

Qualitative Analysis

Aim:- To identify two cations (Basic Radicals) from given mixture of salts.

A] Preliminary Tests :-

① Colour	Flesh (Buff) colour or light green.	Mg^{2+} , NH_4^+ , Pb^{2+} Al^{3+} , Ca^{2+} , Sr^{2+} Ba^{2+} may be present.
② Nature	Crystalline	Water soluble salts like nitrates, sulphates and halides of, NH_4^+ , Al^{3+} etc. may be present.

B] Dry Tests for Basic radicals

(Test tube must be dry for this Test)

① Heating in a dry test tube :-

Take a small quantity of the mixture in a clean and dry test tube and heat it strongly

① Decephitation (Crackling noise)

② Coloured residue

Cold

Yellow

Hot

Brown

Crystalline salt like $Pb(NO_3)_2$, $NaCl$, KBr etc. may be present

Pb^{2+} may be present

TEST	OBSERVATION	INFERENCE
<u>② Charcoal cavity Test :-</u>		
Mixture + Na_2CO_3 solid in 1:2 proportion placed in fresh charcoal cavity moisten with a drop of water. Heat it with below pipe in a reducing (yellow) flame.	① Deerepitation	Pb^{2+} or K^+ salt may be present
	② White residue	Al^{3+} , Ba^{2+} , Ca^{2+} Mg^{2+} salts may present.
<u>③ NaOH Test :-</u>		
Mixture + NaOH solution and heat. Hold moist turmeric paper near the mouth of the test tube	moist turmeric paper remains as it is	NH_4^+ absent
<u>④ Flame Test</u>		
Prepare a paste of the given mixture with conc. HCl on a watch glass. Glass rod dip in mixture, heat it on oxidising flame (Blue) observe the colour change of the flame.	Crimson red	Pb^{2+} may be present.

	OBSERVATION	INFERENCE
C] <u>Preparation of Original solution (O.S.)</u>		
Take a small quantity of mixture in a beaker add 20 ml of distilled water, stir with glass rod to dissolve the mixture. If mixture does not dissolve completely then warm it to dissolve; clear solution is obtained, which is used as a O.S. for further tests.		

D] Detection and Analysis of Groups.

From the above dry tests zero group radical is absent.

The remaining two groups must be detected from group I to VI by using following tests.

D] O.S + dil HCl	White ppt.	Group I (Pb^{2+}) present
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Filter the above ppt. and use this ppt for Analysis of Gr. I

Analysis of Group I (Pb^{2+})

Group I ppt. + H_2O (excess) and boil	Precipitate dissolves	Pb^{2+} is present. (Use this solution for confirmatory tests)
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TEST	OBSERVATION	INFERENCE
<u>C.T. for Pb^{2+}</u>		
Divide the solution into three parts.		
Part I solution + KI	Yellow ppt.	Pb^{2+} confirm
Part II solution + K_2CrO_4	Yellow ppt.	Pb^{2+} Confirm
Part III solution + dil H_2SO_4	white ppt.	Pb^{2+} Confirmed

Since the Group I is detected, in bulk o.s. add the group reagent (dil HCl) of the detected group till the first radical is completely precipitated.

Then filter the solution use ppt for analysis of gr. I and C.T. for Gr. I. With filtrate perform further tests for second group analysis and C.T. for second radicals.

Detection of Further Group.

① Filtrate + dil HCl (heat) + H_2S gas or water	No black ppt	Gr. II absent
② Filtrate (Remme H_2S) + NH_4Cl (equal) + NH_4OH (till alkaline to litmus)	white gelatinous ppt.	Gr. III is present. (Al^{3+}) is present

TEST	OBSERVATION	INFERENCE
<u>Analysis of Group III (Al^{3+}, Fe^{3+})</u>		
Filtrate + NH_4Cl + NH_4OH	White gelatinous ppt.	Al^{3+} present. (If o.s. is colourless.)
Dissolve the group III ppt. in dil HCl and use this solution for C.T. of Al^{3+}		
<u>C.T. for Al^{3+}</u>		
Above solution + few drops of NaOH and warm	white gelatinous ppt. (soluble in excess of NaOH)	Al^{3+} confirmed.
) Lake Test		
Above solution + Blue litmus solution + NH_4OH dropwise along sides of the test tube.	Blue floating mass in the colourless solution.	Al^{3+} Confirmed.
<u>Result</u> :- The given inorganic mixture contains following two cations (Basic Radicals.)		
① Pb^{2+} (Lead)		
② Al^{3+} (Aluminium)		