To analyse the given salt for acidic and basic radicals

Experiment	Observations	Inference
1. Physical examination: (a) Noted the colour of the given salt. (b) Noted the smell of the salt.	White No specific odour	Cu^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Fe^{3+} absent. NH_4^+, S^{2-} and CH_3COO^- may be absent.

2. Dry heating test Heated a pinch of the salt in a dry test tube and noted the following observations :	A reddish brown gas evolved which turned $FeSO_4$ solution black.	$N0^{3-}$ may be present.
(a) Gas evolved	No sublimate formed.	Ammonium halides, aluminium chloride, iodide may be absent.
(b) Sublimation	No crackling sound observed.	Lead nitrate, barium nitrate, may be absent.
(c) Decrepitation	White	Ba^{2+}, Sr^{2+}, Ca^{2+}, Al^{3+}, Mg^{2+}, etc., may be present.

(d) Colour of the residue		
3. Charcoal cavity test Mixed a pinch of the salt with double the quantity of Na_2CO_3 and heated the mixture on a charcoal cavity in the reducing flame.	White residue.	Ba^{2+}, Sr^{2+}, Ca^{2+}, Al^{3+}, Mg^{2+}, etc., may be present.
4. Cobalt nitrate test To the above white residue added a drop of cobalt nitrate solution. Heated it in oxidising flame.	No characteristic colour.	Al^{3+}, Zn^{2+}„Mg^{2+}, PO_4^{3-}, may be absent.

5. Flame test Prepared a paste of the salt with cone. HCl and performed flame test.	Persistent grassy green flame on prolonged heating.	Ba^{2+} present.
6. Borax bead test Did not perform this test since the given salt was white.	–	Cu^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Fe^{3+} may be absent.
7. Dil. sulphuric acid test Treated a pinch of the salt with dil. H_2SO_4 and warmed.	No gas evolved.	CO_3^{2-}, S^{2-}, SO_3^{2-}, NO_2^- may be absent.
8. $KMnO_4$ test To a pinch of the salt added dil. H_2SO_4 and a drop of $KMnO_4$ solution.	Pink colour of $KMnO_4$ was not discharged.	Cl^-, Br^-, I^-, $C_2O_4^{2-}$ and Fe^{2+} may be absent.
9. Cone, sulphuric acid test Heated a pinch of the salt with cone, sulphuric acid and added to it a paper pellet.	A reddish brown gas evolved which turned $FeSO_4$ solution black.	NO_3^- may be present.

10. Confirmatory test for ni-trate (a) Copper chips test. Heated a pinch of the salt with cone, sulphuric acid and a few copper chips. (b) Ring test. To 2-3 ml of the salt solution, added freshly pre-pared $FeSO_4$ solution. Then added cone, sulphuric acid along the sides of the test tube.	Reddish brown gas evolved. A dark brown ring formed at the junction of the two liquids.	NO_3^- confirmed. NO_3^- confirmed.
11. Heated a pinch of salt with cone. NaOH solution	No ammonia gas evolved.	NH_4^+ absent.
12. Preparation of Original Solution (O.S.) Shook a pinch of the salt with water.	Solution obtained	Labelled it as Original Solution (O.S.)
13. To a part of the O.S. added 1-2 ml of dilute hydro-chloric acid.	No ppt. formed.	Group I absent. (Pb^{2+}absent)
14. Through a part of the above solution, passed H_2S gas.	No ppt. formed.	Group II absent (Pb^{2+}, Cu^{2+}, As^{3+}, absent)

15. To the remaining solution, added a pinch of solid ammonium chloride. Boiled the solution, cooled it and added excess of ammonium hydroxide solution.	No ppt. formed.	Fe^{3+}, Al^{3+} absent
16. Through a part of the above solution, passed H_2S gas.	No ppt. formed.	Group IV absent. (Zn^{2+}, Mn^{2+}, Co^{2+} and Ni^{2+} absent)
17. To the remaining ammonical solution added ammonium carbonate solution.	White ppt. formed.	Group V present. (Ca^{2+}, Ba^{2+}, Sr^{2+} may be present)

18. Confirmatory test for Ba^{2+} ion Filtered the above white ppt. Dissolved the ppt. in hot dilute acetic acid. (a) Pot. chromate test. To one part of the above solution, added a few drops of pot. chromate solution. (b) Flame test. Performed flame test with the salt.	 Yellow ppt. Persistent grassy green flame on prolonged heating.	 Ba^{2+} confirmed. Ba^{2+} confirmed.

