**Experiment 3**

**QUALITATIVE ANALYSIS**

**SALT NO.1 (NH4Br)**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White, crystalline | Cu2+,Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | Ammoniacal smell | NH4+ may be present |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with con.HCl and performed flame test. | No characteristic observations | Ba2+ , Sr 2+ ,Ca2+ may be absent. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| 1. **Dil.H2SO4 test**   To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| 1. **Con. H2SO4 test**   To a little of the salt added con. H2SO4  **Confirmatory test for Br –**  AgNO3 test  To a little of the salt solution added AgNO3 solution | Reddish brown vapours  Pale yellow precipitate partially soluble in NH4OH | Br – present  Br - confirmed |

**Chemical equations:** (left hand side)

Br - + H2SO4 HBr + HSO4 –

2 HBr + H2SO4 SO2 + Br2 + 2 H2O

Brown gas

Br - + AgNO3 AgBr + NO3 –

Pale yellow ppt

**Analysis of cations:**

Analysis of group zero

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1.The solid salt is heated with con. NaOH  2.A glass rod dipped in dil.HCl is brought near the mouth of the test tube.  3.The above gas is passed through Nessler’s reagent | Ammoniacal smell  White fumes  Brown precipitate | Presence of group zero.  Presence of NH4+  Presence of NH4+ confirmed |

**Chemical reactions:** (left hand side)

NH4 + + NaOH Δ  NH3 + H2O + Na+

NH3 + HCl NH 4Cl

White fumes

2 K2[HgI4] + 3NaOH + NH3 H2N.HgO.HgI + 4KI +3NaI +2H2O

**RESULT:**

Acidic radical: **Br –**

Basic radical: **NH4+**

The given salt is **Ammonium bromide (NH4Br)**

**Experiment 4**

**SALT NO. 2 [ Pb(CH3COO)2]**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White ,crystalline | Cu2+,Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | Vinegar smell | CH3COO - may be present |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with Con.HCl and performed flame test. | No characteristic observations | Ba2+ , Sr 2+ ,Ca2+ may be absent. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| 1. **Dil.H2SO4 test**   To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| 1. **Con. H2SO4 test**   To a little of the salt added con. H2SO4  **Confirmatory test for**  CH3COO -  FeCl3 test  To a little of the salt solution added neutral FeCl3 solution. Filter. Divide the filtrate in to two portions  i)To one part added dil.HCl  ii)To second part added water and boiled | Vinegar smell  Reddish coloured filtrate  Reddish colour disappears  Reddish brown precipitate | CH3COO -  present  CH3COO - confirmed |

**Chemical equations:** (left hand side)

**Acetate ion (CH3COO - )**

**CH3COO - + H2SO4 CH3COOH + HSO4 –**

**Acetic acid**

3 **CH3COO-  + FeCl3 (CH3COO)3 Fe + 3Cl-**

**(CH3COO)3 Fe +2 H2O (CH3COO) (OH)2 Fe + 2 CH3COOH**

**Reddish brown ppt**

**Analysis of Cations:**

**Analysis of group zero**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1.The solid salt is heated with con. NaOH | No ammoniacal smell | Absence of group zero. |

**Analysis of group I**

|  |  |  |
| --- | --- | --- |
| **1**.To a little of the salt solution dil.HCl is added  White precipitate is boiled with  5-10 ml of water and divided the solution in to two parts  a) To one part KI is added  b) To the second part K2CrO4 is added | White precipitate  Yellow precipitate  Yellow precipitate | Presence of group I  Presence of Pb2+  Presence of Pb2+ confirmed  Presence of Pb2+ is confirmed |

**Chemical reactions**

**Pb 2+ + 2HCl PbCl2 + 2H+**

**White ppt**

**PbCl2 + 2 KI PbI2 ↓ + 2 KCl**

**Yellow**

**Ppt**

**PbCl2 + K2CrO4 PbCrO4 ↓ + 2KCl**

**Yellow ppt  
RESULT:**

Acidic radical: **CH3COO –**

Basic radical: **Pb 2+**

The given salt is **Lead acetate** **Pb (CH3COO)2**

**Experiment 5**

**SALT NO. 3 [ Al 2 (SO4) 3]**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White, Amorphous | Cu2+, Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | No characteristic smell | CH3COO – ,NH4+ may be absent |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with Con.HCl and performed flame test. | No characteristic observations | Ba2+ , Sr 2+ ,Ca2+ may be absent. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| 1. **Dil.H2SO4 test**   To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| 1. **Con. H2SO4 test**   To a little of the salt added con. H2SO4   1. To the above added Cu turnings and heated 2. **BaCl2 test**   To a little salt solution added BaCl2 solution  **Confirmatory test for** **SO4 2-**  To a little salt solution added  Lead acetate solution | No characteristic observations  No brown fumes  White precipitate  White precipitate | CH3COO - , Cl - ,Br – absent  NO3 – absent  SO4 2- present  SO4 2- confirmed |

