

Kaur

XI Sci A and B

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30/9/13

### ANALYSIS OF CATION

Prepare a clear transparent solution by dissolving the given salt in

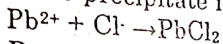
- i. Distilled water (hot or cold) or
- ii. Dil. HCl (hot or cold)

#### Group separation

##### 1. Salt solution + dil. HCl

If precipitate is formed - I group is present. ( $\text{Pb}^{2+}$ )

If the precipitate is not formed, I group is absent.



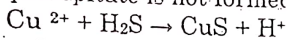
##### 2. Pass $\text{H}_2\text{S}$ .

If precipitate is formed II group is present. ( $\text{Cu}^{2+}$  or  $\text{As}^{3+}$ )

If precipitate is black, it is  $\text{Cu}^{2+}$

If precipitate is yellow, it is  $\text{As}^{3+}$ .

If precipitate is not formed, II group is absent.



##### 3. Boil it to remove $\text{H}_2\text{S}$ . Add 3 drops of ~~Con. HNO<sub>3</sub>~~

and boil. Add solid  $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{OH}$  (more).

If precipitate is formed, II group is present.

If precipitate is reddish brown, it is  $\text{Fe}^{3+}$ .

If precipitate is not formed, III group is absent



##### 4. Add more $\text{NH}_4\text{OH}$ and pass $\text{H}_2\text{S}$ .

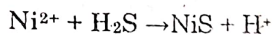
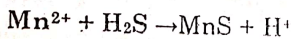
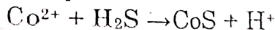
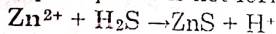
If precipitate is formed IV group is present.

If the precipitate is black, it is  $\text{Ni}^{2+}$  or  $\text{Co}^{2+}$

If it is flesh coloured, it is  $\text{Mn}^{2+}$

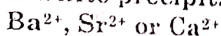
If precipitate is dirty white, it is  $\text{Zn}^{2+}$ .

If precipitate is not formed, IV group is absent.

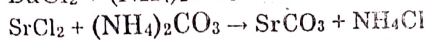
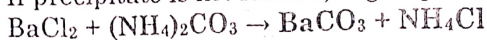


##### 5. Boil the mixture to remove $\text{H}_2\text{S}$ . Add $\text{NH}_4\text{Cl}$ , $\text{NH}_4\text{OH}$ and $(\text{NH}_4)_2\text{CO}_3$

If white precipitate is formed, V group is present.



If precipitate is not formed, V group is absent.



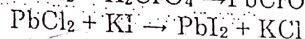
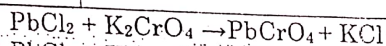
6. If there is no precipitate, it would be  $\text{NH}_4^+$  or  $\text{Mg}^{2+}$ .

### Confirmatory tests:

#### I group

Wash the precipitate with cold water and add 2ml of water and boil. Divide it into 2 parts.

S.No.	Experiment	Observation	Inference
1	To one part add $\text{K}_2\text{CrO}_4$	Yellow precipitate	$\text{Pb}^{2+}$ is confirmed
2	To the other part add KI	Yellow precipitate	$\text{Pb}^{2+}$ is confirmed

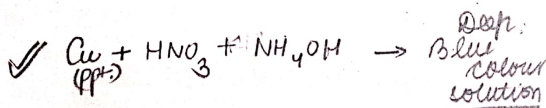


#### II group:

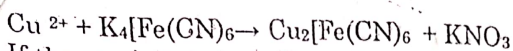
Wash the precipitate with hot water.

If the precipitate is black, treat with 3ml of  $\text{HNO}_3$  and boil. Add  $\text{NH}_4\text{OH}$ . Blue colour solution is obtained. Divide the blue solution into 2 parts.

S.No.	Experiment	Observation	Inference
1	To one part, add acetic acid + KI	White precipitate is formed in brown solution	$\text{Cu}^{2+}$ is confirmed
2.	To the other part add $\text{K}_4[\text{Fe}(\text{CN})_6]$	Chocolate brown colour	$\text{Cu}^{2+}$ is confirmed



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If the precipitate is yellow, dissolve the precipitate in **Con. HNO<sub>3</sub>** and divide into 2 parts.

S.NO.	Experiment	Observation	Inference
1.	Ammonium molybdate	Yellow precipitate	As <sup>3+</sup> is confirmed
2.	Magnesia mixture	White precipitate	As <sup>3+</sup> is confirmed

III group: Al<sup>3+</sup> (white ppt.) / Pg. 196. (Pac. book)

2) Cobalt Nitrate test

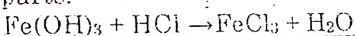
C.T: 1) Lake test: Dissolve white ppt + dil HCl. Add 2 drops of blue detrus soln. + NH<sub>4</sub>OH dropwise till blue colour develops. — Blue ppt.

Perform charcoal cavity / Cobalt nitrate test with soln. *blue mass*

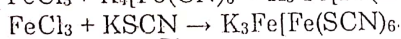
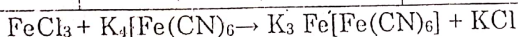
III group:

If the precipitate is reddish brown, it is Fe<sup>3+</sup>

Dissolve the precipitate in dil. HCl and divide the solution into 2 parts.



