San José State University
Department of Chemistry
Inorganic Chemistry, Chem 145, Fall, 2020

Course and Contact Information

Instructor:	Prof. Madalyn Radlauer
Office Location:	DH 517
Telephone:	(408) 924-5482
Email:	madalyn.radlauer@sjsu.edu
Office Hours:	Wed. 10:00 am – 11:00 am Fri. 10:00 am – 11:00 am Or by request
Class Days/Time:	MWF 9:00 am – 9:50 am
Classroom:	Virtual! We will meet via Zoom
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.

Course Website

Course materials such as the syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas (https://sjsu.instructure.com/). You are responsible for regularly checking with the messaging system in Canvas to learn of any updates.

Course Description (from the University Catalog: 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 Format

Technology Intensive, Hybrid, and Online Courses

This semester, due to the COVID-19 pandemic, this course will be completely online. Both asynchronous and synchronous instruction will take place, so you will be required to attend class via Zoom as well as work through course modules on Canvas (https://sjsu.instructure.com/). Thus you will need a computer with reliable internet access. You will need to use your SJSU account to access class meetings as only authenticated users will have access. Because there will be a considerable amount of group work, it is required that you use a camera and microphone for class meetings. Zoom virtual backgrounds are allowed as long as they are not distracting. If there is any reason you do not feel comfortable sharing video, please discuss with me at your earliest convenience and we will figure something out. If you have unmet technology needs, please see the SJSU Learn Anywhere website (https://www.sjsu.edu/learnanywhere/) for assistance.

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 (recommended, available via the SJSU campus bookstore and on reserve at the MLK Library)

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

Because this text is rather expensive, I am in the process of transitioning to a free textbook option. The site is still under construction, but you can find some useful readings at the following website: https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_(Miessler_Fischer_Tarr).

Other References (not required, on reserve at the MLK Library)

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

Model Kit (highly recommended)

A model kit can be a great help in this course, especially early on. Look for one with atoms that can bind to 1-6 other atoms or groups.

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 in-class group quizzes, in-class worksheets, "take-home" problems, pre-class questions, three midterm exams, and one comprehensive final exam, which all contribute to the course learning outcomes. Dates for the exams are in the Course Schedule below. All relevant dates are also posted to Canvas. Exams and assignments in the course will be weighted as follows:

Assignments	**Points**
In-class Group Quizzes	75
In-class Worksheets	75
"Take-home" Problems	250
Pre-class Questions	100
Midterm Exams (100 points each)	300
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 have a range of question styles that will be similar to the other assignments and exams in the course.

Grading Information

Determination of Grades

Points will be distributed as described in Course Requirements and Assignments above. I will not curve because I believe that everyone can succeed in this course. 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:

Percentage of Total Points	Final Course Grade
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

Course Modules

The course is organized into four modules on Canvas, each covering several weeks of material. These modules will lay out the lecture videos and recommended reading, the worksheets, and the assessments for each major course topic. You will be assigned to a group for each module with whom you will take the group quizzes and work through the worksheets. Group assignment will be random, but you will not be with any one person for more than one module. The three midterm exams will cover large sections of the course and though they will mostly be associated with one module, later modules will rely on the information learning earlier in the course. The final exam is cumulative.

Weekly Workflow

Weekday	Activities
before Monday	submit last week's take-home problem and watch the video (~10 minutes) for this week
Monday	lecture/discussion (will capture Zoom recording and post to module), then Group Quiz (last 15 minutes)
before Wednesday	look through the assigned reading (also a good time to try a few of the recommended problems)
Wednesday	in-class Worksheets in breakout rooms and as a whole class
before Friday	pre-class questions (including a question about what was the muddiest point in the week so far)
Friday	lecture/discussion to address muddiest points and to take the material to the next level (will capture Zoom recording and post to module)

Group Quizzes

Each Monday during the last 10 or 15 minutes of class, you will do a group quiz. It will be brief and generally cover things from the pre-class video and that day's in-class lecture (though material from the previous week may also be relevant). These quizzes will typically include 1 or 2 multiple choice questions with space to explain your answers.

