

[CLASS XII CHEMISTRY PRACTICALS] - 2024-2025

Evaluation Scheme) 2024-2025 Examination Marks	
Volumetric Analysis	08
Salt Analysis	08
Content Based Experiment	06
Class record and viva	04
Project and viva	04

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Note:-

1. Chemical equations of Experiment 3 to 14 are to be written on blank pages.
2. Observation table of experiment 13 to 16 are to be drawn on blank pages.
3. Project work (4 marks) is also included in the practical syllabus. For project work, contact the teacher for the topic.
4. Project report should be hand written.
5. Start each experiment form a new page.

EXPERIMENT – 1 Classification of Anions

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

Preliminary Investigation

Physical State Colour Odour Solubility Flame Test	Solid White (Cu^{2+} , Fe^{2+} , Fe^{3+} , Ni^{2+} , Mn^{2+} , Co^{2+} absent) Ammonical 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 :

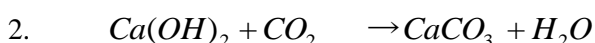
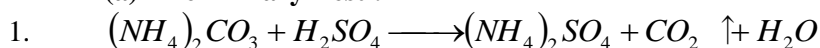
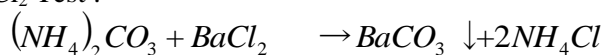
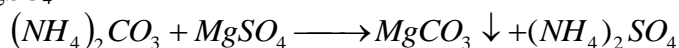
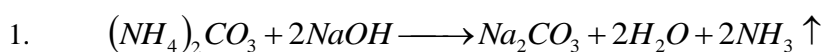
Experiment	Observation	Inference
1. Salt solution + dil H_2SO_4	Colourless, colourless gas with brisk effervescence which turn lime water milky	Group A anion (CO_3^{2-} may be present)
(b) Confirmative test :		
1. $BaCl_2$ Test : Salt solution + $BaCl_2$	White ppt of $BaCO_3$	CO_3^{2-} Confirmed
2. $MgSO_4$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

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

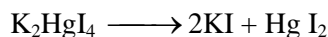
Experiment	Observation	Inference
1. Salt Solution + NaOH+ Heat	Smell of NH ₃	
2. Place a red litmus on the mouth of test tube.	Red litmus turns blue	Zero group present (<i>NH₄⁺ may be</i>)

(b) Confirmative test

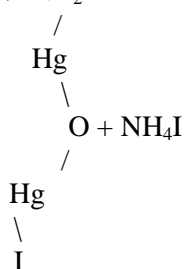
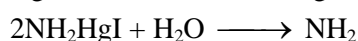
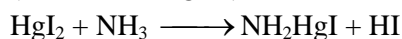
Experiment	Observation	Inference
1. Nessler's reagent test : Salt + Solution + NaOH + Nessler's Reagent	Reddish brown ppt. is formed	<i>NH₄⁺</i> confirmed.
2. NaOH test : Salt Solution + NaOH + Heat. Bring a glass rod dipped in conc. HCl	Smell of NH ₃ Dense white fumes of NH ₄ Cl are formed.	<i>NH₄⁺</i> Confirmed.

Chemical Reactions : -**Acidic Radical****(a) Preliminary Test :-****(b) Confirmative Test**1. BaCl₂ Test :2- MgSO₄**2. Basic Radical****(a) Preliminary Test :-**NH₃ + Red litmus -----> Litmus turns blue**(b) Confirmative test :-**

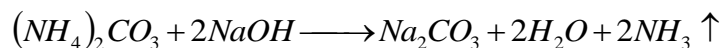
1. Nessler's Test :



(Nessler's Reagent)



2. NaOH Test

**Result :** The given inorganic salt contains followingAcidic Radical : - CO₃²⁻Basic Radical : NH₄⁺

EXPERIMENT – 4

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

Preliminary Investigation

Physical state	: Solid
Colour	: white (Cu^{2+} , Fe^{2+} , Fe^{3+} , Ni^{2+} , Mn^{2+} , Co^{2+} absent)
Odour	: Ammonical smell (NH_4^+ may be present)
Solubility	: Soluble in water
Flame Test	: No characteristic flame (Cu^{2+} , Ca^{2+} , Ba^{2+} , Sr^{2+} , Pb^{+2} , Zn^{2+} absent)

(A) Identification of Acidic Radical

(a) Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil H_2SO_4 solution	No gas is evolved	Group A anion (CO_3^{2-} , CH_3COO^- , NO_2^- , SO_3^{2-} , S^{2-} , absent)
2	Salt + Conc H_2SO_4 + Heat Bring a glass rod dipped in NH_4OH	Colourless gas with pungent smell which gives dense white fumes of NH_4Cl	Group B anion (Cl^- may be)

(b) Confirmative Test:

	Experiment	Observation	Inference
1	AgNO_3 test : Salt Solution + AgNO_3 . Dissolve the ppt in NH_4OH	Curdy white ppt White ppt soluble in NH_4OH	Cl^- confirmed
2	Chromyl chloride Test: a) Salt + Solid $\text{K}_2\text{Cr}_2\text{O}_7$ (1:2) + conc. H_2SO_4 + Heat b) Pass these vapour through 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.	Cl^- confirmed

(B) Identification of Basic Radical

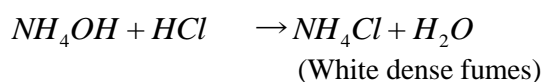
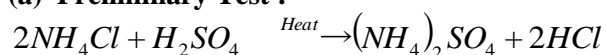
(a) Preliminary Test:

	Experiment	Observation	Inference
1	Salt solution + NaOH + Heat	Smell of Ammonia	Zero group (NH_4^+) May be
2	Place a red litmus on the mouth of test tube	Red litmus turns blue	

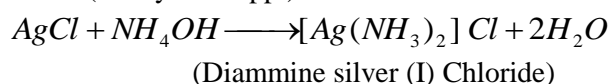
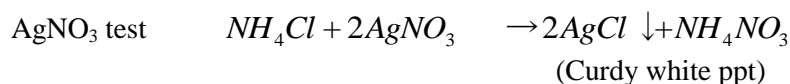
(b) Confirmative Test:

	Experiment	Observation	Inference
1	Nessler Test: Salt solution + NaOH + Nessler's reagent	Reddish brown ppt is formed	NH_4^+ Confirmed
2	NaOH Test : Salt Solution + NaOH + Heat Bring a glass rod dipped in dil HCl	Smell of NH_3 white dense fumes of NH_4Cl are formed	NH_4^+ Confirmed

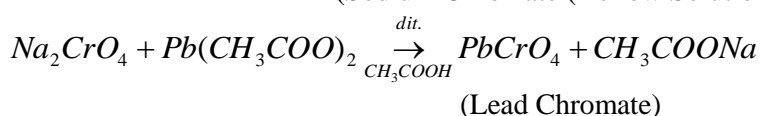
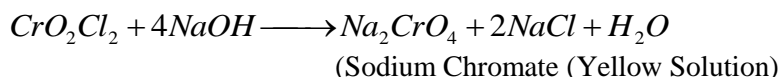
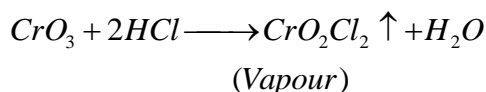
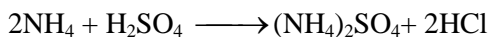
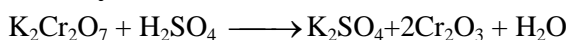
(a) Preliminary Test :



