Syllabus Spring 2019
CHEM 280 Inorganic Chemistry I
CHEM 280L Inorganic Chemistry I Laboratory

1. Course Description

Surveys classical and contemporary approaches to the study of coordination compounds, solid-state chemistry and the chemistry of elements based on groups in the periodic table.

2. Credit Hour Policy

"This course meets the federal requirements of 45–75 total hours of student work (combined classroom plus other academic activities such as laboratory, clinical, or fieldwork) per credit hour" (COMBINED DEF 1 & 2)

3. Faculty Contact Information

Instructor: Todsapon Thananatthanachon, Ph.D.
Office: KC 322
Email: tt92@evansville.edu
Phone: 812-488-2415

4. Course Meeting Days and Times

Lecture		MWF, 12:00 pm – 12:50 pm, KC101
Lab	Section 1	M, 2:00 pm – 5:00 pm, KC335
	Section 2	Th, 1:00 pm – 4:00 pm, KC335
	Section 3	Tu, 1:00 pm – 4:00 pm, KC335

5. Course Learning Objectives

Topics	**Learning Outcomes**: Students will be able to:
Coordination chemistry: Introduction	- Identify properties and characteristics of coordination compounds such as oxidation number, coordination number, and electron count of metal centers. - Give proper naming and chemical formula of coordination compounds.
Coordination chemistry: Structures	- Identify the structure of coordination compounds based on their coordination numbers. - Determine isomers (both optical and structural) of coordination compounds.
Coordination chemistry: Bonding	- Utilize various bonding theories to describe bonding in coordination compounds. - Determine hybrid orbitals of the metal centers in a coordination compounds by using the valence bond

	theory - Apply the crystal field theory to explain optical property, stability and magnetic property of coordination compounds
Coordination chemistry: Reaction and mechanism	- Identify type of reactions for coordination compounds - Explain and predict the effect of incoming ligand, leaving ligand and metal center on a substitution reactions and its mechanism. - Utilize the *trans*-effect to explain the strength of chemical bond - Predict proper mechanism for electron-transfer reactions
Solid state chemistry: structures	- Determine number of atoms, coordination number, length of cell edge and radius of atoms in various cubic unit cells. - Identify ionic structures of various ionic compounds. - Identify type of structural defects commonly found in ionic compounds
Solid state chemistry: energies	- Determine lattice energy of various ionic compounds.
Descriptive chemistry	- Explain the nature and the trends in periodic properties including chemical reactivity, physical properties (sizes, ionization energies, etc.) of the main group and the f-block elements. - Explain the physical and chemical reactivities of main group elements and their common compounds - Recognize impacts and applications of main group elements and their compounds in everyday's life.
Laboratory	- Plan and perform experiments involving inorganic synthesis. - Prepare solutions of various concentrations by means of dissolution of solid samples and diluting more concentrated solution samples. - Utilize modern instrumental techniques such as IR, UV-VIS, NMR spectroscopy and magnetic susceptibility balance to characterize products.

6. Schedule with Topics and Assignments

Tentative lecture and lab schedule

January 2019

Su	M	T	W	Th	F	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14 **Day 1** Introduction and review **HW1 assigned**	15	16 **Day 2** Coordination Chem: Introduction	17	18 **Day 3** Coordination Chem: Introduction	19
20	21 **MLK day** **No Class**	22	23 **Day 4** Coordination Chem: Introduction	24 Exp. 1 (lab section 2)	25 **Day 5** Coordination Chem: Structure **HW2 assigned** **Quiz 1**	26
27	28 **Day 6** Coordination Chem: Structure Exp. 1 (lab section 1)	29 Exp. 1 (lab section 3)	30 **Day 7** Coordination Chem: Structure	31 Exp. 2 (lab section 2)		

February 2019

Su	M	T	W	Th	F	Sa
					1 **Day 8** Coordination Chem: Bonding **HW3 assigned** **Quiz 2**	2
3	4 **Day 9** Coordination Chem: Bonding Exp. 2 (lab section 1)	5 Exp. 2 (lab section 3)	6 **Day 10** Coordination Chem: Bonding	7 Exp. 3 (lab section 2)	8 **Day 11** Coordination Chem: Bonding	9
10	**11 Day 12** Coordination Chem: Reaction and mechanism Exp. 3 (lab section 1)	12 Exp. 3 (lab section 3)	13 **Day 13** Coordination Chem: Reaction and mechanism Exp. 3 (lab section 1) **HW4 assigned**	14 Exp. 4 (lab section 2) **Exam 1**	15 **Day 14** Coordination Chem: Reaction and mechanism	16
17	18 **Day 15** Coordination Chem: Reaction and mechanism Exp. 4 (lab section 2)	19 Exp. 4 (lab section 3)	20 **Day 16** Coordination Chem: Applications **Reading assign. 1 assigned**	21 Exp. 5 (lab section 2)	22 **Day 17** Solid-state: structures **HW 5 assigned** **Quiz 3**	23
24	25 **Day 18** Solid-state:	26	27 **Day 19** Solid-state:	28		

	structures Exp. 5 (lab section 1)	Exp. 5 (lab section 3)	structures	Exp. 6 (lab section 2)		