**Chemical equations:** (left hand side)

**Sulphate ion (**SO4 2-**)**

**SO4 2- + BaCl2 BaSO4 + 2 Cl -**

**White ppt**

**SO4 2- + Pb(CH3COO)2  PbSO4 + 2 CH3COO –**

**White ppt**

**Analysis of Cations:**

**Analysis of group zero**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1.The solid salt is heated with con. NaOH | No ammoniacal smell | Absence of group zero. |

**Analysis of group I**

|  |  |  |
| --- | --- | --- |
| **1**.To a little of the salt solution dil. HCl is added | No White precipitate | Absence of group I |

**Analysis of group II**

|  |  |  |
| --- | --- | --- |
| 1.To the above added H2S | No precipitate | Absence of group II |

**Analysis of group III**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1.To a little of the salt solution NH4Cl and excess of NH4OH are added  The above precipitate is dissolved in minimum quantity of dil. HCl and divided in to two parts  2. To one part of the solution NaOH is added   1. To the second part a few drops of blue litmus solution is added.   NH4OH is added drop wise till the solution is alkaline. | White gelatinous precipitate  White precipitate soluble in excess NaOH  Solution turns pink  A blue precipitate floating in a colourless solution is formed | Presence of group III  Presence of Al3+  Presence of Al3+ confirmed  Presence of Al3+ confirmed |

**Chemical equations:** (left hand side)

**Al3+ + 3 NH4OH Al (OH)3 ↓ + 3 NH4+**

**White**

**gelatinous**

**ppt**

**Al (OH)3 + 3 HCl AlCl 3 + 3 H2O**

**AlCl 3 + 3 NaOH Al (OH)3 ↓ + 3 NaCl**

**White ppt**

**Al (OH)3 + NaOH NaAlO2 + H2O**

**Sodium meta**

**aluminate**

**AlCl 3 + 3 NH4OH Al (OH)3 ↓ + 3 NH4Cl**

**Blue colour**

**adsorbs on the ppt**

**RESULT:**

Acidic radical: **SO4 2–**

Basic radical: **Al 3 +**

The given salt is **Aluminium sulphate**  **Al 2 (SO4) 3**

**Experiment 6**

**SALT NO. 4 [ Zn(CH3COO) 2]**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White, crystalline | Cu2+,Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | Vinegar smell | CH3COO - may be present |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with Con.HCl and performed flame test. | No characteristic observations | Ba2+ , Sr 2+ ,Ca2+ may be absent. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| 1. **Dil.H2SO4 test**   To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| 1. **Con. H2SO4 test**   To a little of the salt added con. H2SO4  **Confirmatory test for**  CH3COO -  FeCl3 test  To a little of the salt solution added neutral FeCl3 solution. Filter. Divide the filtrate in to two portions  i)To one part added dil. HCl  ii)To second part added water and boiled | Vinegar smell  Reddish coloured filtrate  Reddish colour disappears  Reddish brown precipitate | CH3COO - present  CH3COO - confirmed |

**Chemical equations:** (left hand side)

**Acetate ion (CH3COO - )**

**CH3COO - + H2SO4 CH3COOH + HSO4 –**

**Acetic acid**

3 **CH3COO-  + FeCl3 (CH3COO)3 Fe + 3 Cl-**

**(CH3COO)3 Fe +2 H2O (CH3COO) (OH)2 Fe + 2 CH3COOH**

**Reddish brown ppt**

**Analysis of Cations:**

**Analysis of group zero**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observations** | **Inference** |
| 1.The solid salt is heated with con. NaOH | No ammoniacal smell | Absence of group zero. |

**Analysis of group I**

|  |  |  |
| --- | --- | --- |
| **1**.To a little of the salt solution dil. HCl is added | No White precipitate | Absence of group I |

**Analysis of group II**

|  |  |  |
| --- | --- | --- |
| 1. To the above added H2S | No precipitate | Absence of group II |

**Analysis of group III**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1. To a little of the salt solution NH4Cl and excess of NH4OH are added | No White gelatinous precipitate | Absence of group III |