(b) Confirmative Test :

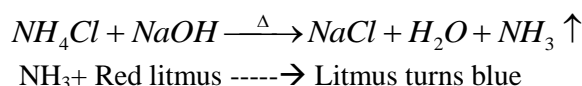


Chromyl Chloride Test :



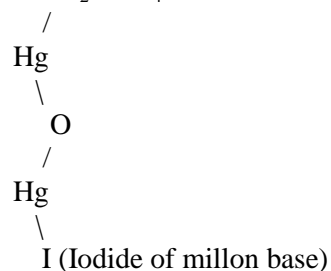
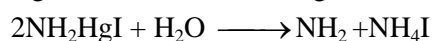
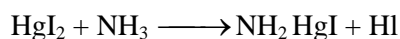
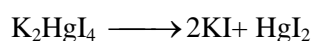
Chemical Reaction for Basic Radical

(a) Preliminary Test :

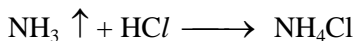
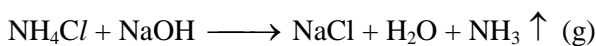


(b) Confirmative Test :

Nessler's Test :



NaOH Test :



(Dense white fumes)

Result : The given inorganic salt contains

Acidic Radical Cl^-
Basic Radical NH_4^+

EXPERIMENT – 5

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

Preliminary Investigation

Physical state	:	Solid
Colour	:	Creamish white (Cu^{2+} , Co^{2+} , Ni^{2+} , Fe^{2+} , Mn^{2+} , Fe^{3+} absent)
Odour	:	No characteristic odour (NH_4^+ , S^{2-} , CH_3COO^- absent)
Solubility	:	Soluble in water
Flame Test	:	Dull Bluish white flame is obtained (Pb^{2+} may be)

(A) Identification of Acidic Radical

(a)- Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil H_2SO_4 solution	No gas is evolved	Group A (CO_3^{2-} , CH_3COO^- , NO_2^- , SO_3^{2-} , S^{2-} , absent)
2	Salt + Conc ⁿ H_2SO_4 + Heat	Brown Colourled gas (NO_2) is evolved	Group B (NO_3^- may be present)

(b) Confirmative test:

	Experiment	Observation	Inference
1	Diphenyl amine test : salt + Conc ⁿ H_2SO_4 + diphenyl amine	Deep blue coloured solution	NO_3^- - confirmed
2	Ring Test : Salt + Freshly prepared FeSO_4 + Conc ⁿ H_2SO_4 along the side of the test tube	Brown ring is formed at the junction of two liquids	NO_3^- - confirmed

(B) Identification of Basic Radical

(b) Preliminary test :

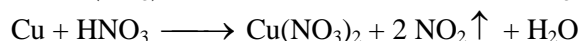
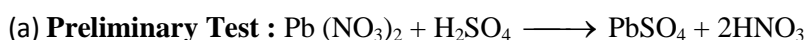
	Experiment	Observation	Inference
1	Salt solution + NaOH	No Smell of ammonia	Zero group [NH_4^+] absent
2	Salt Solution + dil HCl Filter the above ppt and boil it with water and divide into parts.	White ppt of PbCl_2 is formed	I group [Pb^{2+} may be]

Identification of Basic Radical

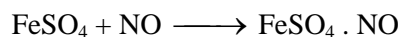
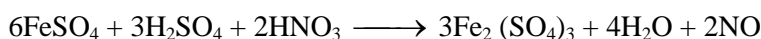
(a) Confirmative test :

	Experiment	Observation	Inference
1	KI test : 1 st part + KI	PbI_2 (Yellow Ppt)	Pb^{2+} Confirmed
2	K_2CrO_4 Test : 2 nd part + K_2CrO_4	Yellow ppt of PbCrO_4 is formed	Pb^{2+} Confirmed

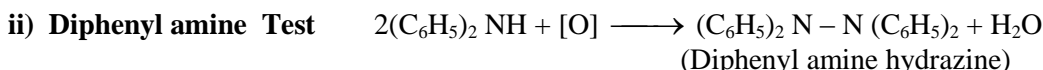
Chemical reaction for Acidic Radical



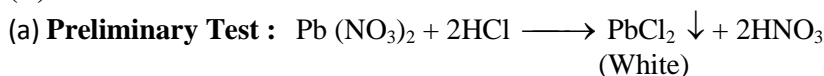
(b) Confirmative Test :



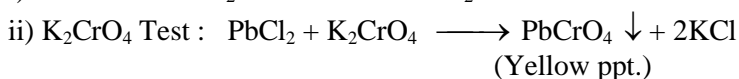
(Nitroso ferrous sulphate)



(B) Identification of Basic Radical



(b) Confirmative Test :



Result : The given inorganic salt contains Acidic Radical NO_3^-

Basic Radical Pb^{+2}

EXPERIMENT – 6

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

Preliminary Investigation

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

(A) Identification of Acidic Radical

(a) Preliminary test :

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

(b) Confirmative test :

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

(B) Identification of basic Radical

(a) Preliminary test :

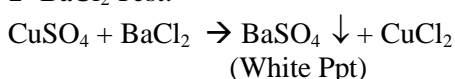
	Experiment	Observation	Inference
1	Salt solution + NaOH + heat	No smell of ammonia	Zero Group, (NH ₄ ⁺ absent)
2	Salt solution + dil . HCl	No white Ppt	Group I, (Pb ²⁺ absent)
3	Above solution + H ₂ S gas	Black Ppt is formed	Group II, (Cu ²⁺ / Pb ²⁺ may be present)
4	Dissolve above ppt in HNO ₃	Solution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

(b) Confirmative test :

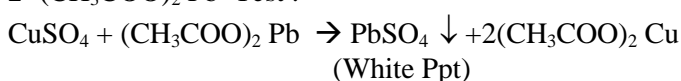
	Experiment	Observation	Inference
1	NH ₄ OH test : 1 st part + NH ₄ OH	Deep blue colour	Cu ²⁺ confirmed
2	Potassium ferrocynide test : IInd part + K ₄ [Fe(CN) ₆]	Chocolate brown ppt of Copper ferrocyanide is formed	Cu ²⁺ confirmed

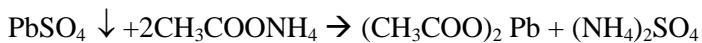
(A) Acidic Radical

1- BaCl₂ Test:



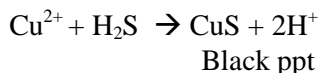
2- (CH₃COO)₂ Pb Test :





