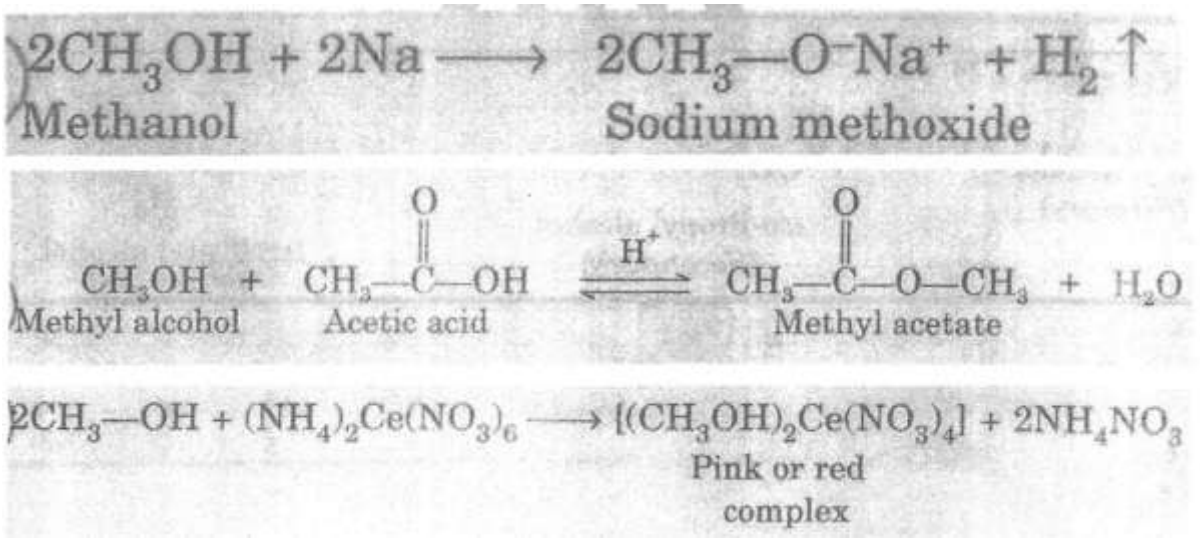
Physical Properties :

(i)	Physical state	→	Liquid
(ii)	Smell	→	Spirit like.
(iii)	Colour	→	Transparent
(iv)	Solubility in water	→	Soluble.
(v)	Flame Test	→	Aliphatic (Blue flame)

TEST FOR FUNTIONAL GROUP :-

S.N	EXPERIMENT	OBSERVATION	INFERENCE
	Sodium Metal Or xanthate test		
1	Take a little sample in Test tube + small quantity of only $cacl_2$ to absorb moisture decant it in another dry test tube and Add a small piece of sodium metal.	**Brisk effervescence of Hydrogen Gas**	**Alcoholic group is present**
2	**Cerric Ammonium Nitrate Test :** Take a little sample in test tube and few drops of cerric ammonium nitrate	**Pink or Red colour appears**	**Alcoholic group is present**
3	**Ester test :-** take a little sample in a test tube and add few drops of acetic acid followed by conc. H_2So_4 + heat	**Fruity smell appears due to formation of ester**	**Alcoholic group is present**

Result : - The given organic compound contains Alcoholic (R-OH) group.



Experiment No. 8

Aim : To identify functional group in the given organic compound.
Apparatus : Test tube, Glass Rod, Beaker, Dropper Filter paper etc.
Chemicals: - Ferric Chloride, Sodium Nitrate crystals.