In-class Worksheets

Worksheets will be posted to the module before class each Wednesday. You will need to access the worksheet for class. You do not have to print it out, but I will try to format it so that you can do your work directly on the worksheet if you choose to print it. These worksheets will be graded for participation. This will be measured in two ways. First, I will drop into your breakout rooms to check in and offer assistance. I expect you to use this time to engage with the material and work together. Second, you will take a photo and upload your work to Canvas right after class.

Pre-class Questions

The pre-class questions will be posted to the appropriate module and full credit will be awarded for on time completion of the assignment. These will be due by 10 am on Thursday (21 h before Friday's class). The reason for this deadline is that each week there will be a question asking for the "muddiest point" from that week, i.e. the part of the topic being covered that is least clear to you. I will read through everyone's answers and plan my in-class lecture on Friday to cover the points that were most difficult for the most people. If your muddiest point is not covered in lecture, I will post it to the module's discussion feed with some comments to start the discussion of that topic so that you will still have access to more instruction on it.

Take-home problems

Instead of having large problem sets due a few times throughout the semester, we are going to try a different model where there will be one or two questions assigned each week. They will be posted at the same time as the in-class worksheets (by Wednesday at the latest) and will be due by class each Monday. Typically, you will both have to provide solutions as well as explain how you went about getting them and why your solution makes sense to you.

Extra Practice Problems

In addition to the graded take-home problems, I will post recommended problems from the textbook. These will not be graded, but I have often gotten requests for more practice problems, so here they are! Solutions to exercises are at the back of the textbook (Appendix A) and solutions to the problems have been posted to Canvas. 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.

Recommended Reading

In each module, I will post recommended reading from the book. While this is not required, it offers you another way to learn the material.

Proctoring Software and Exams

Exams will be proctored in this course through Respondus Monitor and LockDown Browser. Note that the proctoring software does not determine whether academic misconduct occurred, but does determine whether something irregular occurred that may require further investigation. Please contact me if unexpected interruptions (from a parent or roommate, for example) occur during an exam.

Missed Exams or Assignments

This semester is unprecedented. There are pandemics (COVID-19 and racism) causing havoc in our world and forcing us to work and learn under very strange circumstances. This may make it more difficult for you to maintain a steady course schedule and you may need to miss class or an assignment at some point in the semester. If this is the case, please contact me ahead of class time and with as much of a heads up as possible and we can discuss the situation. Generally, I will not accept late work, but I will do my best to be accommodating for unforeseen circumstances.

Classroom Protocol

Be on time to class; class starts on Zoom at 9:00 am sharp. Please find a place where you will be able to use your microphone and webcam. Unless an alternative plan is determined with me before the second class period, I expect everyone to be able to do "face-to-face" discussions so that you can participate during the class period, especially in the breakout rooms. Virtual backgrounds are acceptable as long as they are not distracting and as long as they do not violate the guidelines for a safe and respectful community listed below.

I will be recording the lecture portions of our Zoom classes and making them available to the people enrolled in the class via Canvas. The recordings will be deleted at the end of the semester. If, however, you would prefer to remain anonymous during these recordings, then please speak with me about possible accommodations (e.g., temporarily turning off identifying information from the Zoom session, including student name and picture, prior to recording).

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). You can also message me via Canvas and I will target a similar turnaround time.

University Policies

Per University Policy S16-9 *(http://www.sjsu.edu/senate/docs/S16-9.pdf)*, relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/".

Safe and Respectful Community

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 at http://www.sjsu.edu/studentconduct/docs/ENGLISH%20Brochure.pdf.

Examples of such behavior include

1. Persistent interruptions or using disrespectful adjectives in response to the comments of others.
2. The use of obscene or profane language.
3. Yelling at classmates and/or faculty.
4. Persistent and disruptive late arrival to or early departure from class without permission.
5. Physical threats, harassing/bullying behavior, or personal insults (even when stated in a joking manner).
6. Use of personal electronic devices such as pagers, cell phones, PDAs in class, unless it is part of the instructional activity.