**Analysis of group IV**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1. To the salt solution NH4Cl, NH4OH and Na2S are added**  **Dissolved the white precipitate in dil. HCl, boil off H2S and divide the solution into two parts**  **2. To one-part NaOH solution is added drop wise**  **3.To the second part potassium ferrocyanide is added** | **Dirty white precipitate**  **White precipitate soluble in excess of NaOH**  **Bluish white precipitate** | **Presence of group IV**  **Presence of Zn2+**  **Zn2+ confirmed**  **Zn2+ confirmed** |

**Chemical equations:** (left hand side)

**Zn 2+ + Na2S ZnS ↓ + 2 Na+**

**Dirty white**

**ppt**

**ZnS + 2HCl ZnCl2 + H2S**

**ZnCl2 + 2NaOH Zn(OH) 2↓ + 2NaCl**

**White ppt**

**Zn(OH) 2  + 2 NaOH Na2ZnO2 + 2H2O**

**Soluble sodium**

**Zincate**

**2 ZnCl2 + K4[Fe(CN)6] Zn2[Fe(CN)6] ↓ + 4KCl**

**Bluish white ppt**

**RESULT:**

Acidic radical: **CH3COO -**

Basic radical: **Zn2 +**

The given salt is **Zinc acetate** **Zn(CH3COO) 2**

**Experiment 7**

**SALT NO. 5 [ BaCl 2]**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White, crystalline | Cu2+,Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | No characteristic smell | CH3COO – ,NH4+ may be absent |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with Con.HCl and performed flame test. | Apple green colour | Ba2+ may be present. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| 1. **Dil.H2SO4 test**   To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| 1. **Con. H2SO4 test**   To a little of the salt added con. H2SO4  **Confirmatory test for**  **Cl -**  **AgNO3 test**  To a little of the salt solution added AgNO3 solution | Colourless gas pungent smell  White precipitate soluble in NH4OH | Cl - present  Cl - confirmed |

**Chemical equations:** (left hand side)

**Chloride ion (Cl -)**

**Cl - + H2SO4 HCl + HSO4 –**

**Cl - + AgNO3 AgCl + NO3 –**

**White ppt**

**AgCl + 2 NH4OH [Ag(NH3)2] Cl + 2 H2O**

**Soluble complex**

**Analysis of Cations:**

**Analysis of group zero**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1.The solid salt is heated with con. NaOH | No ammoniacal smell | Absence of group zero. |

**Analysis of group I**

|  |  |  |
| --- | --- | --- |
| 1**.**To a little of the salt solution added dil.HCl | No precipitate | Absence of group I |

**Analysis of group II**

|  |  |  |
| --- | --- | --- |
| 1.To the above added H2S | No precipitate | Absence of group II |

**Analysis of group III**

|  |  |  |
| --- | --- | --- |
| 1. To a little of the salt solution NH4Cl and excess of NH4OH are added | No White gelatinous precipitate | Absence of group III |

**Analysis of group IV**

|  |  |  |
| --- | --- | --- |
| To the salt solution NH4Cl, NH4OH and Na2S are added | No precipitate | Absence of group IV |

**Analysis of group V**

|  |  |  |
| --- | --- | --- |
| 1. To a little of the salt solution NH4Cl, NH4OH and (NH4)2CO3 are added  The precipitate is dissolved in hot dil. acetic acid.  2. To the above K2CrO4 solution is added | White precipitate  Yellow precipitate | Presence of group V  Presence of Ba 2+ confirmed |

**Chemical equations:** (left hand side)

**Barium (Ba 2+) :**

**Ba 2+ + (NH4)2CO 3 BaCO 3 ↓ + 2NH4 +**

**White precipitate**

**BaCO3 + 2 CH3COOH (CH3COO)2Ba + CO2 ↑ + H2O**

**(CH3COO)2 Ba + K2CrO4 2CH3COOK + BaCrO4 ↓**

**Yellow ppt.**

**RESULT:**

Acidic radical: **Cl -**

Basic radical: **Ba2 +**

The given salt is **Barium chloride BaCl2**

**Experiment 8**

**SALT NO. 6 [ Sr(NO3) 2]**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White, crystalline | Cu2+,Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | No characteristic smell | CH3COO – ,NH4+ may be absent |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with Con.HCl and performed flame test. | Crimson red colour | Sr2+ may be present. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| **1.Dil.H2SO4 test**  To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| **2.Con. H2SO4 test**  To a little of the salt added con. H2SO4 | No characteristic observations | CH3COO - , Cl - ,Br – absent |
| **3**.To the above added Cu turnings and heated  **Confirmatory test for** **NO**3 -  To 2-3 ml of the salt solution added freshly prepared FeSO4 solution. Then added con.H2SO4 along the sides of the test tube. | Reddish brown gas  A dark brown ring formed at the junction of the two liquids. | NO3 -  present  NO3 - confirmed |