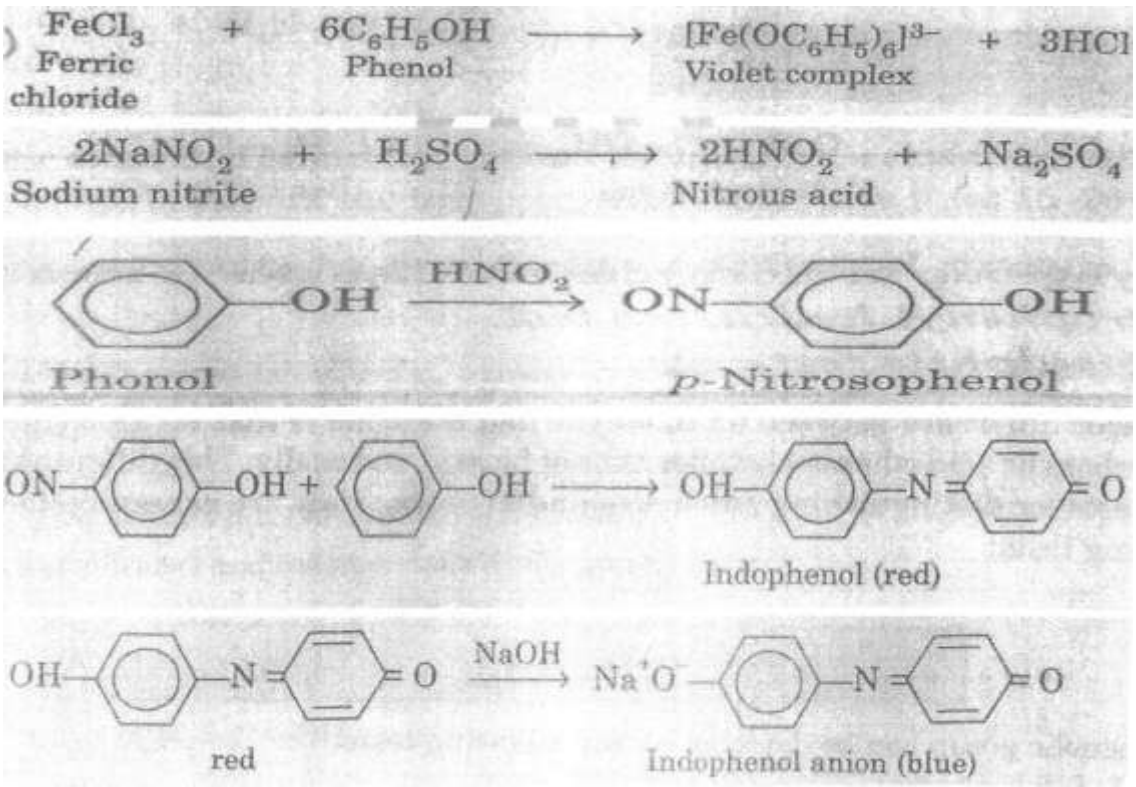
Physical Properties :

(i)	Physical state	→	Crystalline solid
(ii)	Smell	→	Like litebuoy soap
(iii)	Colour	→	colour less
(iv)	Solubility in water	→	Soluble.
(v)	Flame Test	→	Aromatic (Yellow flames)

TEST FOR FUNTIONAL GROUP :-

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Litmus Test** -Take little sample and Blue Litmus in Test tube.	**It turns Red**	**Phenolic group present**
2	**Ferric Chloride Test :** Take a little sample in test tube and add few drops of Neutral Ferric Chloride	**Green or Reddish Violet colour**	**Phenolic group present**
3	**LIbermann's Test** Little sample in test tube + conc. H_2So_4 + Heat and cool the mixture and add 1-2 crystals of sodium nitrite. Pour this mixture into large quantity of water in a beaker.	**Red Colour**	**Phenolic Group is Present**

Result : - The given organic compound contains Phenolic(Ar-OH) group.



Experiment No. 9

Aim : To identify functional group in the given organic compound.
Apparatus : Test tube, Glass Rod Beaker, Dropper Filter paper etc.
Chemicals: - Alcohol, Tollen's reagent , fehling solution, $AgNo_3$ solution

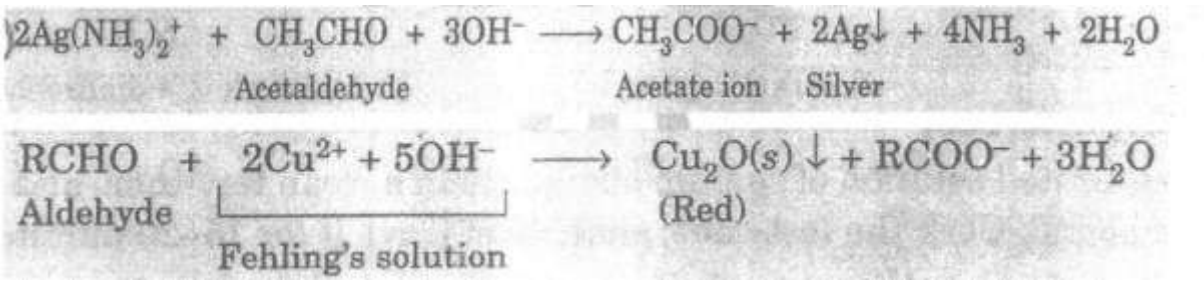
Physical Properties :

