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PRELIMINARY:

EXPERIMENT	OBSERVATION	INFERENCE
Colour of the salt is noted	white/colourless	Absence of Cu^{2+}/Ni^{2+}/Mn^{2+}
Odour is noted	a) vinegar like smell	Presence of acetate (CH_3COO^-)
	b) smell of ammonia	Prese of NH_4^+
	c) No characteristic odour	Absence of NH_4^+ or CH_3COO^-
Solubility is noted	1) Soluble in water	Presence of NH_4^+ or Cl^-
	2) Insoluble in water	Absence of NH_4^+ or Cl^-

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TEST FOR Cl^-, Br^-, I^-

Take a dry test tube, add a pinch of salt into it. Then add 1-2 ml of conc. H_2SO_4 to it and heat.

a) Colourless gas which gives a dense white fumes when a glass rod dipped in NH_4OH is shown near the mouth of test tube

Presence of Cl^-

$$Cl^- + H_2SO_4 \longrightarrow HCl + HSO_4^-$$

$$HCl + NH_4OH \longrightarrow NH_4Cl\,(g)$$

(sublimable salt)

Confirmatory Test

To the salt solution add 1-2 ml dil. HNO_3. Then heat it and then cool it. Now add $AgNO_3$ to it

white curdy precipitate which dissolves in NH_4OH soln.

Presence of Cl^- is confirmed

TEST FOR ACID RADICAL (Anion)

Test for CO_3^{2-} (Carbonate ion)

Take aml of dil. HCl in test tube then add a pinch of salt into it.	Brisk effervescence with the liberation of colourless, odourless gas	Presence of CO_3^{2-}

$$CO_3^{2-} + HCl \longrightarrow CO_2 + H_2O + Cl^-$$

Confirmatory:

Pass the above gas through lime water	lime water turns milky

$$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$$

$$CaCO_3 + CO_2 + H_2O \longrightarrow Ca(HCO_3)_2$$
(Soluble)

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$$2FeSO_4 + H_2SO_4 + NO_2 \longrightarrow Fe_2(SO_4)_3 + NO + H_2O$$

$$FeSO_4 + NO \longrightarrow FeSO_4 \cdot NO$$

nitroso ferrous sulphate
(Brown ring)

or

Nitrate	No characteristic reaction	Absence of NO_3^-

Add NH_4OH drop by drop to $FeCl_3$ ⇒ neutral

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The red blood coloured soln is divided into two parts.

To one part add dil HCl.	Red colour disappears.	Presence of CH_3COO^- confirmed
To the second part add water and boil it	Reddish brown ppt	Presence of CH_3COO^- confirmed.

$$3\,CH_3COO^- + \underset{\text{(neutral)}}{FeCl_3} \longrightarrow Fe(CH_3COO)_3 + 3Cl^-$$

$$Fe(CH_3COO)_3 + H_2O \xrightarrow[\Delta]{} CH_3COO(OH)_2Fe + 2(CH_3COO)$$

Reddish brown ppt

Cl_2 - greenish
I - violet
P - pale yellow

$Cl^- + AgNO_3 \longrightarrow AgCl + NO_3^-$
white curdy ppt

b) Reddish brown gas — Presence of Br^-

$Br^- + H_2SO_4 \longrightarrow HBr + HSO_4^-$

$2HBr + H_2SO_4 \longrightarrow Br_2 + SO_2 + 2H_2O$
(reddish coloured gas)

Confirmatory Test:

To the salt soln add dil HNO_3, then heat and cool it. Then add $AgNO_3$ to it — Pale yellow ppt — Presence of Br^- is confirmed

$Br^- + AgNO_3 \longrightarrow AgBr + NO_3^-$
pale yellow ppt

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Test for SO_4^{2-} SULPHATE (SO_4^{2-})

To the salt soln add $BaCl_2$ soln. → White ppt insoluble in conc. HCl. → Presence of SO_4^{2-}

$$SO_4^{2-} + BaCl_2 \longrightarrow BaSO_4 + 2Cl^-$$

Confirmatory

To the salt soln add lead acetate soln → White ppt soluble in excess of ammonium acetate soln → Presence of SO_4^{2-} confirmed

$$(CH_3COO)_2Pb + SO_4^{2-} \longrightarrow PbSO_4 + 2CH_3COO^-$$

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TEST FOR BASIC RADICAL

Test for O group:

To the dry salt add conc. NaOH and heat	smell of ammonia	Presence of O group (NH_4^+)

confirmatory:

$$NH_4^+ + NaOH \longrightarrow \underset{(g)}{NH_3} + H_2O + Na^+$$

confirmatory:

Pass the above gas through nessler's reagent	Brown ppt	Presence of NH_4^+ confirm

$$K_2HOI_4 + 2NH_3 \longrightarrow Hg\begin{matrix}NH_2\\ \diagdown\\ \diagup\\ I\end{matrix} + NH_4I + 2KI$$