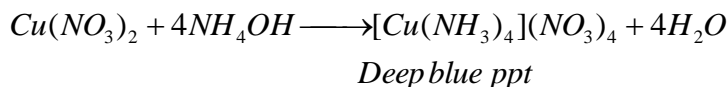
(B) Basic radical

(a) Preliminary Test \rightarrow

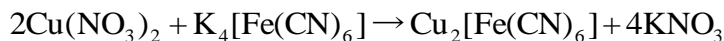


(b) **Confirmative test** $\rightarrow 3\text{CuS} + 8\text{HNO}_3 \longrightarrow \text{Cu}(\text{OH})_2 + 2\text{NO} + 4\text{H}_2\text{O} + 3\text{S}$

1. NH_4OH test



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



Result : The given inorganic salt contains. Acidic Radical – SO_4^{2-}

Basic Radical Cu^{2+}

EXPERIMENT – 7

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

Preliminary Investigation

Physical state	:	Solid
Colour	:	White (Cu^{2+} , Fe^{2+} , Fe^{3+} , Ni^{2+} , Mn^{2+} , Co^{2+} absent)
Qdour	:	No characteristic odour (absence of NH_4^+ , S^{2-} , CH_3COO^-)
Solubility	:	Soluble in water.
Flame Test	:	No characteristics flame (Pb^{+2} , Sr^{+2} , Cu^{2+} , Ca^{+2} , Ba^{+2} , Ni^{+2} , Zn^{2+} absent)

(A) Identification of Acidic Radical

(a) Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil H_2SO_4	No gas is evolved	Group A (CO_3^{2-} , S^{2-} , SO_3^{2-} , NO_2^- , CH_3COO^-) Absent
2	Salt + Conc ⁿ H_2SO_4 + Heat	No gas evolved	Group B anions (Cl^- , Br^- , I^- , NO_3^- , $\text{C}_2\text{O}_4^{2-}$ absent)
3.	Salt + BaCl_2	White ppt is formed	Group C anion (SO_4^{2-} may be)

(b) Confirmative test :

	Experiment	Observation	Inference
1	BaCl_2 test : Salt Solution + BaCl_2 Add dil HCl to above ppt	White Ppt Ppt remains insoluble	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.	SO_4^{2-} confirmed

B- Identification of Basic Radical

(a) Preliminary test :

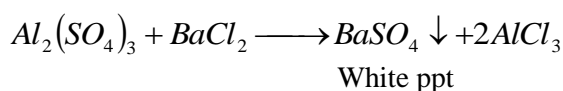
	Experiment	Observation	Inference
1	Salt solution + NaOH + heat	No smell of NH ₃	Zero Group, (NH_4^+ absent)
2	Salt solution + dil . HCl	No Ppt	Group I, (Pb^{2+} absent)
3	To the above solution pass H ₂ S gas	No ppt.	Group II (Cd^{2+} , Pb^{2+} , As^{2+} Cu^{2+} absent)
4	Boil H ₂ S gas and add NH ₄ Cl + NH ₄ OH & divide the Solution in two parts.	White gelatinous ppt.	Group III (Al^{3+} may be)

(b) Confirmative test:

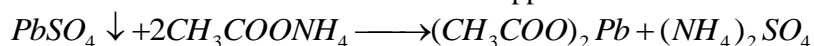
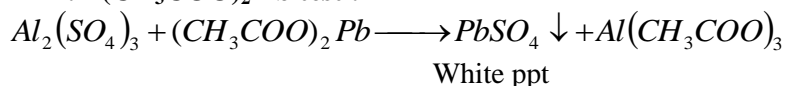
	Experiment	Observation	Inference
1	Lake test : 1 st part + dil HCl + 2 drops of blue litmus + NH ₄ OH	Blue ppt.floats over colourless solution	Al^{3+} confirmed
2	Ammonium chloride Test : IInd part + NH ₄ Cl + Boil the solution	Formation of white gelatinous ppt.	Al^{3+} confirmed

(A) Acidic Radical

1. BaCl₂ test :

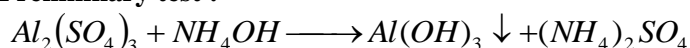


2. (CH₃COO)₂ Pb test :

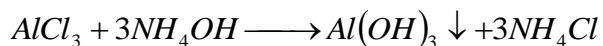


(B) Basic Radical

(a) Preliminary test :



(b) Confirmative test:



White ppt

Result : The given inorganic salt contains. Acidic Radical – SO_4^{2-}

Basic Radical Al^{+3}

EXPERIMENT – 8

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

Preliminary Investigation

Physical state	:	Solid
Colour	:	White (Cu^{2+} , Fe^{+2} , Fe^{+3} , Ni^{+2} , Mn^{+2} , Co^{+2} are absent)
Qdour	:	No characteristic odour (S^{2-} , NH_4^+ , CH_3COO^-) <i>absent</i>
Solubility	:	Soluble in water.
Flame Test	:	Green flashes (Zn^{2+} may be)

(A) Identification of Acidic Radical

(a) - Preliminary test :

	Experiment	Observation	Inference
1	Salt solution + dil H_2SO_4	No gas is evolved	Group A (CO_3^{2-} , S^{2-} , SO_3^{2-} , NO_2^- , CH_3COO^- <i>absent</i>)
2	Salt + Conc ⁿ H_2SO_4 + Heat	Colourless gas having pungent smell which gives white dense fumes with glass rod dipped in NH_4OH	Group B anions (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. H_2SO_4 + heat Pass the vapour in a test tube containing 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 Na_2CrO_4 is obtained Yellow ppt of lead chromate is formed	Cl^- Confirmed
2	AgNO_3 Test : Salt Solution + AgNO_3 Dissolve ppt. in NH_4OH	White ppt. ppt becomes soluble.	Cl^- confirmed

B- Identification of Basic Radical

(a) Preliminary test :

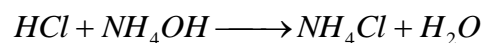
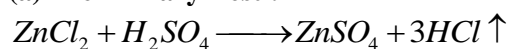
	Experiment	Observation	Inference
1	Salt solution + NaOH + heat	No smell of NH_3	Zero Group, (NH_4^+ <i>absent</i>)
2	Salt solution + dil . HCl	No white Ppt	Group I (Pb^{2+} <i>absent</i>)
3	To the above solution pass H_2S gas	No ppt.	Group II, (Cu^{2+} , As^{+3} , Cd^{+2} , Pb^{+2} <i>absent</i>)
4	Boil above solution to remove H_2S and add NH_4Cl (s) + NH_4OH in excess.	No ppt.	Group III [Fe^{2+} , Fe^{3+} , Al^{3+} <i>absent</i>]
5	To above test tube pass H_2S gas Dissolve the white ppt in HCl and divide it into 2 parts.	White ppt is obtained	Group IV [Zn^{2+} may be]

(b) **Confirmative test :**

	Experiment	Observation	Inference
1	$K_4[Fe(CN)_6]$ Test : 1 st part + $K_4[Fe(CN)_6]$	White ppt of zinc ferrocyanide	Zn^{+2} conformed
2	NaOH Test : 2 nd part + NaOH	Bluish white ppt.	Zn^{+2} confirmed