(i)	Physical state	→	Liquid
(ii)	Smell	→	Pungent smell
(iii)	Colour	→	colour less
(iv)	Solubility in water	→	Soluble.
(v)	Flame Test	→	Aliphatic (Blue flames)

TEST FOR FUNTIONAL GROUP :-

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Schiff's Test :** Take a little sample in a test tube and add Schiff's reagent to it.	**A deep red or violet colour appears**	**Aldehyde is present**
2	**Tollen's reagent Test :** Take a little sample in a test tube and add tollen's reagent + heat	**Silver mirror is formed along the sides of test tube**	**Aldehyde is present**
3	**Fehling's Test** Sample + 1 ml fehling A + fehling B solution	**Red ppt. appears**	**Aldehyde is present**

Result : - The given organic compound contains Aldehyde (-CHO) group.



Experiment No. 10

Aim : To identify functional group in the given organic compound.
Apparatus : Test tube, Glass Rod, Beaker, Dropper, Filter paper etc.
Chemicals: - m-di nitrobenzene, sodium nitro prusside solution, 2-4 dinitro phenyl hydrazine

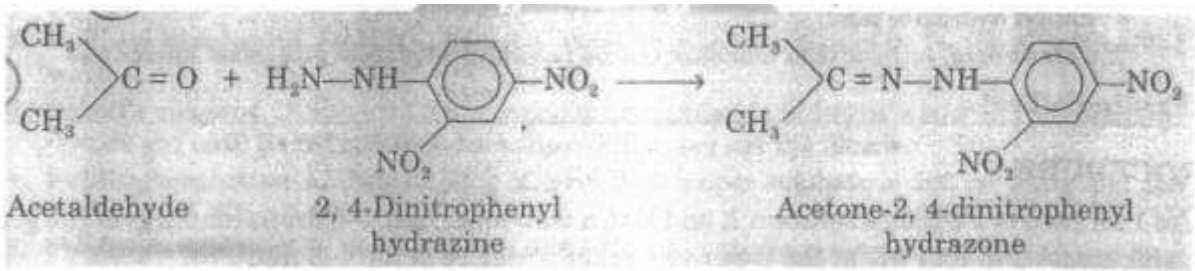
Physical Properties :

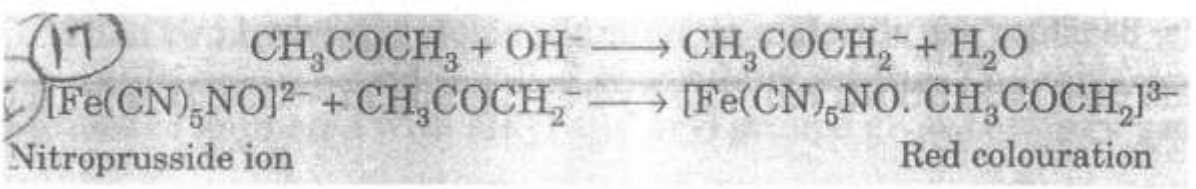
(i)	Physical state	→	Liquid
(ii)	Smell	→	Nail Polish Remover
(iii)	Colour	→	colour less
(iv)	Solubility in water	→	Soluble.
(v)	Flame Test	→	Aliphatic (Blue flames)

TEST FOR FUNTIONAL GROUP :-

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**2. 4 DNP Test :** Sample + alcohol and add 2, 4 dinitro phenyl Hydrazine to it and shake	**Yellow or Orange soln.**	**Ketonic group present**
2	**m-dinitrobenzene Test :** sample + 1 gm m – dinitrobenzene followed by 5 ml NaOH solution and shake	**Violet colour**	**Ketonic group present**
3	**Sodium nitroprosside Test** Take 1ml of sodium nitroprusside solution in a test tube + sample + NaOH solution dropwise	**Wine red colour**	**Ketonic group is present**

Result : - The given organic compound contains **Ketonic** (>C=0) group.





