

San José State University
Department of Chemistry
Inorganic Chemistry, Chem 145, Fall, 2018

Instructor:	Prof. Madalyn Radlauer
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Office Hours:	Monday 1 pm – 2 pm Wednesday 4 pm – 5 pm Friday 10 am – 11 pm or by appointment
Class Days/Time:	MWF 9:00 am – 9:50 am
Classroom:	DH 415
Prerequisite:	CHEM 112B (with grades of "C" or better; "C-" not accepted)
Co-requisite:	CHEM 113A

Note: Extensive knowledge and thorough understanding of concepts and topics covered in General Chemistry (i.e. CHEM 1A & CHEM 1B) are essential for success in this class. To that end, CoSAC will host general chemistry review sessions for CHEM 145 students in the second week of classes.

Course Website

Course materials such as the syllabus, handouts, notes, assignment instructions, etc. can be found on [Canvas](https://sjsu.instructure.com/) (<https://sjsu.instructure.com/>). You are responsible for regularly checking with the messaging system in Canvas to learn of any updates. Pre-class questions will be posted to Canvas by 8 am the day before class (unless there is an exam or problem set in that class period). These will count toward your grade and must be completed at least 30 minutes before class begins (see below for details).

Course Description (from the [University Catalog](http://info.sjsu.edu/web-dbgen/splash/catalog.html): <http://info.sjsu.edu/web-dbgen/splash/catalog.html>)

Development of unifying principles to understand the chemistry of the elements. An introduction to the chemistry, bonding theories, and applications of coordination compounds.

Course Goals and Learning Objectives

The goal of this course is to provide an introduction to inorganic chemistry, specifically regarding periodic trends, bonding theory, molecular symmetry, atomic and molecular orbitals, and coordination compounds.

Program Learning Outcome (PLO)

Upon successful completion of this program, students will be able to:

PLO 1: Demonstrate understanding of core concepts and to effectively solve problems in inorganic chemistry

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

CLO 1: Predict and classify the structures of various inorganic complexes.

CLO 2: Predict the properties of various inorganic complexes and use this prediction to distinguish between molecules.

CLO 3: Discuss and employ atomic structure and bonding models, including molecular orbitals, to interpret experimental and spectroscopic evidence.

CLO 4: Apply concepts and models of symmetry, structure, and bonding to other areas in chemistry such as organic and biochemistry, and to use these concepts to more deeply examine many aspects of biology, forensic science, materials science, and environmental science.

Texts/Readings

Textbook (required for course readings)

[*Inorganic Chemistry*](#) by Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr (5th edition, 2014)
ISBN: 9780321811059.

This textbook is available in the SJSU campus bookstore.

Other References (not required, these may provide further clarification of various topics)

[*Inorganic Chemistry*](#) by Catherine E. Housecroft and Alan G. Sharpe

[*Chemical Applications of Group Theory*](#) by F. Albert Cotton

[*Symmetry and Spectroscopy*](#) by Daniel C. Harris and Michael D. Bertolucci

These texts are on reserve at the King Library. They can also be checked out from Professor Radlauer during office hours and borrowed until the next class period.

Library Liaison

You should have a student library account with the King Library that allows you access the library electronic databases. If you plan to access the library services from off-campus, you may need to obtain a password and/or proxy to do so. Check the Library website for information. The reference Librarian for Chemistry is Yen Tran and her email is yen.tran@sjsu.edu.

Course Requirements and Assignments

Graded work will include online pre-class questions, a total of sixteen in-class group activities, three problem sets, three in-class exams, and one comprehensive final exam, which all contribute to the course learning outcomes. Dates for the exams and due dates for the problem sets are in the Course Schedule below. Homework problems from the text will be suggested, but not graded. Reading the text and working suggested problems are an excellent way to prepare for classes and exams. Exams and assignments in the course will be weighted as follows:

<u>Assignments</u>	<u>Points</u>
Online Pre-class Questions (details below)	100
In-class Group Activities (10 points each)	160
Problem Sets (50 points each)	150
Exam 1	130
Exam 2	130
Exam 3	130
Final Exam	200
Total	1000

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Final Examination or Evaluation

The Final Exam is comprehensive and will be written in a style similar to Exams 1-3 including primarily short answer questions.

Grading Information

Determination of Grades

Points will be distributed as described in Course Requirements and Assignments above. I will not curve, though I may, at the end of the course, linearly shift the scale. I will only shift it to benefit you. The course grade will be determined from the resulting average of the point total as follows:

<u>Percentage of Total Points</u>	<u>Final Course Grade</u>
96 and above	A+
92 to 95.9	A
88 to 91.9	A-
84 to 87.9	B+
80 to 83.9	B
76 to 79.9	B-
72 to 75.9	C+
68 to 71.9	C
64 to 67.9	C-
60 to 63.9	D+
56 to 59.9	D
52 to 55.9	D-
less than 52	F

Online Pre-Class Questions

Before every class (except the first, when problem sets are due, and when there are exams), I will post a question related to the material. They will be posted on Canvas by 8 am the day before class and they need to be completed by 30 minutes before class begins. These questions are graded for completion rather than accuracy. You can use your notes to help you answer these questions, but please work on them by yourself. The objective of these brief assignments is for me to get a sense of how well you understand the material. If there are any technical issues with Canvas, email me at the time of the issue.