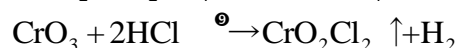
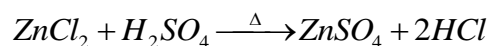
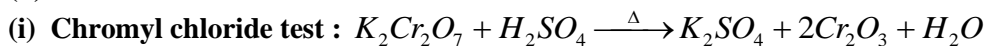
Chemical reaction for Acidic Radical

(a) **Preliminary Test :**

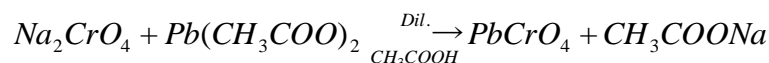
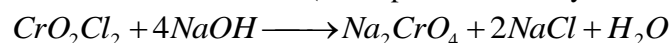


(White dense fumes)

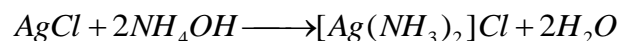
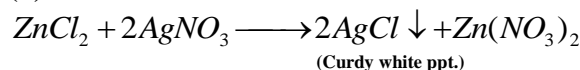
(b) **Confirmative Test :**



(red vapours of chromyl chloride)



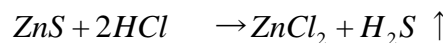
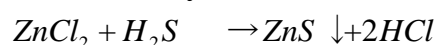
(ii) **Silver Nitrate Test**



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

Chemical reaction for Basic Radical

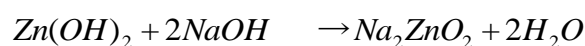
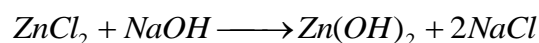
(a) **Preliminary Test :**



(b) **Confirmative Test :**



2. NaOH test :



Result : The given inorganic salt contains. Acidic Radical Cl^- Basic Radical Zn^{+2}

EXPERIMENT – 9

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

Preliminary Investigation

Physical state	:	Solid
Colour	:	White (Cu^{2+} , Fe^{+2} , Fe^{+3} , Ni^{+2} , Mn^{+2} , CO^{+2} are absent)
Odour	:	No characteristic odour (NH_4^+ , CH_3COO^- , S^{2-}) absent
Solubility	:	Soluble in water.
Flam Test	:	Apple green flame (Ba^{2+} may be)

(A) Identification of Acidic Radical

(a)- Preliminary test:

	Experiment	Observation	Inference
1	Salt solution + dil H_2SO_4	No gas is evolved	Group A (CO_3^{2-} , S^{2-} , SO_3^{2-} , NO_2^- , CH_3COO^- absent)
2	Salt + Conc H_2SO_4 + Heat	Reddish orange vapours which turns starch paper yellow	Group B anion (Br^- may be)

(b) Confirmative test:

	Experiment	Observation	Inference
1	AgNO_3 Test : Salt Solution + AgNO_3 Dissolve ppt. in NH_4OH	Yellow ppt. Ppt. remains partially soluble	Br^- confirmed
2	MnO_2 Test : Salt Solution + MnO_2 + Conc. H_2SO_4 + Heat	Orange red vapour of Br_2	Br^- confirmed

B- Identification of Basic Radical

(a) 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	To the above solution pass H_2S gas	No ppt.	Group II (Cu^{2+} , As^{+3} , Cd^{+2} , Pb^{+2} absent)
4	Boil above solution to remove H_2S and add NH_4Cl (s) + NH_4OH in excess.	No ppt.	Group III [Fe^{2+} , Fe^{3+} , Al^{3+} absent]
5	To above test tube pass H_2S gas	No ppt	Group IV [Zn^{2+} , Co^{+2} , Ni^{+2} , Mn^{+2} absent]
6	Remove H_2S gas by boiling. Add $[\text{NH}_4]_2\text{CO}_3$ to it.	White ppt	V group (Ca^{2+} , Ba^{2+} , Sr^{2+} may be)

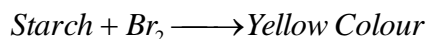
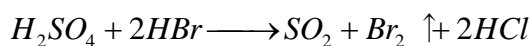
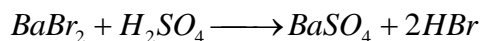
Dissolved the ppt in CH_3COOH and divide in three part

(b) Confirmative test:

	Experiment	Observation	Inference
1	Potassium chromate test : 1 st part + K_2CrO_4	Yellow ppt	Ba^{2+} confirmed
2	Ammonium sulphate Test : IInd part + $(\text{NH}_4)_2\text{SO}_4$	No ppt	Sr^{2+} absent
3	Ammonium oxalate Test: IIIrd part + ammonium oxalate test $(\text{NH}_4)_2\text{C}_2\text{O}_4$	No ppt	Ca^{2+} absent
4.	Flame test : Perform flame test with salt.	Apple green flame	Ba^{2+} confirmed

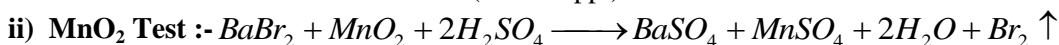
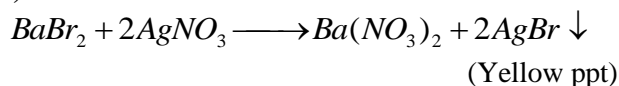
Chemical reaction for Acidic Radical

(a) Preliminary Test:



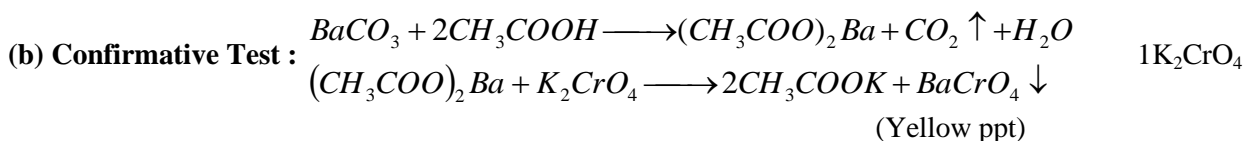
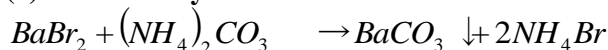
(b) Confirmative Test:

i) Silver Nitrate test



Chemical reaction for Basic Radical

(a) Preliminary Test :



Result : The given inorganic salt contains.

