

## Separation and Identification Of Group 1 Cations



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



التحليل النوعي هو فرع من الكيمياء التحليلية التي تحدد مواد معينة في عينة معينة من المواد. في تحليل المواد غير العضوية، يتضمن هذا الفرع تحليل كل من المكونات المعدنية كأيونات وغير المعدنية كأنيونات.

**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.

الترسيب هو تشكيل مادة صلبة في محلول أثناء التفاعل الكيميائي. عندما يحدث التفاعل الكيميائي فإن المادة الصلبة التي تشكلت تسمى راسب.

**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.

الراسب هو مادة صلبة غير قابلة للذوبان تنفصل عن المحلول.

**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.

الانفصال هذه هي الإجراءات التي تفصل مجموعات الأيونات عن المجموعات الأخرى أو الأيونات الفردية في خليط من الأيونات

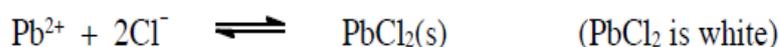
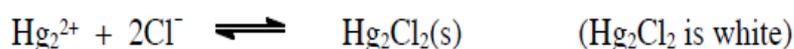
جهاز الطرد المركزي هو وسيلة تستخدم لفصل خليط غير متجانس من المواد الصلبة والسائلة عن طريق تدويره ، بعد جهاز طرد مركزي ناجح ، يستقر الراسب الصلب في قاع أنبوب الاختبار ويكون المحلول المسمى بالفلتر صافياً

**A centrifuge** is an instrumental used to separate a heterogeneous mixture of solid and liquid by spinning it , after a successful centrifuge , the solid precipitate settle to the bottom of the test tube and the solution called the filter is clear .

### Chemistry of the Precipitation of the Group I Cations

كاشف ترسيب المجموعة الأولى هو محلول مخفف من حمض الهيدروكلوريك، والأيونات المترسبة هي تلك من الفضة،  $+Ag$ ، الزئبق (I)،  $+Hg_2$ ، والرصاص (II)،  $+Pb_2$ . المعادلات الأيونية الصافية هي

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:



ترجمه

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:



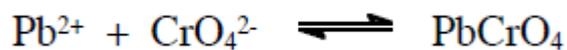
**Chemistry of the Separation and Identification of the Group**

**I Cations**

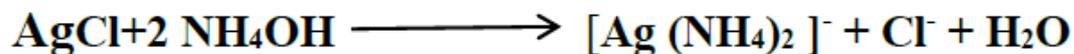
The lead chloride may be extracted from the other two chlorides which may also be in the precipitate with hot water since its solubility increases with an increase in temperature much more markedly than do the solubilities of silver chloride and mercury (I) chloride.



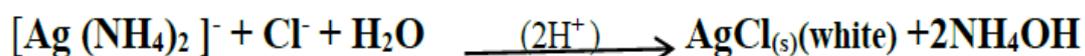
The presence of lead ion is confirmed by adding an aqueous solution of potassium chromate,  $\text{K}_2\text{CrO}_4$ , which provides chromate ion to form lead chromate,  $\text{PbCrO}_4$ , a bright yellow solid which is less soluble than lead chloride:



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 diammine silver (I) ion.

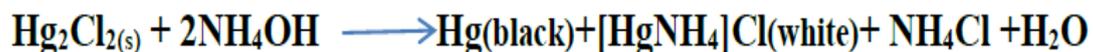


The presence of silver ion is confirmed by acidification of the solution containing the  $\text{Ag}(\text{NH}_3)_2^+$  ion with nitric acid. The nitric acid converts the ammonia of the silver complex ion equilibrium to ammonium ion:



## Lab.4                      Medical Chemistry                      Dr.Nada Hasan

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:



This type of reaction seen with mercury is called a disproportionation reaction where the  $\text{Hg}_2\text{Cl}_2(\text{s})$  oxidizes and reduces itself to  $\text{Hg}(\text{black})$  and  $[\text{HgNH}_4]\text{Cl}(\text{white})$ , so the mix of the two gives a gray precipitate .

The formation of the insoluble black mixture of the two principal products serves as confirming evidence for the original presence of mercury (I).