Inorganic Chemistry, Chem 145, Fall 2020, 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. The recommended reading and problems from our primary textbook, *Inorganic Chemistry* by Miessler, Fischer, and Tarr will be listed on the Canvas site along with each module. The related modules are indicated in bold as M0, M1, M2, M3, and M4.

Tentative Course Schedule

Class	Week	Date	Topics, Readings, Assignments, Deadlines
1	1	W 8/19	***First day of classes*** Introduction to course and testing of Zoom logistics
2	1	F 8/21	**M0:** Review of muddiest points from preparatory videos (other than the matric math one – we'll get to that a little later on)
3	2	M 8/24	**M1:** Symmetry elements
4	2	W 8/26	**M1:** Symmetry elements worksheet
5	2	F 8/28	**M1:** Symmetry elements and point groups
6	3	M 8/31	**M1:** Point groups
7	3	W 9/2	**M1:** Point groups worksheet
8	3	F 9/4	**M1**: Character tables
	4	M 9/7	***Labor Day – No class***
9	4	W 9/9	**M1**: Character tables worksheet
10	4	F 9/11	**M1**: How to use character tables
11	5	M 9/14	**M1**: How to use character tables
12	5	W 9/16	**M1**: Reducing reducible representations worksheet
13	5	F 9/18	**M1**: Applications in vibrational spectroscopy
14	6	M 9/21	**M1**: Applications in vibrational spectroscopy
15	6	W 9/23	**M1**: Review
16	6	F 9/25	**Midterm Exam 1 (covering Module 1)**
17	7	M 9/28	**M2:** Diatomic MO diagrams
18	7	W 9/30	**M2:** Diatomic MO diagrams worksheet
19	7	F 10/2	**M2:** Moving to larger molecules
20	8	M 10/5	**M2:** SALCs
21	8	W 10/7	**M2:** SALCs worksheet
22	8	F 10/9	**M2:** MO diagrams of more complex molecules
23	9	M 10/12	**M2:** MO diagrams of more complex molecules

Class	Week	Date	Topics, Readings, Assignments, Deadlines
24	9	W 10/14	**M2:** Review
25	9	F 10/16	**Midterm Exam 2 (covering Module 2)**
26	10	M 10/19	**M3:** Electron counting and ligand types
27	10	W 10/21	**M3:** Recognizing ligand types worksheet
28	10	F 10/23	**M3:** Electronic properties of ligands
29	11	M 10/26	**M3:** MOs of octahedral complexes and delta octahedral
30	11	W 10/28	**M3:** MOs of octahedral complexes worksheet
31	11	F 10/30	**M3:** Delta octahedral trends
32	12	M 11/2	**M3:** MOs of complexes with other symmetries
33	12	W 11/4	**M3:** d-d splitting worksheet
34	12	F 11/6	**M3:** Spectrochemical series and high and low spin complexes and distortions of the ligand field
35	13	M 11/9	**M3:** Review
	13	W 11/11	***Veteran's Day – No class***
36	13	F 11/13	**Midterm Exam 3 (covering Module 3)**
37	14	M 11/16	**M4:** Magnetism, Electronic spectroscopy
38	14	W 11/18	**M4:** Electronic spectroscopy worksheet
39	14	F 11/20	**M4:** Types of charge transfer
40	15	M 11/23	**M4:** Reactivity
	15	W 11/25	***Thanksgiving Break – No class***
	15	F 11/27	***Thanksgiving Break – No class***
41	16	M 11/30	**M4:** Intro to organometallic and bioinorganic chemistry
42	16	W 12/2	**M4:** Applications worksheet
43	16	F 12/4	**M4:** Review
44	17	M 12/7	***Last day of classes*** Class wrap-up
	Final Exam	F 12/15	***Assigned final exam time is 7:15 – 9:30 am***
		F 12/18	***Grades available***