Acidic Radical Br^-
Basic Radical Ba^{2+}

EXPERIMENT – 10

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

Preliminary Investigation

Physical state	:	Solid
Colour	:	White (Cu^{+2} , Fe^{+2} , Fe^{+3} , Ni^{+2} , Mn^{+2} , Co^{+2} are absent)
Odour	:	No characteristic odour (NH_4^+ , S^{2-} , CH_3COO^- absent)
Solubility	:	Soluble in water.
Flame Test	:	No characteristic flame (Ca^{+2} , Sr^{+2} , Ba^{+2} , Pb^{+2} , Cu^{+2} , Zn^{+2} absent)

(A) Identification of Acidic Radical

(a) Preliminary test :

	Experiment	Observation	Inference
1	Salt solution + dil H_2SO_4 + heat	No gas is evolved	Group A (CO_3^{2-} , S^{2-} , SO_3^{2-} , NO_2^- , CH_3COO^- absent)
2	Salt + Conc ⁿ H_2SO_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 ($C_2O_4^{2-}$, may be)

(b) Confirmative test :

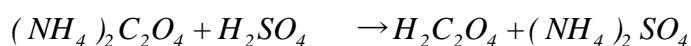
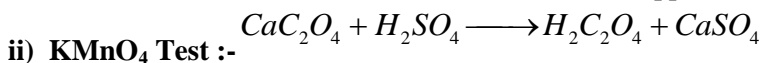
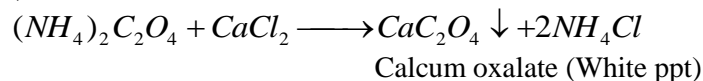
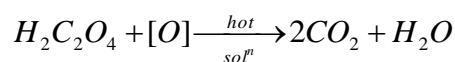
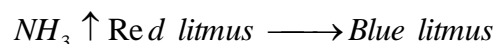
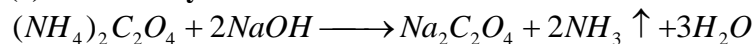
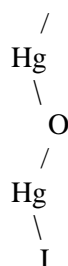
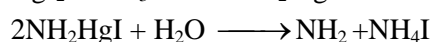
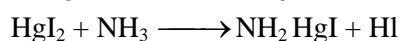
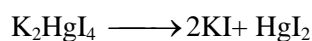
	Experiment	Observation	Inference
1	Calcium Chloride Test : Salt Solution + CaCl ₂	White ppt. of calcium oxalate is formed	(C ₂ O ₄ ²⁻) confirmed
2	KMnO ₄ Test : Above ppt + dil H ₂ SO ₄ + Heat Add very dil solution of KMnO ₄	Pink colour of KMnO ₄ is discharged with evolution of CO ₂ gas.	(C ₂ O ₄ ²⁻) Confirmed

B- Identification of Basic Radical**(a) Preliminary test:**

	Experiment	Observation	Inference
1	Salt solution + NaOH + heat Place red litmus paper on mouth to test tube	Smell of NH ₃ Red litmus turns blue	Zero Group, (NH ₄ ⁺ present)

(b) Confirmative test:

	Experiment	Observation	Inference
1	To above solution, bring on glass rod dipped in conc. HCl near mouth of test tube.	White dense of NH ₄ Cl are formed	(NH ₄ ⁺) confirmed
2	Nessler's Test : Solution + NaOH + Nessler's reagent	Reddish brown ppt is formed	(NH ₄ ⁺) confirmed

Chemical reaction for Acidic Radical**(a) Preliminary Test :****(b) Confirmative Test :****i) CaCl₂ test****ii) KMnO₄ Test :-****Basic Radical****(a) Preliminary test****(b) Confirmative Test :****Nessler's Test :**

(Iodide of millon base)

NaOH Test :

Result : The given inorganic salt contains.

Acidic Radical – $\text{C}_2\text{O}_4^{2-}$

Basic Radical NH_4^+

EXPERIMENT – 11

Aim : To analyse 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 ⁿ H_2SO_4 + Heat	Colourless pungent smelling gas (HCl) is evolved which gives white dense fumes of NH_4Cl .	Group B anion 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 + $\text{Kr}_2\text{Cr}_2\text{O}_7(\text{s})$ (1:2) + conc. H_2SO_4 + heat Pass the vapour in a test tube containing NaOH Solution Add (CH_3COOH + $\text{Pb}(\text{CH}_3\text{COO})_2$)	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**(a) 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 Solution	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]

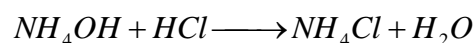
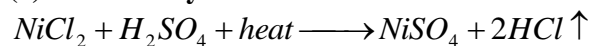
5	Pass H ₂ S gas through above solution Dissolve the ppt by boiling with aqua regia [Conc HCl + Conc. HNO ₃] evaporate to dryness & add water & divide in 2 parts .	Black ppt.	Group IV [Ni ⁺² or Co ⁺² May be present]
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(b) Confirmative test :

	Experiment	Observation	Inference
1	DMG test : I part + DMG	Rose pink ppt.	Ni ⁺² conformed
2	NaOH Test : 2 nd part + NaOH	Apple green ppt	Ni+ confirmed

Chemical reaction for Acidic Radical

(a) Preliminary Test :

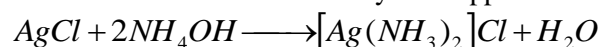


(White dense fumes)

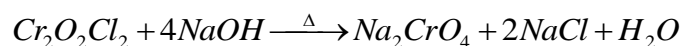
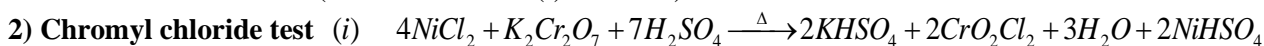
(b) Confirmative Test :



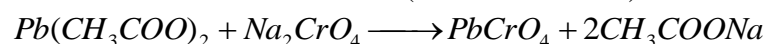
Curdy white ppt



(Diammine Silver (I) Chloride)



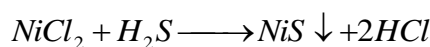
(Sodium Chromate)



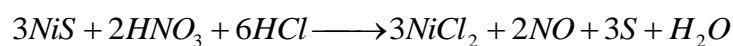
Yellow Ppt

Identification of Basic Radical

(a) Preliminary Test :

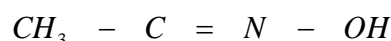


(black ppt.)

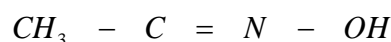


(b) Confirmative Test :

(1) DMG test

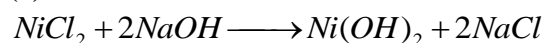


|



(Rose pink ppt)

(2) NaOH Test :



Result : The given inorganic salt contains.

Acidic Radical Cl^-

Basic Radical Ni^{+2}

EXPERIMENT – 12

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_2SO_4 , Distilled water.

Theory : Molecular formula of Mohr's salt – $FeSO_4[NH_4]_2SO_4 \cdot 6H_2O$

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 table :

1- Weight of empty watch galss (W_1) = 21.7200 g

2- Weight of empty watch glass + mohrs salt (W_2) = 21.7200 + 1.9600 = 23.6800 g

3- Weight of Mohr's Salt [$W_2 - W_1$] = 23.6800 – 21.7200 = 1.9600 g

4- Volume of solution = 250 ml.

6. Molarity 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_2SO_4 to prevent hydrolysis of $FeSO_4$ before making solution of 250 ml.
- 2- Weighing should be done accurately.
3. Apparatus should be clean.

EXPERIMENT – 13

Aim : To prepare a standard solution of M/50 Mohr's salt solution. With its help, determine molarity and strength of $KMnO_4$ Solution.

Apparatus Required : Burette, comical 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, $KMnO_4$ solution, dil H_2SO_4 , conc. H_2SO_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,

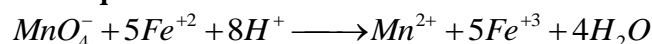
392 g of Mohr's salt is needed.