<u>Questions Answered (%)</u>	<u>Score</u>
90 to 100	100
80 to 89	85
70 to 79	70
60 to 69	50
50 to 59	25
less than 50	0

In-class Group Activities

Throughout the semester, there will be a variety of in-class group activities worth 10 points each. Most of these will be graded based on participation, though there will likely be a few that are graded for accuracy. I will not be announcing the group activity dates as there will be a lot of them, so I recommend you come to class.

Problem Sets

Problem sets will be due by the beginning of class on their due date, but they will be accepted at the end of the class period as well. Late assignments will not be accepted. Problem sets can be done in groups, but each student must turn in their own individual work. Working in groups does not mean copying down each other's answers. Please do your own work.

Homework

In addition to the three problem sets, carefully study the book and lecture notes and ask questions on any material you do not understand. I have 3 scheduled office hours and I am willing to schedule office hours by appointment if none of these times accommodate your schedule. Recommended problems from the textbook will be assigned to correspond with the lecture material. Additionally, the recommended problems will be representative of the type of questions you will see on the exams. They will not be collected or graded. Solutions to exercises are at the back of the textbook (Appendix A). Solutions to the problems can be found in the [student resources associated with the textbook](https://www.pearsonhighered.com/chemistryresources/index.html) at <https://www.pearsonhighered.com/chemistryresources/index.html>, specifically the [solution manual pdfs](http://media.pearsoncmg.com/ph/esm/esm_miessler_inorgchem_5/Miessler-Fischer-Tarr5e_SM_CM_Final.zip) at http://media.pearsoncmg.com/ph/esm/esm_miessler_inorgchem_5/Miessler-Fischer-Tarr5e_SM_CM_Final.zip. While all the solutions are provided to you up front, remember that you will learn more effectively by attempting the problems before looking at the answers.

Missed Exams and Group Activities

If an exam or group activity is missed without a legitimate excuse, a score of 0 will be entered for that assignment. If an acceptable excuse is provided, then the grade will be the average of your other grades in that assignment category. In no case will a make-up exam or in-class activity be given. Contact me *in advance* if you will miss a group activity or exam date for a legitimate activity. There will be no final exam rescheduling unless you have 3 exams on the same date.

Exam Regrades

To qualify for an exam regrade, you must take the exam in ink and not use white-out. Do not write on your exams that are submitted for a regrade. Submitting a modified exam for regrading is a serious breach of academic integrity. Regrades must be submitted within one week of the exam being handed back to you. Regrade requests must include a written description of what you feel was graded incorrectly. One exception to all of the above: if an arithmetic error in your point tally has occurred, simply write “tally error” as your explanation and I will check the point tally.

Classroom Protocol

Be on time to class; class starts at 9:00 am sharp. Device use in class should be limited to taking notes. No device use is allowed during exams. Students are encouraged to participate during the class period. I hope that the classroom will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. Behavior that interferes with the normal academic function in a classroom is unacceptable. Students exhibiting this behavior will be asked to leave the class. The university has a [brochure on student conduct](http://www.sjsu.edu/studentconduct/docs/ENGLISH%20Brochure.pdf) that you can view at <http://www.sjsu.edu/studentconduct/docs/ENGLISH%20Brochure.pdf>

Email policy

I receive a lot of emails, so to be sure that I see your email, all Chem 145 emails should have Chem 145 in the subject line. I will do my best to respond to class-related emails within 1 business day of receiving them, however, keep in mind that this may not always be possible, especially during high volume times (around exams). Please try not to wait until the last minute to ask questions via email. I may also be slower to respond to emails late at night or over the weekends. Office hours are the best way to get timely answers to more complicated questions.

University Policies

The Office of Graduate and Undergraduate Programs hosts university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc.” You will find all syllabus related University Policies and resources information listed on [GUP’s Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>.

Consent for Recording of Class and Public Sharing of Instructor Material

[University Policy S12-7](http://www.sjsu.edu/senate/docs/S12-7.pdf), <http://www.sjsu.edu/senate/docs/S12-7.pdf>, requires students to obtain instructor’s permission to record the course. Please come to office hours to discuss this if you feel you need to record anything.

- “You must obtain the instructor’s permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”
- “Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](#). Students should be aware of the current deadlines and penalties for dropping classes ([Late Drop Information](#) can be found at <http://www.sjsu.edu/aars/policies/latedrops/policy/>). Information about the latest changes and news is available at the [Advising Hub](#).

Accommodation to Students' Religious Holidays

[University Policy S14-7](#) states that San José State University shall provide accommodation on any graded class work or activities for students wishing to observe religious holidays when such observances require students to be absent from class. It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed.

Academic Integrity

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy F15-7](#) requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. Visit the [Student Conduct and Ethical Development website](#) for more information.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](#) requires that students with disabilities requesting accommodations must register with the [Accessible Education Center \(AEC\)](#) to establish a record of their disability.

