

CHEM 3121—Inorganic Chemistry Lab Syllabus

UT Tyler
Spring 2026

About This Course:

Students will learn a variety of practical techniques in the synthesis, characterization, and handling of a variety of inorganic and organometallic compounds. Students will also learn about writing technical papers or reports of publishable quality.

"I consider nature a vast chemical laboratory in which all kinds of composition and decompositions are formed."

Antoine Lavoisier

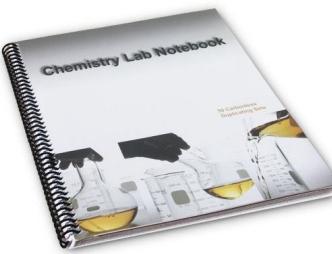


Student Learning Outcomes

- Handle laboratory glassware, equipment, and chemical reagents safely using general guidelines and basic knowledge about common hazards often encountered in a synthetic chemistry laboratory.
- Use instrumentation commonly found in a synthetic inorganic chemistry laboratory.
- Interpret laboratory results and data correctly within inherent limitations on precision and report findings in a scientific notebook using acceptable appropriate notational and descriptive content that is in turn understandable and reproducible.
- Apply procedures from literature sources to synthesize a given compound.
- Write scientific journals and reports which clearly present scientific data and which include lucid, logical conclusions based on the experimental data.

Required Items

- Experiments will be posted on Canvas as handouts
- Lab notebook (carbonless copy or regular notebook)
- Pen (no pencils!)
- Scientific calculator
- Appropriate lab attire (INDIRECT VENT safety goggles, close-toed shoes, pants, etc.)



Class Information

Section 001 M 5:30-9:30 pm
Section 002 F 8:30-12:30 pm
Section 003 F 1:00-5:00 pm

Pre-Lab meets in RBS 2015
Lab meets in RBS 4012

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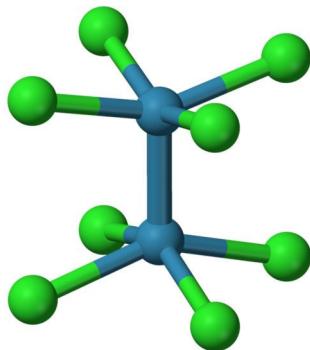
Contact Information:

Keiston Howard
Sections 002 and 003 (F am, F pm)
• khoward16@patriots.uttyler.edu
• RBS 3rd floor, end of hallway
• Office Hours: by appointment
• Instructor of record
• Dr. Jason Smee

Dr. Jason Smee (Section 001, M)
• jsmee@uttyler.edu (best)
• RBS 3030
• 903.566.7069
• Office Hours
• MWF 1-2 pm, TR 1:30-2:30 pm
• and by appointment



Course Requirements



- Prerequisites for this course: CHEM 1312/ 1112 (General Chemistry 2 lecture and lab).
- Co-requisite: Credit for or concurrent enrollment in CHEM 3320.
- Class meets every week, January 12 to April 24 in RBS 2015/4012 except the weeks of Jan 19 (MLK Jr. Day) and Spring Break.
- You may be required to come in outside of class time to finish an experiment (rare). We will try to avoid these as much as possible.
- The deadline for all schedule changes, etc. ("Census Date") is Monday, Jan 26. Please see the University Policies (at the end of this syllabus) for info regarding drops, grade replacement, etc.
- The last day to drop the course with a W is Mon, Mar 30. If you will drop the course, it is YOUR responsibility; failure to officially withdraw will result in a grade of F.
- Attendance will NOT be taken. However, your absence will be obvious. Please notify the instructor as soon as possible of your absence.

The octachlorodimolybdate(II) tetraanion that possesses a metal-metal quadruple bond. You will make a similar compound in lab this semester.

“A scientist in his laboratory is not a mere technician: he is also a child confronting natural phenomena that impress him as though they were fairy tales.”

Marie Curie



Magnetic susceptibility balance similar to the one you will use in lab to determine the number of unpaired electrons in a transition metal complex you will synthesize.

Grading Scale

Grades are tentatively based on a 90/80/70/60 (A/B/C/D) scale. Grades will be based on notebook pages, summary reports, a full lab report, and two journal assignments.