March 2019

Su	M	T	W	Th	F	Sa
					1 **Day 20** Solid-state: structures	2
3	4 **Day 21** Solid-state: structures Exp. 6 (lab section 1)	5 Exp. 6 (lab section 3)	6 **Day 22** Solid-state: Energies **HW6 assigned** **Quiz 4**	7 Exp. 7 (lab section 2)	8 **Day 23** Solid-state: Energies	9
10	11	12	13 **Spring Break** **No class**	14	15	16
17	18 **Day 24** Periodic table Exp. 7 (lab section 1)	19 Exp. 7 (lab section 3)	20 **Day 25** Periodic table **HW7 assigned** **Quiz 5**	21 Exp. 8 (lab section 2)	22 **Day 26** Hydrogen and hydrides	23
24	25 **Day 27** Oxygen Exp. 8 (lab section 1)	26 Exp. 8 (lab section 3)	27 **Day 28** Group 1A	28 Exp. 9 (lab section 2) **Exam 2**	29 **Day 29** Group 2A	30

April 2019

Su	M	T	W	Th	F	Sa
	1 **Day 30**	2 **Dr. T out of town** **No class**	3 **Day 31**	4	5 **Day 32** Group 3A **HW8 assigned**	6
7	8 **Day 33** Group 4A Exp. 9 (lab section 1)	9 Exp. 9 (lab section 3)	10 **Day 34** Group 4A **Reading assign. 2 assigned**	11 Exp. 10 (lab section 2)	12 **Day 35** Group 5A	13
14	15 **Day 36** Group 6A Exp. 10 (lab section 1)	16 Exp. 10 (lab section 3)	17 **Day 37** Group 6A **HW9 assigned** **Quiz 7**	18	19 **Easter Break** **No Class**	20
21	22 **Day 30** Group 7A Exp. 11 (lab section 1)	23 Exp. 11 (lab section 3)	24 **Day 39** Group 8A	25 Exp. 11 (lab section 2)	26 **Day 40** f-block metals	27
28	29 **Day 41** f-block metals	30				

May 2019

Su	M	T	W	Th	F	Sa
			1 **Day 42** **Exam 3**	2 Reading/Study Day	3	4 **Final Exam 2:00 pm**
5	6	7	8	9	10	11
12	13	14	15	16	17	18

Tentative lab schedule

Exp	Date	Title	Note
1	01/24 – 01/29	Synthesis of a photosensitive iron complex	
2	01/31 – 02/05	Linkage isomerism: an infrared study	
3	02/07 – 02/12	Spectroscopy of transition metal complexes	
4	02/14 – 02/19	Synthesis, characterization, and catalytic activity of dichlorodiphosphinenickel(II) compounds	
5	02/21 – 02/26	Crystal growth in gels	Lab worksheet will be provided and is due 05/02
6	02/28 – 03/05	Solid-state models	
7	03/07 – 03/19	Identification of unknown substance #1: alkali metal halide	
8	03/21 – 03/26	Identification of unknown substance #2: alkaline earth and aluminum salts	
9	03/28 – 04/9	Determination of stability constants for various Li^{+}-crown ether complexes by ^{7}Li NMR	
10	04/11 – 04/16	Synthesis of X-Type Zeolite	

11	04/22 – 04/25	Unknown lab	

7. Method of Instruction

The material will be presented primarily by a combination of lecture and discussion.

Lectures are met weekly on Monday, Wednesday, and Friday at 12:00 pm.

Homework will generally be assigned weekly, and is due the following week at the beginning of the lecture, unless noted otherwise. Each assignment is worth 10 points.

A total of 7 **quizzes** will be given typically on the first 15 minutes of lectures (see tentative schedule). Each quiz is worth 20 points. Two lowest quiz scores will be dropped. No make-up quiz is allowed.

Two **reading assignments** will be assigned during a course of the semester. Articles from scientific journals as well as the accompanying worksheets will be posted on the Blackboard. Each assignment is worth 20 points.

Midterm exams are closed books and closed notes. Each of the three midterm exams will have a maximum score of 150 points and will be held on **February 14th, March 28th, and May 1st at 6:30 pm**.