SJSU Counseling and Psychological Services

The SJSU Counseling and Psychological Services is located on the corner of 7th Street and San Carlos in the new Student Wellness Center, Room 300B. Professional psychologists, social workers, and counselors are available to provide confidential consultations on issues of student mental health, campus climate, or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling and Psychological Services website](#) at <http://www.sjsu.edu/counseling>

Inorganic Chemistry, Chem 145, Fall 2018, Course Schedule

The tentative course calendar below includes weekly course content, problem set due dates, exam dates, and the date for the final exam. Dates may be subject to change, but prior to this, fair notice will be given during class and through Canvas. Reading and problems listed in the schedule are referencing the primary textbook: *Inorganic Chemistry* by Miessler, Fischer, and Tarr.

Tentative Course Schedule

Class	Week	Date	Topics, Readings, Assignments, Deadlines
1	1	W 8/22	First day of classes In-class survey, introduction to course (Chapter 1)
2	1	F 8/24	Electrons, orbitals, and periodic trends (Chapter 2)
3	2	M 8/27	Lewis structures and VSEPR (Chapter 3)
4	2	W 8/29	Symmetry elements (4.1)
5	2	F 8/31	Point groups (4.2)
	3	M 9/3	Labor Day – No class
6	3	W 9/5	Matrices and irreducible representations (4.3)
7	3	F 9/7	Problem Set 1 Due Mulliken symbols and character tables (4.3)
8	4	M 9/10	Character tables, cont. (4.3)
9	4	W 9/12	Review
10	4	F 9/14	Exam 1 (coverage Chapters 1-4.3)
11	5	M 9/17	Transforming atomic orbitals with symmetry operations (4.4)
12	5	W 9/19	Reducing reducible representations (4.4)
13	5	F 9/21	Vibrational spectroscopy (4.4)
14	6	M 9/24	Vibrational spectroscopy + intro to MOs (4.4, 5.1)
15	6	W 9/26	MO theory and homodiatomic molecules (5.1-5.2)
16	6	F 9/28	MO diagrams for heterodiatomic molecules (5.3)
17	7	M 10/1	Orbital mixing and SALCs by inspection (5.2-5.4)
18	7	W 10/3	SALCs from group theory (5.4)
19	7	F 10/5	Using the projection operator (5.4)
20	8	M 10/8	SALCs and the projection operator (5.4)
21	8	W 10/10	Making MO diagrams of more complicated molecules (5.4)
22	8	F 10/12	Problem Set 2 Due Coordination chemistry – types of ligands (13.1-13.2)
23	9	M 10/15	Electron counting – d-counts, valence counts (13.3, 13.7)

Class	Week	Date	Topics, Readings, Assignments, Deadlines
24	9	W 10/17	Review
25	9	F 10/19	Exam 2 (coverage Chapters 4-5, 13.1-13.3, 13.7) <i>Note: Dr. Radlauer will be at CSU-Sacramento and the exam will have a proctor</i>
26	10	M 10/22	Octahedral complexes and ligand field theory (10.1-10.4)
27	10	W 10/24	Octahedral complexes and ligand field theory (10.1-10.4)
28	10	F 10/26	Square planar complexes (10.1-10.4)
29	11	M 10/29	Tetrahedral complexes (10.1-10.4)
30	11	W 10/31	Spectrochemical series, high and low spin (10.4-10.7)
31	11	F 11/2	Magnetic moments, Jahn Teller distortions (10.4-10.7)
32	12	M 11/4	Electronic Spectra (Chapter 11)
33	12	W 11/7	Tanabe-Sugano diagrams, selection rules, and calculating d-d splitting (Chapter 11)
34	12	F 11/9	Problem Set 3 Due Charge Transfer: MLCTs, LMCTs, MMCTs (Chapter 11)
	13	M 11/12	<i>Veteran's Day, observed – No class</i>
35	13	W 11/14	Review
36	13	F 11/16	Exam 3 (coverage Chapters 10-11) <i>Note: Dr. Radlauer will be at the University of New Orleans and the exam will have a proctor</i>
37	14	M 11/19	Reactions and Mechanisms (Chapter 12)
	14	W 11/21	<i>Thanksgiving Break – No class</i>
	14	F 11/23	<i>Thanksgiving Break – No class</i>
38	15	M 11/26	Reactions and Mechanisms (Chapter 12)
39	15	W 11/28	Reactions and Mechanisms (Chapter 12)
40	15	F 11/30	Organometallic Chemistry (Chapters 13 and 14)
41	16	M 12/3	Organometallic Chemistry (Chapters 13 and 14)
42	16	W 12/5	Special topics: Class choice #1
43	16	F 12/7	Special topics: Class choice #2
44	17	M 12/10	<i>Last day of classes</i> Review and class wrap up
	Final Exam	W 12/12	Coverage is cumulative 7:15 am – 9:30 am in DH 415 (usual classroom)
		F 12/21	<i>Grades available</i>