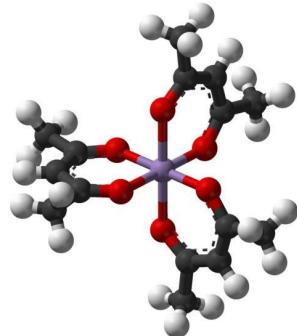
Weighting of course grades	
Notebook pages	10%
Summary reports	65% (5% 1 st report; 15% for rest)
Full lab report	20%
<u>Journal assignments</u>	<u>5%</u>
Total	100%

Lab Notebook Pages (see pp 10-11 in lab manual)

- Before lab you should have a pre-lab written up. It should have the following sections
 - Title/Date
 - Purpose
 - Overall reaction
 - Safety; this should include the name, formula, CAS #, the molar mass, density (if a pure liquid is involved), and safety hazards (irritant, corrosive, etc.)
 - Procedure: Include all details related to conducting the experiment. Notebooks are to be written so that someone months or years later can reproduce your results. To help with calculations later you should have molar masses (and where applicable, densities of liquids) for all reagents and products (this is not necessary for solvents or rinsing/cleaning agents).
 - Reference for the procedure
- During lab you should add the following sections
 - Data/Results/Observations: Record all measurements and observations made during the lab. Be sure to note any deviations from the procedure you were given. Label data and observations clearly to avoid confusion.
 - Calculations; each experiment will include the calculations required to be in your notebook for that experiment.
 - Use a blue or black ink pen to record your data! No pencils! If you need to make a correction to something, especially data, draw a line through the mistake.
 - At the end of lab, sign your data/observations and either I or the TA will do the same.
 - Photograph your notebook pages and upload them as a pdf to the “Lab Notebook” assignment for that experiment on Canvas.

Summary Reports

- For all experiments, except Acylation of Ferrocene, you will write up a summary of your experimental and results sections as if there were to be published in a journal.
- A sample journal article is posted on Canvas for ideas on style/presentation.
- Each summary should include the sections below
 - Cover Page:** Title/Date/Your Name & Your Partner's Name
 - Procedure:** Cite the procedure cited in the lab manual or handout. You should also write out the entire synthesis and be sure to include any deviations or modifications to the procedure. Your procedure should also identify any instrumentation used (make and model), and how samples were prepared, and the conditions under which the samples were run.
 - Results:** Separate your results, if applicable, into the following:
 - Synthesis: describe the reaction briefly (color changes, precipitates, yields, etc.). Indicate any problems or interesting aspects of the synthesis.
 - Characterization: describe any type of spectroscopic results (IR, UV-vis, NMR, magnetic susceptibility, etc.); figures are nice. If possible, you should try and assign features in your characterization ("the peak at 1.97 ppm in the ^1H NMR is due to the methyl group of some residual acetic acid in the sample"). For comparing multiple compounds, use tables!
 - Discussion/Analysis:** show pertinent analytical data (i.e., titration curve) in table and/or graphical format. Indicate any equations you used in calculating an answer. If applicable compare with the known literature values (cite your references!) and note any differences. If these are significant then discuss why your results differ.
 - References:** in the main body of the summary use superscripted numbers for the citations. Refer to this [website](#) for information on how to format your bibliography. You can also consult *The ACS Style Guide: A Manual for Authors and Editors 3/E* (call number QD8.5 .A25 2006), in the library or borrow one from a faculty member.
- Submit your (or your group's) report through TurnItIn on Canvas.



Manganese(III) acetylacetonate, the “go-to” compound used in inorganic labs to be analyzed with the magnetic susceptibility balance. We will be making other compounds for that experiment.

“An investigator starts research in a new field with faith, a foggy idea, and a few wild experiments. Eventually the interplay of negative and positive results guides the work. By the time the research is completed, he or she knows how it should have been started and conducted.”

Donald Cram



The Attenuated Total Reflectance (ATR) Infrared (IR) Spectrometer you will use to analyze some of the compounds made in this lab.

