Republic of Iraq Ministry of Higher Education and Scientific Research Al-Mustansiriyah University Collage of Science Department of Chemistry



# Practice Qualitative Chemical Analysis

First Grade - First Term

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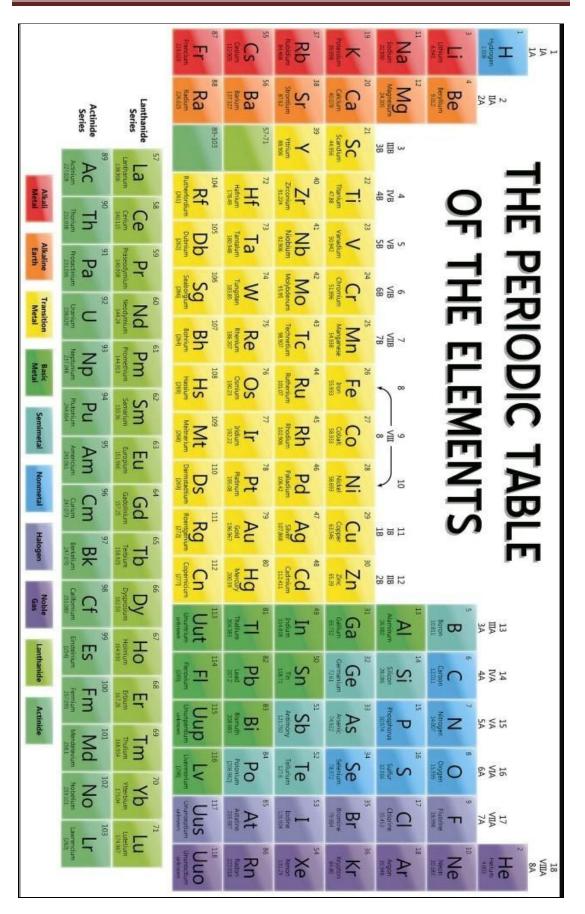
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## **Qualitative Analysis**

## Separation of ions to groups and identification

Identification steps at first time to groups by certain reagents and then detection each ion in group:

- 1- Identification of groups by certain reagent.
- 2- Identification of each ion in group by special reagent.

Properties of reagents used in the detection and separation of ions of different groups from each other:

- 1- Abilities to precipitate ions of group which belong to it from mixture.
- 2- Reagent must form pure precipitate with ions of element belong to its group without ions from other group.
- 3- The resulting precipitate must be easily separated from the other ions in solution.
- 4- Reagent must be stable, doesn't decomposed and easily to have it, low cost.

## **Analysis Of Cations**

Several methods for the analysis of cations for metals were used descriptively.

The cations covered in this course will be restricted to those of silver, lead, mercury, copper, bismuth, cadmium, arsenic, tin, antimony, iron, manganese, cobalt, nickel, zinc, aluminum, chromium, barium, calcium, strontium, magnesium, sodium, potassium, and ammonium.

The outline will describe the method of precipitating and .analyzing each group. To analyze a general unknown, it is necessary only that the solution left from the Group I precipitation be used as the unknown for the Group II analysis, the solution from the Group II precipitation for the Group III unknown, etc. For the usual analysis, no more than 1 ml. of unknown should be taken. More will make the analysis difficult.

Precipitates of group	Precipitation agent	Ions	Groups
	agent		Group I
AgCl, Hg <sub>2</sub> Cl <sub>2</sub> , PbCl <sub>2</sub>	3M HCl	$Ag^{+1}, Pb^{+2}, Hg\frac{+2}{2}$ مجموعة الفضة	
HgS, pbS, $Bi_2S_3$ , CuS, CdS		IIA= $(Cu^{+2}, Hg^{+2}, Pb^{+2}, Bi^{+3}, Cd^{+2})$	Group II
	$H_2S + 0.3M$ HCl	مجموعة النحاس	
$As_2S_3$ , $Sb_2S_3$ , $SnS_2$ , $SnS$			
2 37 2 3, 2,		IIB = $(As^{+3}, Sb^{+3}, Sn^{+2}, Sn^{+4})$	
		مجمو ُعة الزرنيخ	
$Cr(OH)_3$ , $Al(OH)_3$ ,	$\mathrm{NH_{3}+ \mathrm{NH_{4}}^{+1}}$	IIIA=( $Fe^{+3}, Cr^{+3}, Al^{+3}$ )	Group III
Fe(OH) <sub>3</sub>		مجموعة الحديد	
MnS, ZnS, NiS, CoS	$H_2S+NH_3+NH_4^{+1}$	IIIB = $(Zn^{+2}, Mn^{+2}, Ni^{+2}, Ni^{+2}, Co^{+2})$	
		مجموعة الزنك	Group IV
Ba(PO <sub>4</sub> ) <sub>2</sub> , Sr <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> ,			Oroup I v
$Ca_3(PO_4)_2, Mg(NH_4)PO_4$	(NH <sub>4</sub> ) <sub>2</sub> HPO <sub>4</sub>	Ca <sup>+2</sup> , Ba <sup>+2</sup> , Sr <sup>+2</sup> , Mg <sup>+2</sup> مجموعة الكالسيوم	
		.1 .1 .1	
لا يوجد كاشف مرسب خاص بهذه المجموعة حيث		Na <sup>+1</sup> , K <sup>+1</sup> , NH <sup>+1</sup> مجموعة العناصر القلوية	Group V
أن لكل ايون كاشفه الخاص به			