

CHEMISTRY 520A SYLLABUS ADVANCED INORGANIC CHEMISTRY

Lecture: TuTh 8:00AM - 9:15AM

Location: GMCS 309

Instructor: Dr. Prof. Yong Yan

Office: GMCS 213F or CSL407

Office Hours: TuTh 9:15-10:00 AM (office hour immediately after lecture)

Contact: yong.yan@sdsu.edu

Textbook:

Main: Class materials (PowerPoint slides/reading materials/studying tools by Dr. Yan) will be distributed during the lectures as class materials.

Optional "Inorganic Chemistry," Weller *et al.* Oxford 6th edition, main information according to Chap. 1 & 20.6 Chap. 2 Chap. 3 Chap 6 Chap. 7.11 & 19 Chap. 7 & 20 Chap. 4

Optional: "The Organometallic Chemistry of the Transition Metals" 6th Edition, Crabtree

Optional: "Molecular Symmetry and Group Theory", Robert Carter

Major topics:

- 1, Atoms: Atomic structure and Electron Configuration
- 2, Inorganic Molecules: Inorganic Bonding Approaches and Molecular Orbital Theory
- 3, Symmetry and Applications of Group Theory
- 4, Oxidation and Reduction
- 5, Coordination Chemistry I: Structures and Catalysis
- 6, Coordination Chemistry II: Bonding and Spectroscopy
- 7, Inorganic Characterization and Solid-State Chemistry

Main Schedule:

Exam-1 period: ca. 3~5 weeks (topic 1 and 2)

Exam-2 period: ca. 4~6 weeks (topic 3, 4)

Exam-3 period: ca. 6~7 weeks (topic 5, 6 and 7)

Expected Students Learning outcomes:

a) Students will be able to understand the atomic structures, electronic configurations, reduction and oxidation states, formal charges, Lewis structures and basic bonding information of given inorganic compounds. Therefore, student are able to predict the behavior of elements from their position in the periodic table.

b) Students will be able to apply the molecular orbital theory, chemical bonding principles, to predict the basic properties of small inorganic compounds.

c) Students will be able to determine the symmetry of molecules, particularly point group, symmetry elements of a given complex.

d) Students will be able to utilize the Group Theory to rationale representative chemical applications, with emphasis on the application of hybridizations, vibrational spectroscopy and sigma bonding.

e) Students will be able to understand and predict the unique properties of transition metal complexes, including but not limited to d electron counting, coordination environment, crystal field theory, ligand field, color and transitions, molecular orbital theory to illustrate the bonding in coordination complexes.

f) Students can understand the principle to rationally characterize a given inorganic compound.

Exams:

There will be two in-class exams (exam-1 and exam-2, around 75 minutes, likely on Thursdays) in this course. They are *tentatively* scheduled for **September 26 and November 7**. And a final exam (Exam-3) will be likely set up on the last day of class (Final date may change according to the availability of the room). Please note that our exam-date does not conflict with major religious holidays, and reschedule of exam can only be granted with legitimate note(s) according to SDSU policy. The in-class exams count 30% each and the final 40%.

Bonus points:

10% extra bonus will be distributed at the end, if our students are doing excellent for the following in-class interactions. Note: the scale of extra credit will be depending on the instructor's record.

- 1, attending all the classes (you must attend each class unless legitimate notes provided)
- 2, submitting all the in-class quizzes
- 3, active for in-class discussion and homework

Grading Policies:

Your grade will be determined at the end of the semester, which will not be based on a curve thus your performance will not be affected by others. There is no pre-determined guideline for the grade distribution and most students are assigned the high possible course grades in the end. However, high grades will require a lot of focus, dedication and understanding of the advanced course material. The following flexible scale is a guideline: 90% and up for "A", 80% for "B" and 70% for a "C" grade, 60% and up for "D", below 60% for "F" respectively. The +/- grades will be at the instructor's discretion. GOOD LUCK!

DEI statement:

The Dept. Chemistry & Biochemistry embraces a notion of intellectual community enriched and enhanced by diversity along a number of dimensions, including race, ethnicity and national origins, gender and gender identity, sexuality, class and religion.

Other useful information:

1. NO attendance required but high attendance may give you extra bonus points. Please do not miss any class. Contact me first if you have to miss or reschedule an exam. It is extremely important to avoid any mis-communication.

2, In-class quizzes will be given, but may not be graded for direct points. We have **highly frequent in-class quizzes**, it can occur at the beginning or at the end of the lecture, please do not miss them because they may be shown as the evidence for consideration for the bonus points. In-class quizzes are particularly important for Exam-2 period which is traditionally the hardest part/period of this class.

3, Extra credits may be considered under particular circumstance. But extra-credit can only be considered for our students who have shown evidence to come into this classroom and submit his/her in-class quizzes. The quiz is designed to work with book closed but can be conducted with a

bundled study group. Discussions are usually allowed and highly encouraged during the quiz time. **Therefore it is imperative to form a study group, particularly on group theory and molecular orbital theory (part 2).** The quiz materials are indeed the candidate pool for our student to prepare their exams.

4, Homework will be assigned during the lecture time, will be collected before the final exam but will not be graded. Homework is extremely helpful for our students to prepare the exams. The homework materials are also the candidate pool for our student to prepare their exams. This is also another important source for bonus point consideration.

5, Since a prerequisite for this course is Chem 410A (P-Chem), we expect that our student will know this material. Chapters 1 and 2 (Weller) are examples of material you should be familiar with and which we will not go over explicitly. Note also that while previous catalogs stated “credit or concurrent registration in Chemistry 410A” as a prerequisite for this course, concurrent registration is in fact no longer sufficient. **You must have COMPLETED Chemistry 410A with a passing grade. Over 80% of those taking this class and 410A concurrently failed; therefore the p-chem prerequisite is strictly enforced!**

6, Our students will find that we do not lecture directly out from the textbook. Our class here will utilize varieties of source materials, including the frontier research of current inorganic chemistry. Thus, the exams will not necessarily be based on only textual materials, *i.e.* **your class notes are very important!** It should also be obvious that regular attendance in class will be important, although I do not directly record attendance.

7, Exam review section will be given before the exam time (usually one week before the actual exam time) and possible copies of old exams will be distributed to you prior to examination dates to give you an idea of what to expect.

8, Chemistry 520A is truly a senior chemistry capstone class. Although we concentrate on inorganic compounds, we bring in advanced material from analytical, physical and organic chemistry as well. **Most students find this class one of the two most challenging of their career at SDSU** (the other being P-Chem). Therefore let's be ready and work together to overcome any barrier for the success of this class.