Date

Expt. No. 11 AMMONIUM ION Page No.

Aim

To analyse ammonium ion (NH_4^+) in given salt

Experiment	Observation	Inference
Preliminary Test Salt + Conc. NaOH	Smell of Ammonia gas evolved which becomes white dense fumes of a drop of conc. HCl being over the mouth of the test tube	NH_4^+ may be present
Confirmatory Test In a T- tube one of the limb salt is taken in another limb, Nessler's reagent is taken. Add conc. NaOH to limb which contains salt & cover it by thumb & pass the gas produced to another limb.	Brown ppt or colouration	NH_4^+ confirmed

Result

The given salt contains ammonium ions

Teacher's Signature :

Sodium Hydroxide Test

$$NH_4^+ + NaOH\ (aq) \longrightarrow Na^+\ (aq) + NH_3\ (g) + H_2O$$

$$NH_3\ (g) + HCl\ (g) \longrightarrow NH_4Cl\ (s)$$

Ammonium chloride
(Dense white fumes)

Nessler's Reagent Test

$$K_2HgI_4 + 2NH_3 \longrightarrow Hg(NH_2)I + NH_4I\ (aq) + 2KI\ (aq)$$

Iodide of Millon's base
(Red-brown ppt)

Amino mercuric iodide

$$2Hg(NH_2)I + H_2O \longrightarrow Hg_2(NH_2)OI + NH_4I\ (aq)$$

Date _____

Expt. No. 12 LEAD ION Page No. _____

Aim

To analyse Pb^{2+} (group 2) in the given salt

Experiment	Observation	Inference
Preliminary Test		
Salt soln + dil. HCl	White ppt formed	Pb^{2+} may be present
Confirmatory Test		
Add distilled water to the white ppt formed in Preliminary Test & boil the test tube till white ppt dissolve & divide the dissolved part in to:		
(a) First part: add potassium iodide soln	Yellow ppt	Pb^{2+} confirmed
(b) Second part: add potassium chromate soln (K_2CrO_4)	orange-yellow ppt	Pb^{2+} confirmed

Result

The given salt contains Pb^{2+} ion.

Teacher's Signature : _____

Precipitation with dil. HCl

$$Pb^{2+}(aq) + 2HCl(aq) \longrightarrow \underset{\text{dense white ppt}}{PbCl_2(s)} + 2H^+(aq)$$

Potassium Iodide test

$$PbCl_2(aq) + 2KI(aq) \longrightarrow \underset{\text{yellow ppt.}}{PbI_2(s)} + 2KCl(aq)$$

Potassium Chromate Test

$$PbCl_2(aq) + K_2CrO_4(aq) \longrightarrow \underset{\text{bright orange-yellow ppt}}{PbCrO_4(s)} + 2KCl(aq)$$

Date _____

Expt. No. 13 ALUMINIUM ION Page No. _____

Aim

To analyse Al^{3+} (group III) in the given salt

Experiment	Observation	Inference
Preliminary Test		
salt soln + NH_4Cl (solid) + NH_4OH excess	white gelatinous ppt	Al^{3+} may be present.
Confirmatory Test		
Take Test : white ppt + dil. HCl (excess) so that white ppt gets dissolved + few drops of blue litmus soln + NH_4OH in excess	A blue ppt suspended in a colourless soln	Al^{3+} is confirmed

Result

Al^{3+} ion is present in the given salt

Dissolution of Gelatinous white precipitate

$$Al(OH)_3\,(s) + 3HCl\,(aq) \longrightarrow AlCl_3\,(aq) + 3H_2O\,(l)$$

Lake Test

$$AlCl_3\,(aq) + 3\,NH_4OH\,(aq) \longrightarrow Al(OH)_3\,(aq) + 3NH_4Cl\,(aq)$$

Date _____

Expt. No. 14 ZINC ION Page No. _____

Aim

To analyse (Zn^{2+}) Group IV in the given salt

Experiment	Observation	Inference
Preliminary Test		
salt soln + NH_4Cl (solid) + NH_4OH excess + pass H_2S gas	Dirty white ppt	Zn^{2+} may be present
Confirmatory Test		
Dissolve the white ppt in dil HCl & divide the soln in two parts	white ppt soluble in NaOH excess	Zn^{2+} confirmed
(a) First part : add NaOH soln		
(b) Second part : Add potassium ferrocyanide soln	Bluish white ppt	Zn^{2+} confirmed

Result

The given salt contain Zn^{2+} ions.