(Pottassium tetra iodo mercurate) NESSLER'S REAGENT

(Amino mercuric iodide)

TEST FOR SOLPHATE ACETATE

Take salt in a watch glass add equal quantity of oxalic acid, Then add 1-2 drop of water Rub it using your fingers. and smell it

Vinegar like smell

Presence of acetate CH_3COO^-

$$CH_3COO^- + \begin{matrix} COOH \\ | \\ COOH \end{matrix} + H_2O \longrightarrow CH_3COOH + \begin{matrix} COO^- \\ | \\ COO^- \end{matrix}$$

Confirmatory

To the salt soln add neutral $FeCl_3$ soln

Red blood colouration

To the salt soln. add Potassium iodide soln KI	Yellow ppt which dissolves in hot water and reappears as golden sparkles on cooling	Presence of Pb^{2+} confirmed

$$Pb^{2+} + 2KI \longrightarrow PbI_2 + 2K^+$$

only for viva

Test for group 2

Pb^{2+}, Cu^{2+}, As^{3+}

To the salt soln add dil HCl pass H_2S gas	Black ppt or Yellow ppt	Presence of group 2.

TEST FOR NITRATE (NO_3^-)

To the above mixture add paper balls and heat strongly	Plenty of pale brown gas is produced	Presence of NO_3^-

$$NO_3^- + H_2SO_4 \longrightarrow HNO_3 + HSO_4^-$$

$$4HNO_3 \xrightarrow{\Delta} 4NO_2 + O_2 + 2H_2O$$

(NO_2: pale brown colored gas)

Confirmatory Test (Brown ring test)

Take salt soln in the test tube (saturated) Add equal volume of freshly prepared $FeSO_4$ soln. mix it well, then add conc. H_2SO_4 along the sides of the test tube without shaking	Brown ring is formed	Presence of NO_3^- is confirmed.

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~~only for viva~~

c) Violet colored gas — Presence of I^-.

$$I^- + H_2SO_4 \longrightarrow HI + HSO_4^-$$
$$2HI + H_2SO_4 \longrightarrow I_2 + SO_2 + H_2O$$

Confirmatory:

To the salt solution add 1-2 ml of dil. HNO_3 and heat it, cool it Then add $AgNO_3$. — Dark Yellow ppt — Presence of I^- is confirmed

$$I^- + AgNO_3 \longrightarrow AgI + NO_3^-$$

Dark yellow ppt

or

No characteristic reaction — Absence of Cl^-, Br^-, I^-

$$Al(OH)_3 + 3HCl \longrightarrow AlCl_3 + 3H_2O$$

$$AlCl_3 + 3NH_4OH \longrightarrow$$

$$Al(OH)_3 + 3NH_4Cl$$

Blue ash test

To the salt soln add dil HNO_3 and cobalt nitrate soln then heat it, then dip a filter paper into the soln, burn the filter paper

Blue ash is formed

Presence of Al^{3+} confirmed

the soln into two parts

To one part add NaOH soln dropwise — white ppt — Presence of Zn^{2+} confirm.

~~Zn^{2+} + 2NaOH → Zn~~

$$ZnCl_2 + 2NaOH \longrightarrow Zn(OH)_2 + 2NaCl$$

To the second part add Potassium ferrocyanide — white or bluish white ppt — Presence of Zn^{2+} Confirmed

$$ZnCl_2 + K_4[Fe(CN)_6] \longrightarrow Zn_2[Fe(CN)_6] + 4KCl$$

Test for 4 group

Zn^{2+}, soln Mn^{2+}, Co^{2+}, Ni^{2+}

To the salt soln add solid NH_4Cl and add excess of NH_4OH Then add H_2S

dirty white ppt

Presence of group 4 (Zn^{2+})

confirmatory

$$Zn^{2+} + H_2S \longrightarrow ZnS + 2H^+$$

Confirmatory :

~~To the~~ salt so dissolve the white ppt in dil HCl boil off H_2S Then divide

Test for group 5:

Ba^{2+}, Sr^{2+}, Ca^{2+}

To the salt soln add solid NH_4Cl add excess of NH_4OH then add ammonium carbonate soln → white ppt → presence of group 5

$$Ba^{2+} + (NH_4)_2CO_3 \longrightarrow BaCO_3 + 2NH_4^+$$

$$Sr^{2+} + (NH_4)_2CO_3 \longrightarrow SrCO_3 + 2NH_4^+$$

$$Ca^{2+} + (NH_4)_2CO_3 \longrightarrow CaCO_3 + 2NH_4^+$$

Confirmatory

Dissolve the above ppt in acetic acid then boil off CO_2

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Then divide into 3 parts

To the first part add Potassium chromate (K_2CrO_4)

Yellow ppt

Presence of Ba^{2+} confir

$$Ba^{2+} + K_2CrO_4 \longrightarrow BaCrO_4 + 2K^+$$

To the second part add ammonium sulphate soln

White ppt

Presence of Sr^{2+} confirmed

$$Sr^{2+} + (NH_4)_2SO_4 \longrightarrow SrSO_4 + 2NH_4^+$$

To the third part add ammonium oxalate soln.