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

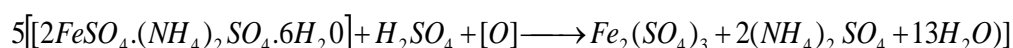
To prepare 250 ml of 0.02 of Mohr's salt solution $\left(\frac{392}{4} \times 0.02\right)$ g of salt is needed. Mohr's salt required = 1.9600 g of mohr's salt.

(b) Titration of Mohr's salt Sol (standard solution) with $KMnO_4$ (unknown solution) - $KMnO_4$ is strong and versatile oxidizing agent. When its treated with Mohr's salt solution in sufficiently acidic medium Fe^{2+} ion are oxidised to Fe^{3+} in cold according to reaction :

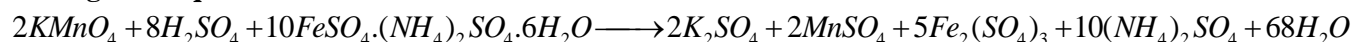
Ionic equation :



Molecular equation



Adding both equation



Indicator \longrightarrow 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 KMnO_4 Solution :-

S.no.	Volume of Mohr's salt used (V_1) ml	Burette initial	Reading final	Volume of 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 :

$$M_1 V_1 = \frac{1}{5} M_2 V_2$$

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

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

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

M_1 = Molarity of KMnO_4 Solⁿ = ?

V_1 = Volume of KMnO_4 Solⁿ = 14.6 ml

M_2 = Molarity of Mohr's Salt Solⁿ = $M/50$

V_2 = Volume of Mohr's Salt Solⁿ = 20 ml

Result

1. Molarity of the given solution = 0.0068 M

2. Strength of the given solution = 1.0744 g/l

Precautions

1. Weighting should be accurate.
2. Add 2 – 3 ml of conc H_2SO_4 to prevent hydrolysis of Mohr's Salt solution.
3. While titrating, the funnel should not be placed at the top of the burette.

EXPERIMENT – 14

Aim : To prepare solution of M/30 (250 ml) Mohr's salt solution. With its help, determine molarity and strength of 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, $[\text{FeSO}_4 \cdot (\text{NH}_4)_2 \text{SO}_4 \cdot 6\text{H}_2\text{O}]$, KMnO_4 , dil H_2SO_4 , conc. H_2SO_4

Indicator : KMnO_4 is a self indicator

End point : Colourless to pink

Theory :

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

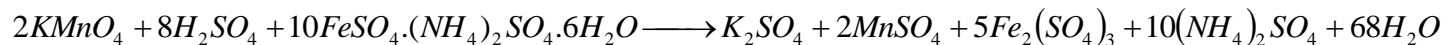
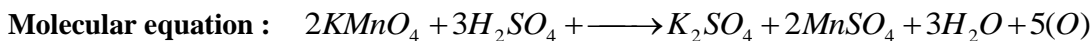
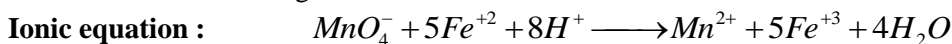
Molecular formula of mohr's salt : $\text{FeSO}_4 \cdot (\text{NH}_4)_2 \text{SO}_4 \cdot 6\text{H}_2\text{O}$. mohr's salt is a primary standard . Hence its solution can be prepared by direct weighing.

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, $392/4 \times 1/30$ i.e, 3.2670 g of mohr's salt is needed.

(b) Titration of Mohr's salt Sol (standard solution) with KMnO_4 (unknown solution), KMnO_4 is strong and versatile oxidising agent . When its treated with mohr's salt solution in sufficiently acidic medium, Fe^{2+} ion are oxidise to Fe^{3+} according to reaction.



Observation Table:-

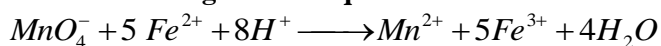
1. Preparation of standard solution:-

- Weight of empty watch glass (W_1) 21.7200 g
- Weight of watch glass + Mohr's salt (W_2) = 21.7200+3.2670 = 24.9870g
- Weight 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 = $M/30$
- Vol of Mohr's salt taken for each titration (V_2) = 20 ml

2. Titration of standard solution with KMnO_4 Solution :-

S.no.	Volume of Mohr's salt used (V_1) ml	Burette Reading		Volume of 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 KMnO_4 $M_1V_1 = \frac{1}{5} M_2V_2$

M_1 = Molarity of KMnO_4 = ?

V_1 = Volume of 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 KMnO_4 = molarity \times mol.wt. of KMnO_4 .

= 0.00938×158

= 1.48209 g/L

Result

1. Modality of the given KMnO_4 solution = 0.00938 M
2. Strength of the given KMnO_4 solution = 1.48204 g/L

Precautions

1. Weighting should be accurate.
2. Add 2 – 3 ml of conc. H_2SO_4 to prevent hydrolysis of Mohr's Salt solution during preparation of standard solution.
3. In case of coloured solution (KMnO_4) upper meniscus is read

EXPERIMENT – 15

Aim : To prepare solution of M/40 oxalic acid. With its help determine the molarity and strength of given KMnO_4 solution.

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

Chemical Required : Oxalic acid, crystal, dil H_2SO_4 , KMnO_4 solution

Indicator : 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.

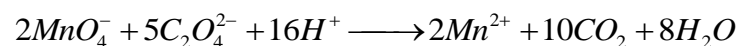
Molecular weight of oxalic acid = 126 g

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.

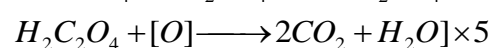
To prepare 250 ml of M/40 oxalic acid solution.

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

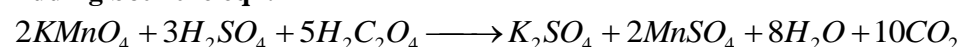
(b) Titration of standard solution with KMnO_4 (unknown solution), KMnO_4 is strong and versatile oxidising agent. In sufficiently acidic medium, at about 60°C KMnO_4 oxidises oxalic acid to CO_2 and itself is reduced into colourless Mn^{2+} ion.



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 g

Volume of oxalic acid = 250 ml

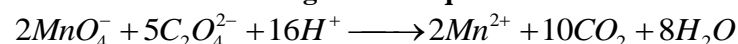
Molarity of oxalic acid = M/40

Volume of oxalic acid taken for each titration (V_2) = 20 ml

2. **Titration of standard solution with KMnO_4 Solution :-**

S.no.	Volume of Mohr's salt used (V_1) ml	Burette Reading		Volume of 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 KMnO_4 .

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

M_1 = molarity of KMnO_4 solution = ?

V_1 = molarity of 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 KMnO_4 = Molarity \times Mol.wt. = $0.0135 \text{ M} \times 158 = 2.1345 \text{ g/L}$

Result

1. Molarity of the given KMnO_4 solution = 0.0135 M
2. Strength of the given KMnO_4 solution = 2.1345 g/L

Precautions 1. Oxalic acid should not be heated about 60°C . 2. weighing should be accurate.

EXPERIMENT – 16

Aim : To prepare solution of M/20 oxalic acid with its help determine the molarity and strength of given KMnO_4 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, dil H_2SO_4 , KMnO_4 solution

Indicator : 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 weighting.

