

Syllabus for Inorganic Chemistry – CHE 421 Fall 2022

CRN # 95795 MWF 9:00 – 9:50 AM

1. Instructor Info:

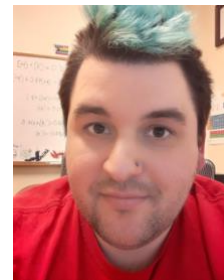
Dr. Daniel C. Ashley – Assistant Professor of Chemistry

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Zoom: <https://spelman.zoom.us/my/danielashley>

[Faculty profile](#)



2. Course Description:

Rigorous treatment of the chemistry of inorganic compounds, including structure, properties, and reactions, and their interpretation in terms of quantum chemistry, and solid state chemistry; analysis with modern instrumentation.

Credit hours: 3

Prerequisites:

Option 1: CHE 346

Option 2 (Chemical Engineering): CHE 232 with corequisite of CHE 345.

3. Required Materials:

If you have difficulties obtaining access to any of the required materials discussed below, please contact Dr. Ashley immediately for assistance.

Textbook: *Inorganic Chemistry*, 5th ed., Gary L. Miessler & Donald A. Tarr, Pearson Publishers. <https://www.bkstr.com/spelmanstore/product/inorganic-chemistry-485305-1>

Software and Website Requirements: We will utilize a number of different software programs and websites in this course. Before class on the first day, I expect you to be able to access the following:

- Canvas
- Microsoft Excel
- Microsoft PowerPoint
- ChemDraw
- Gradescope (www.gradescope.com)

4. Office Hours (in person): Tue. 11-12 AM and Thu. 3-4 PM

Please try to use these times, but if you need assistance outside of posted office hours, I am happy to try to meet with you at another time, either in person or over Zoom.

5. COVID rules: You MUST wear a mask every day in class. If you don't have a mask or are unwilling to wear one you will have to leave class. Also, if you are experiencing COVID-like [symptoms](#) and have to miss class PLEASE let me know so we can figure out if other students have been exposed.

6. Course Goals:

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

- Apply critical thinking and scientific reasoning skills by analyzing data in order to arrive at solutions to specific chemical problems.*
- Exhibit scientific literacy through effective participation as developed through class assignments.*
- Demonstrate mastery of course concepts by satisfactory performance on tests, homework, and other summative assessments.*
- Enroll with a high degree of confidence in the next level of chemistry.*

7. Student Learning Outcomes:

- Understand the basic principles of group theory and be able to efficiently assign the point group of a molecule.
- Know how to construct, and interpret, MO diagrams for small molecules using group theory and SALCs.
- Know the basic terminology and language of coordination chemistry and chemical and physical consequences of transition metal complex isomerism.
- Understand crystal field theory and ligand field theory, and how they describe the impact of metal identity, oxidation state, coordination number, molecular geometry, and ligand identity on transition metal chemistry.
- Be able to use group theory and ligand field theory to predict vibrational and electronic spectroscopic features of transition metal complexes.
- Be able to quickly “count electrons” in transition metal complexes.
- Know the basic terminology and language of organometallic chemistry, applications of the 18-electron rule, and standard organometallic ligands.
- Recognize the relevance of transition metals for biological chemistry and be able to explain how inorganic chemists characterize and study metalloenzymes.

8. Course Structure:

This course will be administered primarily **in-person**, although there will still be an extensive amount of material and assessments that will be delivered online through Canvas. Class will meet three times a week. Attendance in class is **not** optional.

Every class session will have an associated **Daily Worksheet**. This worksheet will be divided into a **pre-class** and **in-class** portion. You should always complete (or at least attempt) the **pre-class** portion before coming to class. The in-class worksheet will be covered by Dr. Ashley during class. **Neither of these worksheets will be turned in for a grade**, but it is **critical** that you master the material that is covered on them as this material is what you will be tested on during our exams. The lectures and in-class activities/content are explicitly structured under the assumption that you are fully prepared for class, and you will not get much out of them if you come to class unprepared.

Before every class session there will be a **graded** pre-class quiz on Canvas to be taken asynchronously (at your own time). It **must** be taken before that day's class, however. These quizzes will be very short, one or two questions only, open book/notes (but no other resources are allowed unless specified otherwise), and will **directly** cover material

from the pre-class worksheet. What is the absolute best way to prepare for the quiz? Do the pre-class portion of the **Daily Worksheet!** Only under extraordinary circumstances will I excuse a missed pre-lab quiz: if you miss it, you miss it. Don't worry though, there will be tons of them!