White ppt while scratching the side of the test tube

Presence of Ca^{2+} confirm

Conc HCl is used to convert it to chloride bcz it is more volatile.

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$$Ca^{2+} + (NH_4)_2C_2O_4 \longrightarrow CaC_2O_4 + 2NH_4^+$$

Flame test: e^- transition is the principle (from lower level to higher level and vice versa)

Take a dry watch glass add pinch of salt into it. Then add 2-3 drops of conc. HCl and make paste of salt. Take the salt on the glass rod. Show it to the flame. Note the colour of flame.

1) apple green — Ba^{2+} confirmed
2) Crimson red — Sr^{2+} confirmed
3) Brick red — Ca^{2+} confirmed

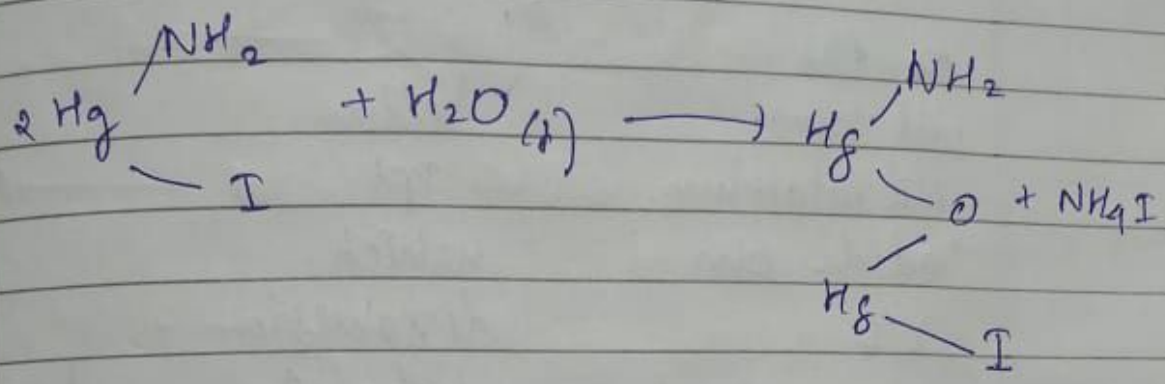
Group reagent

2 - $NaOH$

3 - NH_4OH

4 - H_2S

5 - $(NH_4)_2CO_3$



Test for 1 group:

To the salt soln add dil HCl — white ppt — presence of group 1.

$$Pb^{2+} + 2HCl \longrightarrow PbCl_2 + 2H^+$$

Confirmatory:

To the salt soln add Potassium chromate K_2CrO_4 — bright Yellow ppt — Presence of Pb^{2+} confirmed

$$Pb^{2+} + K_2CrO_4 \longrightarrow PbCrO_4 + 2K^+$$

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Test for group 3

Al^{3+} , Fe^{3+} × viva

To the salt soln add excess of solid NH_4Cl then add excess of NH_4OH	Gelatinous white ppt	Presence of group 3 (Al^{3+})

$$Al^{3+} + NH_4OH \longrightarrow Al(OH)_3 + NH_4^+$$

Confirmatory :

(Blue lake test)

Dissolve the above gelatinous ppt in dil. HCl. Add blue litmus soln. Then add NH_4OH soln in excess drop by drop	Blue lake formation.	Presence of Al^{3+} confirmed

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Test for group 6 (Mg^{2+})

To the salt soln add solid NH_4Cl and then excess of NH_4OH. Then add disodium hydrogen phosphate Na_2HPO_4

White ppt

Presence of group 6.

$$Mg^{2+} + Na_2HPO_4 \rightarrow MgHPO_4 + 2Na^+$$

Confirmatory

To the salt soln add magnoson reagent

Bluish white ppt

Presence of Mg^{2+} confirmed

Bayer's test - test for saturation/unsaturation.