Molecular weight of oxalic acid = 126 g

\therefore molar mass = 126 g/l

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

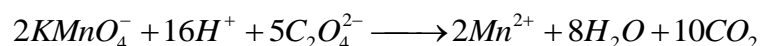
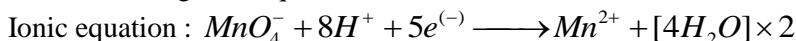
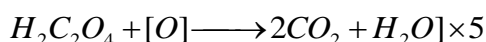
To prepare 250 ml of 1M oxalic acid solution (126/4)g is oxalic acid is required.

\therefore 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_4 (unknown solution): KMnO_4 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_4 oxidizes acid into CO_2 and itself gets reduced to colourless Mn^{2+} ions.

Molecular Equation :



Observation Table :

a) Preparation of M/20 oxalic acid solution :

Weight of water glass (W_1) = 21.7200g

Weight of watch glass + weight of oxalic acid (W_2) = 23.2950 g

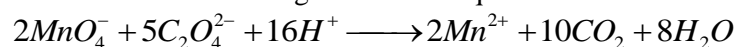
\therefore weight of oxalic acid ($w_2 - w_1$) = 1.5750g

Volume of oxalic acid used for each titration = 20 ml.

3. Titration of standard solution with unknown Solution :-

S.no.	Volume of Mohr's salt used (V_1) ml	Burette	Reading	Volume of KMnO_4 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.



\therefore 1 mole of oxalic acid required 2/5 mole of KMnO_4 .

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

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

$$\text{Strength of } \text{KMnO}_4 \text{ used} = \text{Molarity} \times \text{molar mass} = 0.027 \times 158 = 4.2702 \text{ g/l}$$

$M_1 = \text{Molarity of } \text{KMnO}_4 \text{ Sol}^n = ?$ $V_1 = \text{Volume of } \text{KMnO}_4 \text{ Sol}^n = 14.8 \text{ ml}$ $M_2 = \text{Molarity of Oxalic acid Sol}^n = M/20$ $V_2 = \text{Volume of Oxalic acid Sol}^n = 20 \text{ ml}$

Result

1. Molarity = 0.0270 M

2. Strength = 4.2702 g/L

Precautions

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

EXPERIMENT – 17**Aim :** To identify the functional group present in the given organic compound.**Apparatus Required :** Test tube, test tube stand, test tube holder, dropper, litmus (blue), NaHCO₃, conc. H₂SO₄, NH₄OH, FeCl₃.**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 ₂ H ₅ OH + conc. H ₂ SO ₄ + Heat	Fruity smell of ester	$\begin{array}{c} O \\ \\ - C - OH \end{array}$ grp confirmed.
2	FeCl ₃ Test : Organic compound + dil FeCl ₃ solution .	Red colour appear	$\begin{array}{c} O \\ \\ - C - OH \end{array}$ confirmed

Chemical Reaction : NaHCO₃ Test : RCOOH + NaHCO₃ → RCOONa + CO₂ ↑ + H₂O**Ester Test :** RCOOH + R' – OH $\xrightarrow[H_2SO_4]{conc.}$ RCOOR' + H₂O

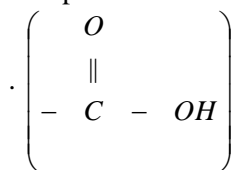
(Fruity smell ester)

FeCl₃ Test : RCOOH + NH₄OH → RCOONaRCOONa + H₂O → Ammonium salt (Soluble)RCOONH₄ + FeCl₃ → (RCOO)₃ Fe + 3NH₄Cl(RCOO)₃Fe + H₂O → Fe(OH) (R COO)₂ + RCOOH

Basic ferric acetate.

Result :

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



EXPERIMENT – 18

Aim : To identify the functional group present 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 H₂SO₄, CH₃COOH.

Physical Properties:

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

Preliminary test :

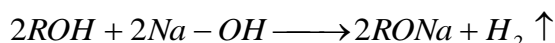
S.no.	Experiment	Observation	Inference
1	Organic compound + blue litmus solution.	No change	-COOH or – OH(Phenol) group absent
2	Organic compound + dil HCl + NaOH	No ppt. or oily layer	- NH ₂ grp. Absent
3	Organic comp + Na metal	H ₂ gas evolved	- OH (alcohol) Group may be

Confirmatory test :

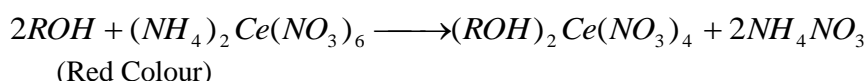
S.no.	Experiment	Observation	Inference
1	Cerric ammonium nitrate Test : Organic compound + cerric ammonium nitrate	Red colour	- OH group. confirmed
2	Ester Test : Organic compound + CH ₃ COOH + Conc. H ₂ SO ₄ (1 – 2 drops) + Heat.	Fruity smell of ester.	- OH grp. confirmed

Chemical reaction :

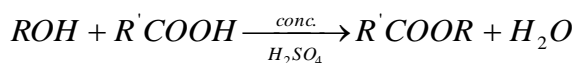
1- Na Metal test :-



2- CERRIC AMMONIUM NITRATE TEST :



3- Easter Test :



Alcohol acid ester

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

EXPERIMENT – 19

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

Apparatus Required : Test tube, test tube stand, test tube holder, dropper litmus (blue) NaHCO_3 , FeCl_3 Solution, Phthalic anhydride, Con. H_2SO_4 , NaOH .

Physical Properties:

State: Solid
 Colour: White
 Odour: Phenolic Smell
 Water Solubility: Water insoluble
 Flammability: Burn with 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_3 test : Organic compound + NaHCO_3 solution.	No effervescence	- COOH absent Phenolic group may be

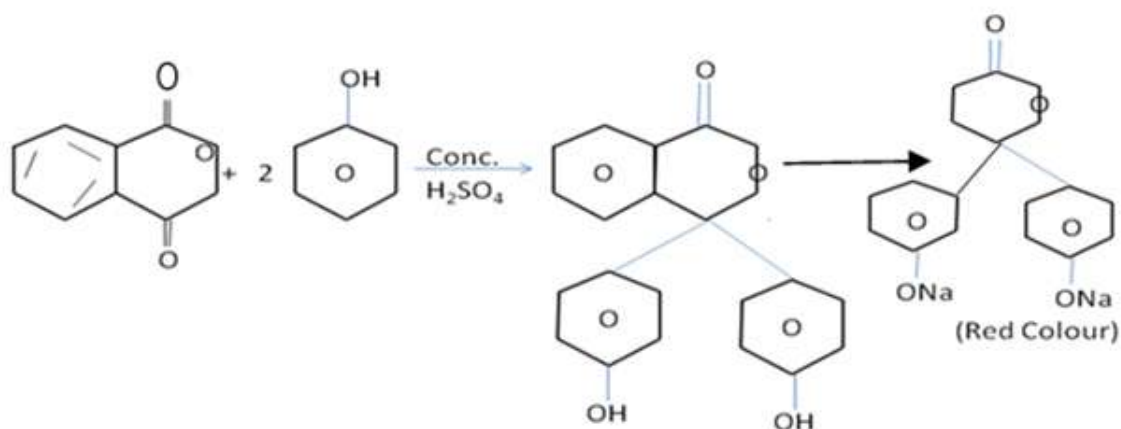
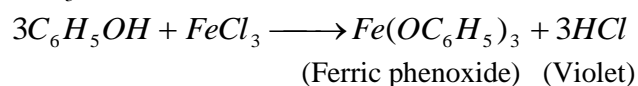
Confirmatory test :

S.no.	Experiment	Observation	Inference
1	FeCl_3 Test : Organic compound + FeCl_3	Green blue or violet colouration	Phenolic (- OH) group. confirmed
2	Phthalic test : Organic compound + phthalic acid + 2-3 drops H_2SO_4 + Δ .then cool and dil. NaOH	Intense green blue or red colouration	Phenol (- OH) grp. Confirmed

Chemical Reaction :

Confirmative test :

FeCl_3 test



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

EXPERIMENT – 20

Aim : To identify the functional group in present 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	- 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.