Teacher's Signature : _____

Dissolution of dirty white ppt in HCl

$$\underset{\text{dirty white ppt}}{ZnS\,(aq)} + 2HCl\,(aq) \longrightarrow ZnCl_2\,(s) + 2H^+\,(aq) + S^{2-}$$

Sodium hydroxide Test

$$ZnCl_2\,(aq) + 2NaOH\,(aq) \longrightarrow \underset{\text{white ppt}}{Zn(OH)_2\,(s)} + 2NaCl\,(aq)$$

$$\underset{\text{white ppt}}{Zn(OH)_2\,(s)} + \underset{\text{excess}}{2NaOH\,(aq)} \longrightarrow \underset{\text{soluble}}{Na_2ZnO_2} + 2H_2O\,(l)$$

Potassium ferrocyanide Test

$$2ZnCl_2\,(aq) + K_4[Fe(CN)_6]\,(aq) \longrightarrow \underset{\text{bluish white ppt}}{Zn_2[Fe(CN)_6]} + 4KCl\,(aq)$$

Date _____

Expt. No. 15 **BARIUM ION** Page No. _____

Aim

To detect Ba^{2+} ion in the given salt (group V)

Experiment	Observation	Inference
Preliminary Test		
salt soln + NH_4Cl + NH_4OH + $(NH_4)_2CO_3$	white ppt	group V ~~may~~ cations may be present (Ba^{2+}, Sr^{2+}, Ca^{2+})
Confirmatory Test		
Dissolve the white ppt in hot dil. Acetic acid to obtain clear soln. Divide the soln in three parts :		
(a) the first part : add K_2CrO_4	Yellow ppt	Ba^{2+} confirmed
(b) second part : $(NH_4)_2SO_4$	No change	Sr^{2+} is absent
(c) Third part : $(NH_4)_2C_2O_4$	No change	Ca^{2+} is absent
Flame test : (salt + conc. HCl) on watch glass being over flame	Apple green flame	Ba^{2+} is confirmed

Result

Given salt contains Ba^{2+} ion

Teacher's Signature : _____

Preliminary Test

group V cation + CO_3^{2-} ⟶ Carbonate of group V (white ppt)

$Ca^{2+} + CO_3^{2-} \longrightarrow CaCO_3\ (s)$
$Ba^{2+} + CO_3^{2-} \longrightarrow BaCO_3\ (s)$
$Sr^{2+} + CO_3^{2-} \longrightarrow SrCO_3\ (s)$
} white ppt formed

Confirmatory Test

Dissolving in Acetic Acid

white ppt (Ba^{2+}/CO_3^{2-} / Sr^{2+}/CO_3^{2-} / Ca^{2+}/CO_3^{2-}) + CH_3COOH ⟶ $Ba(CH_3COO)_2$ or $Sr(CH_3COO)_2$ or $Ca(CH_3COO)_2$ + H_2O + CO_2

[clear solution]

clear solution + K_2CrO_4 ⟶ yellow ppt

$Ba(CH_3COO)_2 + K_2CrO_4 \longrightarrow BaCrO_4\ (\downarrow) + 2CH_3COOK\ (aq)$

yellow ppt

Date _____

Expt. No. 16 STRONTIUM ION Page No. _____

Aim

To detect Sr^{2+} ion of group V in the given salt

Experiment	Observation	Inference
Preliminary Test Salt soln + NH_4Cl + NH_4OH + $(NH_4)_2CO_3$	white ppt	Group V cations may be present (Ba^{2+}, Ca^{2+}, Sr^{2+})
Confirmatory Test Dissolve the white ppt in CH_3COOH + heat to obtain clear soln Divide the soln in 3 parts :		
(a) First part : K_2CrO_4	No change	Ba^{2+} is absent
(b) Second part : $(NH_4)_2SO_4$	white ppt	Sr^{2+} confirmed
(c) Third part : $(NH_4)_2C_2O_4$	No change	Ca^{2+} is absent
Flame Test : Salt in watch glass + conc. HCl + bring over the flame	crimson red flame	Sr^{2+} confirmed

Result

Given salt contains Sr^{2+} ion.

Teacher's Signature : _____

Preliminary Test

group V cation + CO_3^{2-} ⟶ carbonate of group V (white ppt)

$Ca^{2+}/Ba^{2+}/Sr^{2+} + CO_3^{2-} \longrightarrow \underline{CaCO_3 / BaCO_3 / SrCO_3}$

white ppt

Confirmatory Test

Dissolving white ppt in CH_3COOH

white ppt + CH_3COOH ⟶ clear solution

($CaCO_3/BaCO_3/SrCO_3$) → $Ca(CH_3COO)_2 / Ba(CH_3COO)_2 / Sr(CH_3COO)_2$

Clear solution + $(NH_4)_2SO_4$ ⟶ white ppt

$Sr(CH_3COO)_2 + (NH_4)_2SO_4 \longrightarrow SrSO_4 + 2CH_3COONH_4$

white ppt

Date _____

Expt. No. 17 MAGNESIUM Ion Page No. _____

Aim

To detect Mg^{2+} ion of group VI in the given salt

Experiment	Observation	Inference
salt sol^{n} + NH_4Cl + NH_4OH + $(NH_4)_3PO_4$	white ppt	Mg^{2+} is confirmed

Result

Given salt contains Mg^{2+} ion.

Reaction

$$\underset{\text{(group VI cation)}}{Mg^{2+}} + PO_4^{3-} + NH_4OH + 5H_2O \longrightarrow Mg(NH_4)HPO_4 \cdot 6H_2O$$

(white ppt)