Full Lab Report (Acylation of Ferrocene)

- Your report should include the following sections:
 - Cover Page:** same as above with an abstract (2- to 3-sentence summary of results)
 - Introduction:** Provide a brief background on what the experiment is about (include any principles of the experiment and pertinent chemical equations).
 - Procedure, Results, Discussion/Analysis:** same as above
 - Conclusions:** any general comments regarding your results
 - References:** same as above
- Submit your group's report through TurnItIn on Canvas.

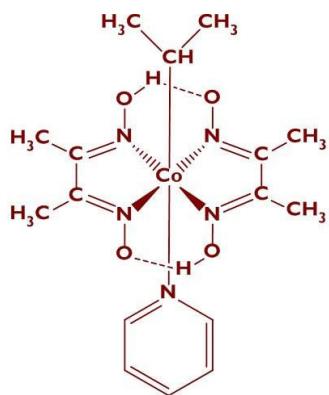
Rubrics for Summary Reports, the Full Lab Report, and Notebook Submissions are provided on Canvas.

Journal Assignments

- Two, short assignments will be given as an introduction to reading the literature
 - Part A is about the structure of an article
 - Part B is about finding specific chemical information in the article



Group Summary Reports



A cobaloxime compound, used as a model for vitamin B₁₂, that you will synthesize and characterize by ¹H NMR.

*“Don’t despise
empiric truth. Lots of
things work in
practice for which the
laboratory has never
found proof.”*

Martin H. Fischer



Double manifold (aka Schlenk line) often used in conjunction with an inert atmosphere glovebox to handle air-sensitive compounds.

- Since we now have almost 50 people in lab, the grading is going to be a lot more intense even with 2 people grading.
- For the first experiment, everybody will turn in their own summary report (basically just the experimental section and references).
- The second through fifth summary reports will be team-based (**teams can only have 2 people, if the section has an odd number of students, ONE group of 3 is permitted**).
- The last report will be a “full” lab report that will also be submitted as a group.
- The basic idea is to have the team members rotate between tasks for the reports. Which roles each member has and who is responsible for submitting the report is for each group to decide.
- Visit this [link](#) to see how to self-enroll into groups on Canvas. This link will also be provided on the Canvas homepage.

Summary Report Checklist

- Cover page
- Introduction (Full Lab Report only) Procedure (Syntheses and Physical Methods)
- Results/Analysis (plus Discussion for Full Lab Report) Conclusion (Full Lab Report only)
- References (superscripted numbers for citations and proper bibliographic formatting) Electronic copy submitted through TurnItIn
- PDF of notebook pages uploaded to the appropriate “Lab Notebook” Canvas assignment

List of Experiments

- Synthesis of a Copper Salt: [Cu(acac)₂] (basic synthesis techniques)
- Synthesis of [Cr₂(OAc)₄] (characterization by IR spectroscopy)
- Δ_o of Chromium(III) Complexes (synthesis of [Cr(acac)₃], [Cr(pic)₃], and [Cr(en)₃]Cl₃ (microwave synthesis and characterization by UV-vis spectrophotometry)
- Magnetic Susceptibility of Two Nickel Complexes (synthesis and characterization by magnetic susceptibility)
- Synthesis of [Co(Hdmg)₂(py)(iPr)] (characterization by ¹H NMR spectroscopy)
- Acylation of Ferrocene (separation by column chromatography and characterization by cyclic voltammetry)

Summary of Important Dates

- January 26 (Monday): Census Date (see Census Date section in University Policies)
- March 2 (Monday): Final Deadline to Apply for Spring Graduation
- March 9 – 13 (M – F): Spring Break, no classes
- March 30 (Monday): Last Day to Drop with a “W”
- April 25 (Friday at midnight): last lab report (Acylation of Ferrocene) is due