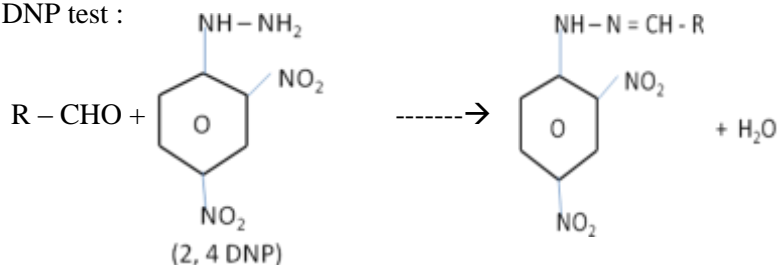
Confirmatory test :

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

Chemical reaction :

1- Preliminary test :

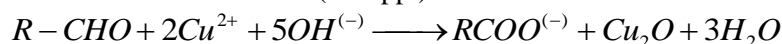
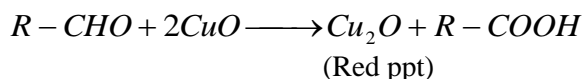
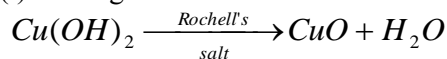
(i) 2, 4 DNP test :



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

b) **Confirmatory Test :**

(i) Fehling's test : -



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

EXPERIMENT – 21

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 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.

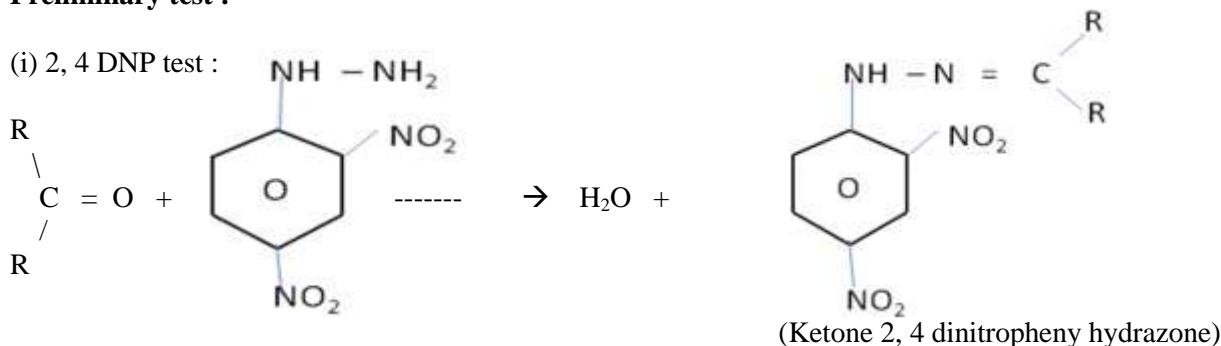
Confirmatory test :

S.no.	Experiment	Observation	Inference
1	Organic compound + sodium nitro prusside + 2 – 3 drops of NaOH and shake.	Red colour or wine red colour	$\text{>C} = \text{O}$ Ketonic grp confirmed
2	Organic compound + Meta dinitrobenzene + NaOH	Violet colour which fades on standing.	Ketonic grp confirmed.

Chemical reaction :

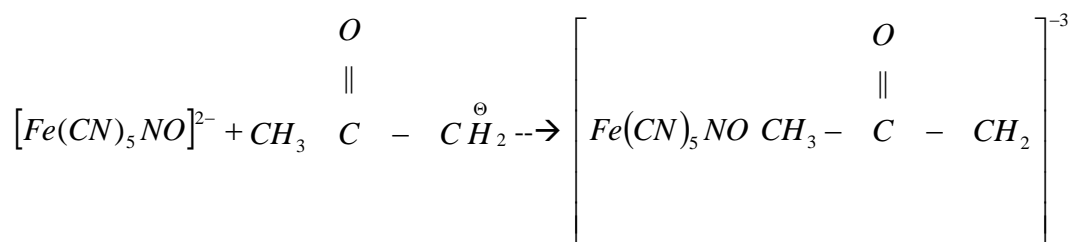
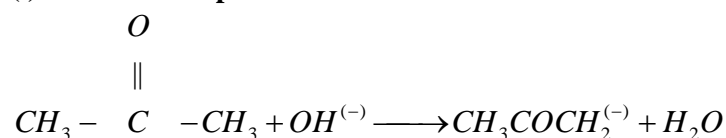
1- **Preliminary test :**

(i) 2, 4 DNP test :



b- Confirmatory test :

(i) **Sodium Nitroprusside Test :**



Result : Given organic compound contains Ketonic group ($\text{>C} = \text{O}$)

EXPERIMENT – 22

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 :

	Experiment	Observation	Inference
1	Conc. H₂SO₄ test: Sample + Conc. H ₂ SO ₄ + Heat	Charring with burnt sugar smell.	Carbohydrates present.
2	Molisch test : Aq. Solution of sample + 2 drops of 1% α naphthol + conc. H ₂ SO ₄ .	Reddish purple ring is formed at the junction of 2 layers	Carbohydrates present.
3	Fehling solution test : Sample solution + 1 ml of fehling A + 1 ml of Fehling B + Δ	Red ppt	Reducing Sugar present
4	Tollens reagent : Aq. Solution of sample + 2 ml of Tollens reagent + Δ	Silver mirror is formed along the surface of test tube.	Reducing sugar present.
5	Benedict's Solution test: Aq solution of sample + Benedict's reagent + Heat	Red ppt	Reducing sugar present
6	Iodine test : Sample Solution + few drops of iodine solution	Violet colour	Starch is present.

Result : Carbohydrates is present.

EXPERIMENT – 23

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 :

S.no.	Experiment	Observation	Inference
1	Spot Test : 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	Acrolein test : 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	Solubility test : 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 ₂ O but is soluble in alcohol on heating and soluble in chloroform.	Fat is present

Result : Fat is present.

EXPERIMENT – 24

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 α amino acid. Amino acids are molecule that have both $-NH_2$ and $-COOH$ group.

Test :

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

Result : Protein is present.

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