Result

Acid radical : NO_3^-
Basic radical : Ba^{2+}.

Experiment	Observations	Inference
1. Physical examination: (a) Noted the colour of the	White	Cu^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Fe^{3+} absent.

given salt. (b) Noted the smell of the salt.	 No specific odour	NH_4^+, S^{2-} and CH_3COO^- may be absent.
2. Dry heating test Heated a pinch of the salt in a dry test tube and noted the following observations : (a) Gas evolved (b) Sublimation (c) Decrepitation	A colorless gas evolved which turned lime water milky. No sublimate formed. No crackling sound observed.	CO_3^{2-} may be present. Ammonium halides, aluminium chloride, iodide may be absent. Lead nitrate, barium nitrate, may be absent.

(d) Colour of the residue	Yellow when hot and white when cold	Zn^{2+} may be present.

3. Charcoal cavity test Mixed a pinch of the salt with double the quantity of Na_2CO_3 and heated the mixture on a charcoal cavity in the reducing flame.	Yellow when hot and white when cold	Zn^{2+} may be present.
4. Cobalt nitrate test To the above white residue added a drop of cobalt nitrate solution. Heated it in oxidising flame.	Green Residue	Zn^{2+} may be pesent.
5. Flame test Prepared a paste of the salt with cone. HCl and performed flame test.	Green flashes seen with naked eye	Zn^{2+} , Mn^{2+} may be present.
6. Borax bead test Did not perform this test since the given salt was white.	–	Cu^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Fe^{3+} may be absent.
7. Dil. sulphuric acid test Treated a pinch of the salt with dil. H_2SO_4 and warmed.	Colourless, odourless gas evolved with brisk	CO_3^{2-} present

Shook a pinch of salt with water taken in test tube.	effervescence, turned lime water milky. Salt did not dissolve.	Insoluble CO_3^{2-} indicated.
8. $KMnO_4$ test To a pinch of the salt added dil. H_2SO_4 and a drop of $KMnO_4$ solution.	Pink colour of $KMnO_4$ was not discharged.	Cl^-, Br^-, I^-, $C_2O_4^{2-}$ and Fe^{2+} may be absent.
9. Cone, sulphuric acid test This test was not performed as the salt reacted with dil. H_2SO_4.	–	Cl^-, Br^-, I^-, $C_2O_4^{2-}$, CH_3COO^- and Fe^{2+} may be absent.
10. Confirmatory test for carbonate Tried to dissolve the salt in water. To the salt added dil HCl	The salt is insoluble in water. Brisk effervescence with evolution of colourless, odourless gas which turned lime water milky.	Insoluble carbonate. Insoluble carbonate confirmed.
11. Heated a pinch of salt with cone. NaOH solution	No ammonia gas evolved.	NH_4^+ absent.

12. Preparation of Original Solution (O.S.) (a) Shook a pinch of the salt with water. (b) Shook a pinch of the salt in dil. HCl.	Insoluble Clear solution obtained	Labelled it as O.S. As the O.S. was prepared in dil. HCl
13. Through a part of O.S. passed H2S gas.	No ppt. formed.	Group I absent. (Pb^{2+} absent)
14. To the remaining solution, added a pinch of solid ammonium chloride. Boiled the solution, cooled it and added excess of ammonium hydroxide solution.	No ppt. formed.	Group II absent (Pb^{2+}, Cu^{2+}, As^{3+}, absent)
15. Through a part of the above solution, passed H_2S gas.		Group III absent Fe^{3+}, Al^{3+} absent

16. Confirmatory tests for Zn^{2+} ion Dissolved the above dull white ppt. in dil HCl. Boiled off H_2S.	Dull White ppt. formed.	Group IV absent. (Zn^{2+} present)
Divided the solution into two parts. (a) To one part added NaOH solution dropwise.	White ppt. soluble in excess of NaOH solution.	Zn^{2+} confirmed.
(b) To another part, added potassium ferrocyanide solution.	Bluish white ppt.	Zn^{2+} confirmed.

Result

Acid radical : CO_3^{2-}
Basic radical : Zn^{2+}