**Chemical equations:** (left hand side)

1. **Nitrate (NO3-)**

**NO3- + H2SO4 HNO3 + HSO4 –**

**4 HNO3  + Cu Cu(NO3)2  + 2 NO2 + 2 H2O**

**Reddish brown**

**NO3- + H2SO4 HNO3 + HSO4 –**

**6 FeSO4 + 3 H2SO4 + 2 HNO3 3 Fe2(SO4)3 + 4 H2O + 2 NO**

**FeSO4 + NO + 5 H2O  [Fe(NO)(H2O)5]SO4**

**Brown ring**

**Analysis of Cations:**

**Analysis of group zero**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1.The solid salt is heated with con. NaOH | No ammoniacal smell | Absence of group zero. |

**Analysis of group I**

|  |  |  |
| --- | --- | --- |
| 1**.**To a little of the salt solution added dil.HCl | No precipitate | Absence of group I |

**Analysis of group II**

|  |  |  |
| --- | --- | --- |
| 1.To the above added H2S | No precipitate | Absence of group II |

**Analysis of group III**

|  |  |  |
| --- | --- | --- |
| 1. To a little of the salt solution NH4Cl and excess of NH4OH are added | No White gelatinous precipitate | Absence of group III |

**Analysis of group IV**

|  |  |  |
| --- | --- | --- |
| To the salt solution NH4Cl, NH4OH and Na2S are added | No precipitate | Absence of group IV |

**Analysis of group V**

|  |  |  |
| --- | --- | --- |
| 1. To a little of the salt solution NH4Cl, NH4OH and (NH4)2CO3 are added  The precipitate is dissolved in hot dil.acetic acid and divide the solution in to two parts  2. To one-part K2CrO4 solution is added  3. To the second part ammonium sulphate is added | White precipitate  No Yellow precipitate  White precipitate | Presence of group V  Absence of Ba 2+  Presence of Sr2+ confirmed |

**Chemical equations:** (left hand side)

**Strontium ( Sr 2+) :**

**Sr 2+ + (NH4)2CO 3 SrCO3 ↓ + 2NH4+**

**White precipitate**

**SrCO3 + 2CH3COOH (CH3COO)2Sr + CO2 ↑ + H2O**

**(CH3COO)2Sr + (NH4)2SO4 2CH3COONH4 + SrSO4 ↓**

**White ppt.**

**RESULT:**

Acidic radical: **NO3 -**

Basic radical: **Sr2 +**

The given salt is **Stron**t**ium Nitrate Sr (NO3)**

**Experiment 9**

**SALT NO. 7 [CaCl 2]**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White, crystalline | Cu2+,Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | No characteristic smell | CH3COO – ,NH4+ may be absent |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with Con.HCl and performed flame test. | Brick red colour | Ca2+ may be present. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| 1. **Dil.H2SO4 test**   To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| 1. **Con. H2SO4 test**   To a little of the salt added con. H2SO4  **Confirmatory test for**  **Cl -**  **AgNO3 test**  To a little of the salt solution added AgNO3 solution | Colourless gas pungent smell  White precipitate soluble in NH4OH | Cl - present  Cl - confirmed |

**Chemical equations:** (left hand side)

**Chloride ion (Cl -)**

**Cl - + H2SO4 HCl + HSO4 –**

**Cl - + AgNO3 AgCl + NO3 –**

**White ppt**

**AgCl + 2 NH4OH [Ag(NH3)2] Cl + 2 H2O**

**Soluble complex**

**Analysis of Cations:**

**Analysis of group zero**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observations** | **Inference** |
| 1.The solid salt is heated with con. NaOH | No ammoniacal smell | Absence of group zero. |

**Analysis of group I**

|  |  |  |
| --- | --- | --- |
| 1**.**To a little of the salt solution added dil. HCl | No precipitate | Absence of group I |

**Analysis of group II**

|  |  |  |
| --- | --- | --- |
| 1.To the above added H2S | No precipitate | Absence of group II |

**Analysis of group III**

|  |  |  |
| --- | --- | --- |
| 1. To a little of the salt solution NH4Cl and excess of NH4OH are added | No White gelatinous precipitate | Absence of group III |

