

Ministry of Higher Education and Scientific research



**Coursebook**

**Department of ...Chemistry.....**

**College of .....Education.....**

**University of .....Salahuddin-Erbil.....**

**Subject: Introduction of coordination Chemistry**

**Course Book – (3<sup>rd</sup>Year) / 1<sup>st</sup> course**

**Lecturer's name Dr.Hikmat Ali Mohamad (PhD)**

**Academic Year: 2022/2023**

<b>1. Course name</b>	<b>Introduction to coordination Chemistry</b>
<b>2. Lecturer in charge</b>	<b>Dr.Hikmat Ali Mohamad</b>
<b>3. Department/ College</b>	<b>Chemistry / Education</b>
<b>4. Contact</b>	e-mail: <a href="mailto:Hikmat.mohamad@su.edu.krd">Hikmat.mohamad@su.edu.krd</a> <b>Tel:+964 770 13193 28)</b>
<b>5. Time (in hours) per week</b>	<b>Theory: 0 Practical: 3 + 3</b>
<b>6. Office hours</b>	<b>2</b>
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b>	<b>BSc.: 1989, Salahuddin University – Erbil- Iraq MSc. (Analytical Chemistry), 1997, Su,Erbil- Iraq PhD, 2007(Inorganic Chemistry), 2007, <u>university of Baghdad, Baghdad –Iraq</u> <u>Assist Lecture :1997</u> <u>Lecturer: 2004</u> <u>Assist prof : 2010</u> <u>Professor: 2018</u> <u>Post graduate Supervision : Msc ; 15, PhD ;3 , Diploma ;1</u> <u>Conferences: 15</u> <u>Skill: A A, NMR spectroscopy, X-Ray diffraction for single crystal .</u> <b>Examiner Committee Post graduate, More than 100</b></b>
<b>9. Keywords</b>	<b>3<sup>rd</sup> year ' inorganic chemistry, education</b>
<b>10. Course overview:</b>	If organic chemistry is considered to be the ‘chemistry of carbon’, then inorganic chemistry is the chemistry of all elements except carbon. In its broadest sense, this is true, but of course there are overlaps between branches of chemistry Inorganic chemistry is not simply the study of elements and compounds; it is also the study of physical principles. For example, in order to understand why some compounds are soluble in a given solvent and others are not, we apply laws of thermodynamics. If our aim is to propose details of a

reaction mechanism, then a knowledge of reaction kinetics is needed. Overlap between physical and inorganic chemistry is also significant in the study of molecular structure. In the solid state, X-ray diffraction methods are routinely used to obtain pictures of the spatial arrangements of atoms in a molecule or molecular ion. To interpret the behaviour of molecules in solution, we use physical techniques such as nuclear magnetic resonance (NMR) spectroscopy; the equivalence or not of particular nuclei on a spectroscopic timescale may indicate whether a molecule is static or undergoing a dynamic process in this text, we describe the results of such experiments but we will not

The aim of study of Inorganic Chemistry is:

1. The study of introduction of coordination chemistry.
2. The study nomenclature of coordination compounds.
3. Adopt idea that describes of coordination bonding.
4. The study of physical properties metal ion complexes.

### **11. Course objective:**

At the end of the course students will be able to:

- Explain certain key introductory concepts in, complex structures, VBT, MOt theory, explanation of chemical reactions.
- Use the skills development in the explanation of physical and chemical behaviours of prepared complexes.
- To provide experience in practical techniques.
- To obtain necessary information about bond theories; molecular orbital theory, valence bond theory.
- Focus on the type of crystals, in order to knowing some properties of them which related to the nature of the crystal.

### **12. Student's obligation**

**\* The students must be attending lecture 3 hours weekly in inorganic laboratory .**

**\* All students must get monthly and daily examination. They also may be participate in discussion and conclusion.**

**\*Final exam will be determined the exam board**

### **13. Forms of teaching**

Different form of teaching will be used to reach the objectives of the course, discussion and conclusion, and practical skills .... Etc.

### **14. Assessment scheme**

**The students are required to do closed book exam at the mid of the semester**

### **15. Student learning outcome:**

**The students learning during this course:**

- 1- Coordination concept.**
- 2- Solving questions in experimental**
- 3- Understanding knowledge about coordination chemistry.**
- 4- Explanation of covalent-coordination bond forming.**

### **16. Course Reading List and References:**

Required book:

1- Chemistry Structure & bonding

Roger L. Deco & Harry B. Gray

2-General Chemistry sixth edition Kenneth W. Whitten,

NO of Week	Name of Experiment
<b>First course</b>	
1	Introduction to Coordination chemistry
2	Preparation of tris(acetylacetonato)Iron(III) $[\text{Fe}(\text{acac})_3]$
3	Preparation of tris(acetylacetonato)manganese (III) $[\text{Mn}(\text{acac})_3]$
4	Preparation of Potassium trioxalatochromate(III) trihydrate $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3] \cdot 3\text{H}_2\text{O}$
5	Determination of $\text{C}_2\text{O}_4^{2-}$ (oxalate) in $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3] \cdot 3\text{H}_2\text{O}$ complex
6	Week (5): Exam.
7	Preparation of Potassium dioxalato diaquachromate(III) dehydrate $\text{Cis-K}[\text{Cr}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2] \cdot 2\text{H}_2\text{O}$
8	Preparation of trans-Potassium dioxalato diaquachromate (III) trihydrate $\text{Trans-K}[\text{Cr}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2] \cdot 3\text{H}_2\text{O}$
9	Detection of $\text{Cis-K}[\text{Cr}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2] \cdot 2\text{H}_2\text{O}$ and $\text{Trans-K}[\text{Cr}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2] \cdot 3\text{H}_2\text{O}$ complex
10	Preparation of hexaamminenickel(II) chloride $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$
11	Determination of Nickel in $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$ Complex by (DMG)
12	Exam.
13	Preparation of tris(ethylenediamine)nickel (II) chloride dihydrate $[\text{Ni}(\text{en})_3]\text{Cl}_2 \cdot 2\text{H}_2\text{O}$
14	Preparation of Tetra-amminecopper(II) sulphate hydrate $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4 \cdot \text{H}_2\text{O}$
15	Preparation of hexa-amminecobalt(III) chloride $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$

**17. Extra notes:**

**\* We suggest that each examination may be after the end of course (30 hours)**