- Take $KMnO_4$ sol.
  make it alkaline
- To the soln of organic compound add alkaline $KMnO_4$.
  - Violet color disappears — unsaturated
  - violet color persists — saturated

1) Test for alcohol. (aliphatic saturated)
   Take the soln of organic compound, dip a blue litmus paper.
   Litmus turns red. — Presence of OH grp

→ Add a piece of Na metal to organic compound. — Presence of OH grp

$$2R\text{-}OH + 2Na \longrightarrow R\text{-}ONa^{+} + H_2$$

→ Confirmatory grp

$$R\text{-}OH + R\text{-}COOH \xrightarrow[\Delta]{H_2SO_4} R\text{-}COOR' + H_2O$$

→ Take organic compound, then add 2 ml of ethanoic

acid into it
- Add 1 or 2 ml of conc H_2SO_4 and heat strongly.
→ Transfer the contents into 15-20 ml of 5% aq. Na_2CO_3 soln taken in a beaker. Smell the content

pleasant fruity smell

presence of OH -grp confirmed

$$R\text{-}OH + R\text{-}COOH \xrightarrow[\Delta]{H_2SO_4} R\text{-}COO\text{-}R' + H_2O$$

2) Test for phenolic grp.
→ Blue litmus test
To the soln of organic compound add blue litmus

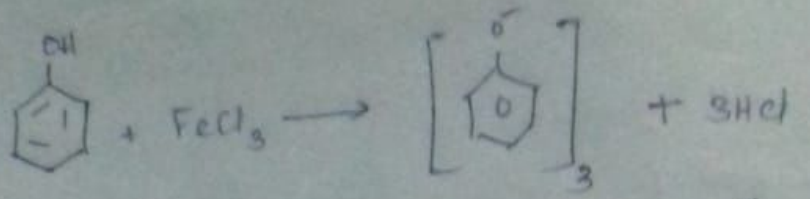
turns red.

presence of phenolic grp Ar-OH.

To the aq. soln of organic compound add neutral ferric chloride soln

Violet coloration

Presence of phenolic grp.



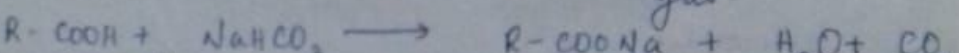
Ferric phenoxide
(Violet)

3) Test for carboxylic acid
(Litmus test)

→ $NaHCO_3$ test

1) To the organic compound solid sodium bicarbonate.

Brisk effervescence with the liberation of colorless, odourless gas



Confirmatory test.

~~4)~~ ~~EsFe~~ test

1) ~~To~~ the organic compound. with ethanol. ~~Eeth~~

4) Test for carbonyl grp
2,4 DNP test

~~0-1~~ To the given organic compound add 1 ml alcohol

Organic compounds

papergrid
Date: / /

	Preliminary Test		
1.	Colour noted	Colourless	absence of phenol, cresol etc
2.	Odour	Carbolic smell	Presence of phenolic grp.
		Pleasant fruity smell	Presence of Ester
		No characteristic odour	Absence of Phenol/Ester
3.	Take the given organic compound & burn it	Sooty flame	aromatic
		non-sooty flame	aliphatic
4.	Test for unsaturation Baeyer's test		
	To the org. compound add alk. $KMnO_4$	soln. Violet colour disappears	unsaturated
		Violet colour persists	saturated
	Test for Alcohol		
	Take the soln. of org. compound & dip a blue litmus paper.	turns red	presence of alc. group
5.	Reaction with Na		
	Add a piece of Na metal to the organic compound	Evolution of colourless, odourless gas	Presence of alcoholic g

$$2R\text{-}OH + 2Na \rightarrow 2R\text{-}ONa + H_2$$

Test for ketone

Reagent Sodium Nitroprusside test

Take 1 ml of sodium nitro prusside soln. and make it alkaline by adding a few drops of NaOH soln. → To it add a pinch of Organic compound and shake it

A red blood coloration

Presence of ketone gp.

meta dinitrobenzene test

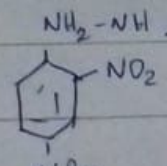
To the given organic compound add 1 ml of ethanol and then add 1 ml of ethanolic soln of meta dinitrobenzene and a few drops of NaOH soln. and then shake

Violet colouration

Presence of 1-C-H

then add 4 ml of
~~alcohol~~
2, 4 DNP reagent and shake the mixture

a yellow, orange or red ppt will separate out



$>C=O$ +

Test for Aldehyde

To the organic compound add shiff's base

pink color

presence of aldehyde

Confirmatory

1) Tollen's reagent is added to organic compound. Heat strongly in a water bath.

appearance of ~~silver~~ silver mirror or grey ppt

Presence of CHO grp.

Take equal volume of Fehling's reagent no 1 & 2. Then add organic compound and heat strongly in water bath.

Reddish brown ppt.

Presence of -CHO.

Test for ketone

Sodium Nitroprusside test
Take 1ml of Sodium nitro prusside soln. and make it alkaline by adding a few drops of NaOH soln.
→ To it add a pinch of Organic compound and shake it

A red ~~blood~~ coloration

Presence of ketonic gp.

meta dinitrobenzene test

To the given organic compound add 1 ml of ethanol and then add 1ml of ethanolic soln of metadinitrobenzene. and a few drops of NaOH soln. and then shake.

Violet colouration

presence of -C(=O)-