S.NO.	Experiment	Observation	Observation
1.	Add NH <sub>4</sub> OH	Dark brown colour	Fe <sup>3+</sup> is confirmed
2.	K <sub>4</sub> [Fe(CN) <sub>6</sub> ]	Deep blue	Fe <sup>3+</sup> is confirmed
3.	Add KSCN	Deep red colour	Fe <sup>3+</sup> is confirmed



Group: IV

Case I

If the precipitate is black, it is Co<sup>2+</sup> or Ni<sup>2+</sup>

Dissolve the precipitate in aqua regia ( 3 parts of con. $\text{HNO}_3$  and 1 part of  $\text{HCl}$ )

Blue residue –  $\text{Co}^{2+}$ . Yellow precipitate –  $\text{Ni}^{2+}$  Evaporate the solution in a china dish. Dissolve in water. Pink colour solution is obtained. Divide into 2 parts.

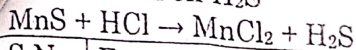
S.No.	Experiment	Observation	Inference
1.	To one part add $\text{KSCN}$ . Allow to settle	Blue colour	$\text{Co}^{2+}$ is confirmed
2.	Add $\text{NH}_4\text{OH}$ , $\text{CH}_3\text{COOH}$ and crystal $\text{KNO}_3$ and warm	Yellow precipitate	$\text{Co}^{2+}$ is confirmed

Dissolve the yellow precipitate in water. Green solution is obtained. Divide the green solution into 2 parts.

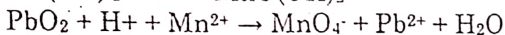
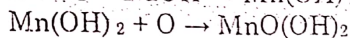
S.No.	Experiment	Observation	Inference
1.	Add $\text{NH}_4\text{OH}$ and few drops of DMG	Bright red precipitate	$\text{Ni}^{2+}$ is confirmed
2.	Add $\text{NaOH}$ in excess and bromine water and boil	Black precipitate	$\text{Ni}^{2+}$ is confirmed

Case: II

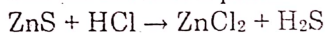
the precipitate is of buff colour, dissolve the precipitate in dil.HCl. Boil-off  $H_2S$



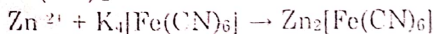
S.No.	Experiment	Observation	Inference
1.	Add NaOH solution	White precipitate	$Mn^{2+}$ is confirmed
2.	To the white precipitate add bromine water	Black or brown colour	$Mn^{2+}$ is confirmed
3.	To the black precipitate add Con. $HNO_3$ and lead peroxide. Boil and cool	Pink colour solution	$Mn^{2+}$ is confirmed

Case: III

If the precipitate is dirty white, dissolve in dil.HCl, boil off  $H_2S$  and divide into 2 parts.



S.No	Experiment	Observation	Inference
1	Add NaOH dropwise	White precipitate	$Zn^{2+}$ is confirmed
2	To the white precipitate, add more NaOH	White precipitate dissolves	$Zn^{2+}$ is confirmed
3	To the other part add $K_4[Fe(CN)_6]$ <i>Potassium Fero - Cyano.</i>	White precipitate or bluish	$Zn^{2+}$ is confirmed

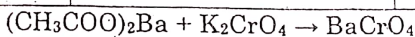




**Group: V**

Dissolve the part of the white precipitate in hot dil acetic acid and divide the solution into 3 parts  $\text{BaCO}_3 + \text{CH}_3\text{COOH} \rightarrow (\text{CH}_3\text{COO})_2\text{Ba} + \text{H}_2\text{O} + \text{CO}_2$

S.No	Experiment	Observation	Inference
1.	Add few drops of potassium chromate	Yellow precipitate	Barium is confirmed
2.	Flame test	Green flame	Barium is confirmed



If  $\text{Ba}^{2+}$  is absent

S.No	Experiment	Observation	Inference
1.	Add ammonium sulphate solution and warm	White precipitate	$\text{Sr}^{2+}$ is confirmed
2.	Flame test	Crimson red	$\text{Sr}^{2+}$ is confirmed



If  $\text{Ba}^{2+}$  and  $\text{Sr}^{2+}$  are absent, then

S.No	Experiment	Observation	Inference
1.	Add ammonium oxalate and little ammonium hydroxide	White precipitate	Calcium is confirmed
2.	Flame test	Brick red	Calcium is confirmed



Group VI

Concentrate the filtrate and divide into 2 parts

S.No	Experiment	Observation	Inference
1.	To one part of the solution add solid ammonium chloride ammonium hydroxide in slight excess. Then add ammonium phosphate solution	White precipitate	$Mg^{2+}$ is confirmed
2.	Add NaOH solution and then add freshly prepared cobalt nitrate	Yellow precipitate	$Mg^{2+}$ is confirmed

S.No	Experiment	Experiment	Inference
1.	Solid mixture is heated with con. NaOH	Ammonia gas is evolved. The gas gives white fumes when a rod dipped in dil. HCl is brought near the mouth of the test tube.	$NH_4^+$ is confirmed
2.	Salt + nessler's reagent	Brick red precipitate	$NH_4^+$ is confirmed

Result: The given salt is \_\_\_\_\_  
 The anion present in the salt is \_\_\_\_\_  
 The cation present in the salt is \_\_\_\_\_