The final exam is worth 200 points and is scheduled on **Saturday May 4th, 2018 at 2:00 pm**. The final exam is consisted of two parts: the standardized ACS inorganic chemistry exam (50 points) and the regular exam written by Dr. Tod (150 points). The final exam will be accumulative.

Laboratory

There are three components utilized for evaluating student's performance in laboratory: pre-lab assignments/in-lab quiz, lab report, and lab behavior. Up to 150 points will be counted toward the course grade. The lab manual for each experiment will be posted on the Blackboard at least one week prior to the week of the experiment. It is to be noted that **the provided lab manual is not allowed in the lab**. Students, therefore, are expected to read, comprehend, and then write a summary of the experiment in their own lab notebook.

Quiz and pre-lab assignments: Either quiz or pre-lab assignment will be given for each experiment. Quiz will be given at the beginning or at the end of each experiment. Students may consult with their lab notebook while taking the quiz. Pre-lab assignment will be included in the lab manual posted on the class's Blackboard and is to be turned in at the beginning of the lab. Each assignment is worth 5 points.

Weekly lab report is due at the beginning of the next experiment. The lab report must be typed using Microsoft Word or other comparable electronic software, and submitted on

Livetext. Only 1 lab report is required for each group. Each report is worth 10 points. **No late lab report will be accepted.**

Lab behavior (2 points for each experiment). Each student will also be evaluated by his/her behavior in the lab. This includes the preparedness and organization of the students, the understanding of and complying with the lab and the safety rules, etc.

8. Withdrawal and Attendance Policies

Withdrawal: The University policy allows you to withdraw from a class without a designated grade or record on your transcript during the first week of a semester. The last date to withdraw without a grade of W will be Friday, January 18, 2019. The last day to withdraw from Chemistry 280 and receive a W is Friday, April 12, 2019. All withdrawals thereafter will be assigned a grade of F except for health or emergency reasons as determined by the Office of the Dean of Students. Failure to withdraw officially from a class or from the University will result in an F for each of the courses involved. **Before** asking me to sign a drop slip **you must check out of the laboratory.**

Attendance policy: You are **required** to attend the laboratory sessions and take all exams when scheduled. In general, no make up exams will be given. A sufficient number of quizzes will be given so that make up quizzes will be unnecessary. If you are required to miss and exam for a documented university activity or if you have a **documented** illness, you will be excused from that exam unless you have made arrangements to take the exam early. You will be given a score for that exam which will be the average of your other hour exams and the final exam. There are **no provisions** for laboratory make-ups. If you miss a laboratory for the same reasons given for missing exams, you must contact me. Your score on that particular laboratory experiment will be the average of your scores on all other experiments.

9. Grading Criteria

Your grade will base on the total points that you accumulate during the semester. You can accumulate points through your work in the laboratory, on exams and quizzes, and on homework. The point scale is:

Homework assignment	90	points
Quizzes	100	points
Two reading assignments	40	points
Three midterm exams	450	points
Final exam	200	points
Laboratory	150	points
Total	**1030**	**points**

Your final letter grade will be based as follows:

A: 90%-100% D: 60%-69%

B: 80%-89%
C: 70%-79%
F: < 60%

10. Office Hours

MWF: 10:00 – 11:00 am
TuTh: 9:00 – 11:00 am
W: 2:00 – 4:00 pm
By appointment

11. Disability Policy

It is the policy and practices of the University of Evansville to make reasonable accommodations for students with properly documented disabilities. Written notification to faculty from the Office of Counseling Services is required for any academic accommodation. If you are eligible to receive an accommodation and would like to request it for this course, please discuss with me. Otherwise, it is not guaranteed that the accommodation can be provided on a timely basis. If you have questions about services for students with disabilities or procedures for requesting services, you may contact the Office of Counseling Services.

12. Honor Code

All assignments occur under the purview of the University of Evansville Honor Code, which states: I will neither give nor receive unauthorized aid, nor will I tolerate an environment which condones the use of the unauthorized aid. Violations of the Honor Code, including unauthorized aid or plagiarism, will result in failure of the course. Ignorance of the proper ways to acknowledge the use of another's work is not a valid excuse for plagiarizing. If you are unclear on how to cite sources you use or on what constitutes academic dishonesty, please consult me.

13. Other Requirements

Textbook:

Rodgers, G.E. *Descriptive Inorganic, Coordination, and Solid-State Chemistry*, 3rd Edition.

Laboratory notebook

A notebook (of any kind) is required for laboratory.

Laboratory Goggles

Goggles must be worn in laboratory at all times. An approved model may be purchased in the campus bookstore.