

Ministry of Higher Education and
Scientific Research
University of Anbar
College of Dentistry



Practical Medical Chemistry
Class:1st stage

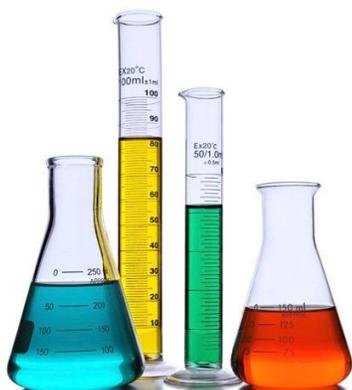
Lab.9

Detection of Positive Ions (Cations)

الكشف عن الأيونات الموجبة (الكاتيونات)

By :

Assist.Lect. Shahad Abdunnassir



Separation and Identification Of Group 1 Cations



The purpose of this experiment was to separate and identify group one cations through qualitative analysis.



Introduction

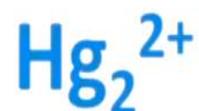
Qualitative analysis is a branch of analytical chemistry that identifies particular substances in a given sample of material. In the analysis of inorganic substances, this branch involves the analysis of both metallic constituents as cations and nonmetallic constituents as anions.

Precipitation is the formation of a solid in a solution during the chemical reaction . when the chemical reaction occurs the solid formed is called the precipitate.

Precipitate is an insoluble solid that separate from the solution .

Separations these are procedure that separate groups of ions from other groups or individual ions in a mixture of ions.

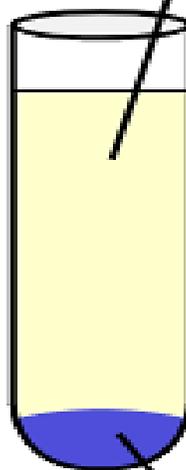
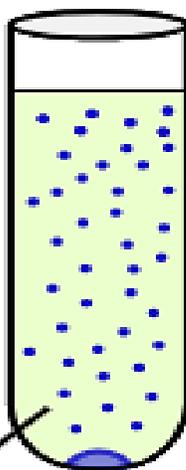
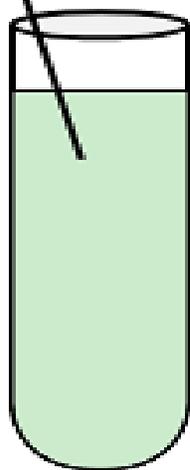
Group I Analysis



Precipitating reagent : dilute HCl

Solution

Supernate

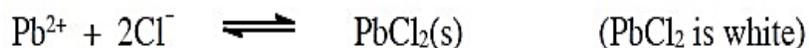
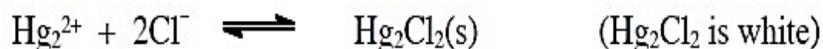


Suspension

Precipitate

Chemistry of the Precipitation of the Group I Cations

The precipitating reagent of Group I is a dilute solution of hydrochloric acid, and the ions precipitated are those of silver, Ag^+ , mercury (I), Hg_2^{2+} , and lead (II), Pb^{2+} . The net ionic equations are:



A slight excess of chloride ion is used to reduce the solubility of the precipitates in accordance with the common ion effect. Even so the solubility of lead chloride is sufficiently high for an appreciable concentration of lead ion to remain in solution.

A large excess of chloride ion should be avoided in order to prevent the formation of soluble chloro complex ions which will dissolve the precipitates:



Chemistry of the Separation and Identification of the Group I Cations

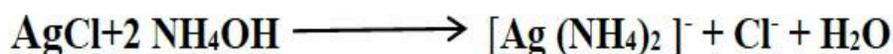
The lead chloride may be extracted from the other two chlorides which may also be in the precipitate with hot water since its solubility increases with an increase in temperature much more markedly than do the solubility of silver chloride and mercury (I) chloride.



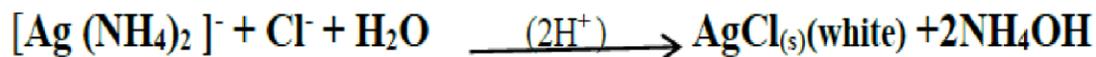
The presence of lead ion is confirmed by adding an aqueous solution of potassium chromate, K_2CrO_4 , which provides chromate ion to form lead chromate, PbCrO_4 , a bright yellow solid which is less soluble than lead chloride:



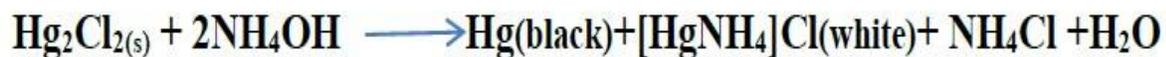
The silver chloride and mercury (I) chloride which may be in the precipitate may be separated from one another by taking advantage of the fact that only silver ion forms a soluble complex ion with ammonia. By adding ammonia water to the residue, the silver chloride is selectively dissolved due to the formation of the soluble di ammine silver (I) ion.



The presence of silver ion is confirmed by acidification of the solution containing the $\text{Ag}(\text{NH}_3)_2^+$ ion with nitric acid. The nitric acid converts the ammonia of the silver complex ion equilibrium to ammonium ion:



The addition of ammonia converts the white mercury (I) chloride in the precipitate to a mixture of white mercury (II) amidochloride and elemental mercury, black in the finely divided condition in which it is formed:



Tools used in the experiment

- 1- Test tube
- 2- Beaker
- 3- Dropper

Chemical materials

- 1- $\text{Pb}(\text{NO}_3)_2$
- 2- AgNO_3
- 3- Hg_2SO_4
- 4- Dil. HCl
- 5- K_2CrO_4
- 6- NH_4OH

Procedure