There will be approximately 5 problem sets throughout the semester. **These problem sets will not be collected for a grade.** For each problem set however, you will be responsible for **preparing a 3-5 minute narrated PowerPoint presentation on one of the problems. I will grade this presentation.** This presentation will then be uploaded to Canvas to help your classmates learn the material. The purpose of having you make so many presentations throughout the semester is that an essential skill every scientist must have is to be proficient at discussing and presenting complicated information in a group setting. The best way to become good at this is practice! In our class these presentations will help you learn how to make an organized, effective presentation quickly and easily. Additionally, one of the best ways to learn something is by teaching it to others, so by helping teach your classmates you will be helping teach yourself!

Most problem sets will also have an in-class day right after the PowerPoint presentations are due where I will select a handful of students to present their slides to the class. The purpose of the in-class presentations is to give us a chance to talk as a class about specific topics/problem types that might be giving students trouble. I will always bring snacks for these days!

There will be four exams throughout the semester. The format for these will be short-answer, essay, mechanism drawing, orbital diagram construction...basically anything goes. These will all be take-home exams, and you will upload your results on Gradescope. These exams will be open book/notes unless specified otherwise. The course will end with a cumulative final exam, which will also be a take-home exam.

Additionally, you will have a final project/presentation that will be part of your grade for lecture and lab. You and your classmates will prepare presentations on specific metalloenzymes/metalloprotein system. More details on this project will be given throughout the semester in lecture and lab.

The course schedule (posted on Canvas) will help keep you abreast of what topics we are covering in class, when we have quizzes, what readings you are responsible for, when presentations are due, and when exams are due. **It is your responsibility** to check this frequently and be aware of these dates.

Finally, there will be periodic "game days" in class where we will all play a fun (and educational 🧐) game together. The winners will earn extra credit, so come ready to play!

9. Topics Covered:

The specific textbook chapters listed below will be covered this semester.

- **Atomic Structure (Chapter 2)**
- **Simple Bonding Theory (Chapter 3)**
- **Molecular Structures and Isomers of Coordination Complexes (Chapter 9)**
- **Electronic Structure of Coordination Complexes: CFT (Chapter 10)**
— EXAM I —
- **Symmetry and Group Theory (Chapter 4)**
— EXAM II —
- **Molecular Orbitals (Chapter 5)**
- **Acid-Base and Donor-Acceptor Chemistry (Chapter 6)**
— EXAM III —
- **Electronic Structure of Coordination Complexes: LFT (Chapter 10)**
- **Organometallic Chemistry (Chapter 13)**
- **Reactions and Mechanisms of Coordination Complexes (Chapter 12)**
— EXAM IV —

10. Grading:

The weighting of the graded assignments is given below:

Class participation – 5%

Pre-class quizzes – 15%

PowerPoint presentations – 20%

Final poster session – 20%

Exams – 40%

Final letter grades will be determined using the following scale:

92.5 – 100	A
89.5 – 92.5	A-
86.5 – 89.5	B+
82.5 – 86.5	B
79.5 – 82.5	B-
76.5 – 79.5	C+
72.5 – 76.5	C
69.5 – 72.5	C-
66.5 – 69.5	D+
59.5 – 66.5	D
Below 59.5	F

Grade Policies

An **Incomplete (IP)** is assigned to a student when extenuating circumstances (e.g., illness, death of an immediate family member, or family emergency) prevent a student who is passing a course from completing the final exam or final assignment(s) by the

end of the semester. In consultation with a Dean, the faculty member determines if an Incomplete is appropriate and completes the necessary paperwork. The faculty member determines the date for completion of all work. A grade of IP must be changed by the deadline given by the following semester as specified on the College academic calendar. A student who cannot complete the work necessary to remove the IP by the specified deadline must request an extension from the professor, who will notify the Dean's Office of the extension. If the required work is not completed by the established deadline or the student is not given an extension, the IP will automatically be changed to an F.

11. Course Expectations:

This is a senior level course on a complicated and often esoteric subject. In addition, inorganic chemistry is **very** near and dear to my heart, and I take it quite seriously. Taking this all together then, you should anticipate this being an intense, highly challenging course and I will demand a lot from you in terms of the quality of your work. That being said I am also highly aware of the fact that this material is hard, and I will be grading it with this in mind.

What I expect from you:

I expect for you to try your hardest to learn the material and weave it into the broader context of your chemical education. Don't just focus on passing the class. That's not the point.

I expect you to read emails from me carefully.

I expect you to read and follow the course schedule.

I expect you to read the syllabus.

I expect you to treat me with respect as your instructor and as a person.

I expect you to treat your classmates with respect as colleagues and people.

What you can expect from me:

You can expect me to try my best to stick to the course schedule and the syllabus, and always notify you of any changes.

You can expect me to precisely communicate relevant course information to you throughout the semester.