**Analysis of group IV**

|  |  |  |
| --- | --- | --- |
| To the salt solution NH4Cl, NH4OH and Na2S are added | No precipitate | Absence of group IV |

**Analysis of group V**

|  |  |  |
| --- | --- | --- |
| 1. To a little of the salt solution NH4Cl, NH4OH and (NH4)2CO3 are added  The precipitate is dissolved in hot dil. acetic acid and divide the solution in to three parts  2. To one-part K2CrO4 solution is added  3. To the second part ammonium sulphate is added  4.To the third part added ammonium oxalate | White precipitate  No Yellow precipitate  No white precipitate  White precipitate | Presence of group V  Absence of Ba 2+  Absence of Sr2+  Presence of Ca2+ confirmed. |

**Chemical equations:** (left hand side)

**Strontium (Sr 2+):**

**Ca 2+ + (NH4)2CO 3 CaCO3 ↓ + 2NH4+**

**White precipitate**

**CaCO3 + 2CH3COOH (CH3COO)2Ca + CO2 ↑ + H2O**

**(CH3COO)2Ca + (NH4)2C2O4 2CH3COONH4 + CaC2O4 ↓**

**White ppt.**

**RESULT:**

Acidic radical: Cl**-**

Basic radical: Ca**2 +**

The given salt is **Calcium Chloride CaCl 2**

**Experiment 10**

**SALT NO. 8 [MgSO4]**

**Aim**: Analyse the given salt for acidic and basic radicals.

**Preliminary experiments:**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| **1.Colour and appearance** | White, crystalline | Cu2+,Ni2+,Mn2+,Co2+,Fe3+etc may be absent |
| **2.Odour** | No characteristic smell | CH3COO – ,NH4+ may be absent |
| **3.Solubility** | Soluble in cold water | Insoluble CO32- may be absent |
| 4.**Flame test**  Prepared a paste of the salt with Con.HCl and performed flame test. | No characteristic observations | Ba2+ , Sr 2+ ,Ca2+ may be absent. |

**Analysis of anions:**

|  |  |  |
| --- | --- | --- |
| 1. **Dil.H2SO4 test**   To a little of the salt added dil. H2SO4 | No gas evolved | CO3 2- absent |
| 1. **Con. H2SO4 test**   To a little of the salt added con. H2SO4   1. To the above added Cu turnings and heated 2. **BaCl2 test**   To a little salt solution added BaCl2 solution  **Confirmatory test for** **SO4 2-**  To a little salt solution added  Lead acetate solution | No characteristic observations  No brown fumes  White precipitate  White precipitate | CH3COO - , Cl -, Br – absent  NO3 – absent  SO4 2- present  SO4 2- confirmed |

**Chemical equations:** (left hand side)

**Sulphate ion (SO4 2-)**

**SO4 2- + BaCl2 BaSO4 + 2 Cl -**

**White ppt**

**SO4 2- + Pb (CH3COO)2  PbSO4 + 2 CH3COO –**

**White ppt**

**Analysis of Cations:**

**Analysis of group zero**

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Inference** |
| 1.The solid salt is heated with con. NaOH | No ammoniacal smell | Absence of group zero. |

**Analysis of group I**

|  |  |  |
| --- | --- | --- |
| 1**.**To a little of the salt solution added dil. HCl | No precipitate | Absence of group I |
| **Analysis of group II**  1.To the above added H2S | No precipitate | Absence of group II |

**Analysis of group III**

|  |  |  |
| --- | --- | --- |
| 1.To a little of the salt solution NH4Cl and excess of NH4OH are added | No White gelatinous precipitate | Absence of group III |

**Analysis of group IV**

|  |  |  |
| --- | --- | --- |
| 1.To the salt solution NH4Cl, NH4OH and Na2S are added | No precipitate | Absence of group IV |

**Analysis of group V**

|  |  |  |
| --- | --- | --- |
| 1.To a little of the salt solution NH4Cl, NH4OH and (NH4)2CO3 are added | No white precipitate | Absence of group V |

**Analysis of group VI**

|  |  |  |
| --- | --- | --- |
| 1.To the salt solution NH4Cl NH4OH and ammonium hydrogen phosphate solutions are added | White precipitate | Presence of group VI  Presence Mg2+ confirmed |

**Chemical equations:** (left hand side)

**Mg2+ + NH4OH + (NH4)2HPO4 Mg(NH4)PO4  ↓ + 2NH4 +  +H2O**

**White ppt.**

**RESULT:**

Acidic radical: **SO4 2-**

Basic radical: **Mg2 +**

The given salt is **Magnesium sulphate MgSO4**