Experiment No. 11

Aim : To identify functional group in the given organic compound.
Apparatus : Test tube, Glass Rod, Beaker, Dropper, Filter paper etc.
Chemicals: - Litmus paper, sodium Bicarbonate, Ethyl alcohol , conc. H_2So_4

Physical Properties :

(i)	Physical state	→	White solid
(ii)	Smell	→	Vinegar like
(iii)	Colour	→	White
(iv)	Solubility in water	→	Soluble.
(v)	Flame Test	→	Aliphatic (Blue flames)

TEST FOR FUNTIONAL GROUP :-

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Litmus Test :** Place a dropper a crystal of the compound on moistre blue litmus paper	**It turns red**	**Inference Carboxylic group present**
2	**Sodium Bicarbonate Test :** Take 5 ml of dil soln. of sodium bicarbonate in test tube + small quantity of substance	**Brisk effervesence due to liberation of Co_2**	**Carboxylic group present**
3	**Ester Test :** little sample in test tube + 5 drops of ethyl alcohol followed by 2 drops of conc. H_2 So_4	**Pleasant fruity smell due to formation of ester**	**Carboxylic group is present**

Result : - The given organic compound contains **Carboxylic** (-COOH) group.
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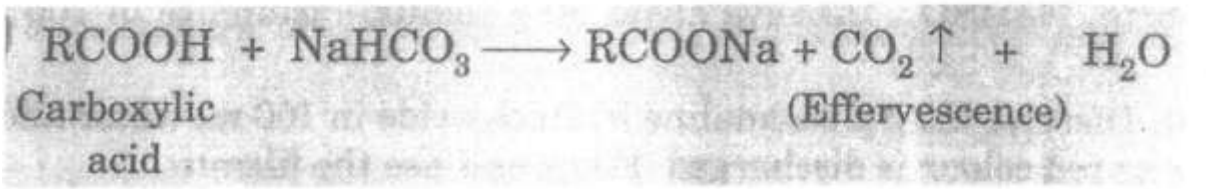

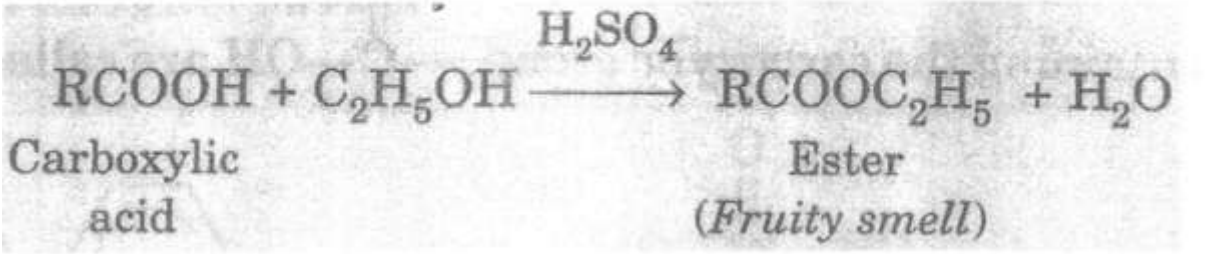

Experiment No. 12

Aim : To identify functional group in the given organic compound.
Apparatus : Test tube, Glass Rod, Beaker, Dropper, Filter paper etc.
Chemicals: - Litmus paper, Conc. HCL, sodium nitrate NaOH.

Physical Properties :

(i)	Physical state	→	Liquid
(ii)	Smell	→	Rotten fish smell
(iii)	Colour	→	Reddish Brown
(iv)	Solubility in water	→	In Soluble.
(v)	Flame Test	→	Aromatic (Yellow flames)

TEST FOR FUNTIONAL GROUP :-

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Solubility Test :** 0.1 g compound + 2-3 cm^3 dil . HCl .	**Compound dissolve**	**Amino group may be present**
2	**Litmus Test :** Take a little sample in a test tube and add red litmus solution	**It turns blue**	**Amino group be present**
3	**Azodye test :** sample + dissolve it in conc. Hcl + water and cool this solution into ice. + 1 gm $NaNo_2$ + 5 ml water and shake + B naphthol + NaOH solution	**Orange or red dye is formed**	**Amino group is present**

Result : - The given organic compound contains **Amino** ($-NH_2$) group.