You can expect me to respond to emails in a timely manner.

You can expect me to grade assignments in a timely manner.

You can expect me to listen to your concerns or complaints about the course.

You can expect me to treat you with respect as a student, as a colleague, and as a person.

12. Tips for Success:

- a. **Follow the schedule:** Posted on Canvas is the course schedule. I don't make this thing for fun, it is to help you understand exactly what we are covering in class, what you should be doing outside of class, and relevant due dates.
- b. **Make sure you complete all of the required assignments:** This one sounds obvious, but it's worth emphasizing. The problem sets and exams are written under the assumption you have gone through all of the assignments and readings listed on the schedule, so make sure that you do. **I do not have time to cover every piece of important course content in class!** This means that some of it will be **only** covered in out-of-class assignments. Additionally, the pre-class quizzes and PowerPoint presentations are worth a combined 35% of your grade, so make sure you keep up with them! Also bear in mind that I will **never** give you any graded or ungraded assignments as busywork. Everything assigned in this course is designed to help you learn the material and to help you succeed on the exams, so don't ignore it!
- c. **Q: "Reading is what?" A: "FUNDAMENTAL!":** I take reading **very seriously**, as I consider critical reading comprehension to be an extremely important skill to master as a scientist. Therefore, don't treat any reading I give you in this course as optional (unless I say otherwise). This includes the textbook, the **Daily Worksheets**, and any papers I might assign to you. If you are working as a scientist in any field (academia, industry, medicine, etc.) you won't always have someone to help explain things to you, but that is what textbooks, papers, and the internet are for. Don't be afraid of reading!
- d. **Reach out for help if you need it:** If you find yourself struggling in class, make sure you ask for help! If you are stuck on something, come to office hours, talk to me after class, ask questions during class, or send me an e-mail. Please remember that I am genuinely, 100% on your side. I have two goals for every class I teach: to help my students learn the material and to help my students have a fun and positive experience. **I promise you** that I am always trying my best to achieve both of those goals, but I can't automatically tell what each individual student needs. I can only solve a problem if I am aware of it, so please reach out for help if you need it. I'm a very friendly person, I promise, so there is never a risk in asking 😊.
- e. **Take care of yourself emotionally:** School and grades and chemistry are all very important and totally worth working hard at, no argument from me there! But they aren't the only things that matter in life either, so make sure you keep it all in perspective and give yourself a break now and then. Stress is very normal during college, but please reach out if you find yourself really struggling with anxiety or depression. Sometimes just talking to a friend or family member can make a world of difference when you're having a hard time. I am also happy to talk to you if you need assistance (I was a stressed-out college student once too! Heck, I'm *still* stressed-out now!) and of course there is also the Spelman Counseling Center (<https://www.spelman.edu/student-life/health-and-wellness/counseling-center>). **Remember, you're not alone!**

13. Course Policies:

Student Access Statement

Spelman College is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or think you may have a disability) and, as a result, need a reasonable accommodation to participate in class, complete course requirements, or benefit from the College's programs or services, you should contact the Student Access Center as soon as possible (<https://www.spelman.edu/student-life/health-and-wellness/student-access-center/overview>). The Student Access Center works with students confidentially and does not disclose any disability-related information without their permission. Contact the Student Access Center at 404-270-5289 for additional information.

Academic Integrity Policy

At the heart of Spelman College's mission is academic excellence, along with the development of intellectual, ethical and leadership qualities. These goals can only flourish in an institutional environment where every member of the College affirms honesty, trust, and mutual respect. All members of the academic community of Spelman College are expected to understand and follow the basic standards of honesty and integrity, upholding a commitment to high ethical standards. Students are expected to read and abide by the Spelman College Code of Conduct (see the current Spelman College Student Handbook:

<https://www.spelman.edu/docs/students/studenthandbook.pdf>) and are expected to behave as mature and responsible members of the Spelman College academic community. Students are expected to follow ethical standards in their personal conduct and in their behavior towards other members of the community. They are expected to observe basic honesty in their work, words, ideas, and actions. Failure to do so is a violation of the Spelman College Academic Integrity Policy. Violators will be subject to the sanctions outlined in the Spelman College Bulletin.

14. Technology Issues:

The first point of contact for any technology related question or problem is Spelman College's Technology Service Desk. Contact the Technology Service Desk by phone by calling (404) 270-5400 or via e-mail at stsservicedesk@spelman.edu.

The Technology Service Desk is staffed by IT professionals Monday through Friday from 8 a.m. through 11 p.m. The Technology Service Desk provides phone support for most applications, including the Canvas Learning Management System, Microsoft Windows, and the Office 365 Microsoft Office suite.