Tentative Lab Schedule

<u>Week</u>	<u>Experiment</u>
Jan 12	Introduction/syllabus
Jan 19	No lab due to MLK Jr Day on Monday
Jan 26	Pre-lab: reminder on formatting summary reports Experiment 1: Synthesis of a Copper Salt: $[\text{Cu}(\text{acac})_2]$
Feb 2	Pre-lab: experiment summary, changes to procedure, brief intro to IR Experiment 2. Synthesis of a Metal-Metal Quadruple-Bonded Complex: $\text{Cr}_2(\text{OAc})_4$
Feb 9	If necessary, finish Experiment 2 .
Feb 16	Pre-lab: experiment summary, changes to procedure, brief intro to UV-vis Experiment 3. Measuring Δ_o for Four Chromium Compounds (synthesis part only)
Feb 23	Finish Experiment 3 (UV-vis analysis).
Mar 2	Pre-lab: experiment summary, changes to procedure, brief intro to magnetic susceptibility Experiment 4. Magnetic Susceptibility of Two Nickel Complexes
Mar 9	Spring Break—no labs :)
Mar 16	If necessary, finish Experiment 4 .
Mar 23	Pre-lab: experiment summary, changes to procedure, brief intro to magnetic susceptibility Experiment 5. Synthesis of a Vitamin B12 Analog: $[\text{Co}(\text{Hdmg})_2(\text{py})(\text{iPr})]$
Mar 30	If necessary, finish Experiment 5 .
Apr 6	Pre-lab: experiment summary, changes to procedure, brief intro to cyclic voltammetry Experiment 6. Acylation of Ferrocene (full lab report)
Apr 13	If necessary, finish Experiment 6 .
Apr 20	Experiment 6 FULL LAB REPORT due

University Policies and Information (Last Update – 5/30/2024)

WITHDRAWING FROM CLASS

Students may [withdraw](#) (drop) from this course using the [Withdrawal Portal](#). Withdrawing (dropping) this course can impact your Financial Aid, Scholarships, Veteran Benefits, Exemptions, Waivers, International Student Status, housing, and degree progress. Please speak with your instructors, consider your options, speak with your advisor, and visit the One-Stop Service Center (STE 230) or email enroll@uttyler.edu to get a complete review of your student account and the possible impacts to withdrawing. We want you to make an informed decision. UT Tyler faculty and staff are here for you and often can provide additional support options or assistance. Make sure to carefully [read the implications for withdrawing from a course and the instructions](#) on using the [Withdrawal portal](#).

Texas law prohibits students from dropping more than six courses during their entire undergraduate career.* The six courses dropped include those from other 2-year or 4-year Texas public colleges and universities. Consider the impact withdrawing from this class has on your academic progress and other areas, such as financial implications. We encourage you to consult your advisor(s) and Enrollment Services for additional guidance. CAUTION #1: Withdrawing before census day does not mean you get a full refund. Please see the [Tuition and Fee Refund Schedule](#). CAUTION #2: All international students must check with the [Office of International Programs](#) before withdrawing. All international students are required to enroll full-time for fall and spring terms. CAUTION #3: All UT Tyler Athletes must check with the Athletic Academic Coordinator before withdrawing from a course. CAUTION #4: All veterans or military-affiliated students should consult with the [Military and Veterans Success Center](#).

*Students who began college for the first time before 2007 are exempt from this law.

ARTIFICIAL INTELLIGENCE STATEMENT

UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy. Refer to the About This Course section of the UT Tyler Syllabus Module for specific information on appropriate use of AI in your course(s). **For this course, you can use AI programs (ChatGPT, Copilot, etc.) for exam preparation (e.g., generating flashcards and sample test questions), but not on daily quizzes or homework.** Using AI on quizzes and homework is like having a gym membership and then having someone work out for you; you will not see any improvement in your health. The same goes for learning. Be aware that in cases where information provided by AI conflicts with the lecture material, the lecture material will take priority. You will NOT be permitted AI on exams. Remember, AI does make mistakes, so I recommend the "trust but verify" policy when it comes to using AI.

FINAL EXAM POLICY

Final examinations are administered as scheduled. If unusual circumstances require that special arrangements be made for an individual student or class, the Dean of the appropriate college, after consultation with the faculty member involved, may authorize an exception to the schedule. Faculty members must maintain student final examination papers for a minimum of three months following the examination date.

INCOMPLETE GRADE POLICY

If a student, because of extenuating circumstances, is unable to complete all the requirements for a course by the end of the semester, then the instructor may recommend an Incomplete (I) for the course. The "I" may be assigned in place of a grade only when all of the following conditions are met: (a) the student has been making satisfactory progress in the course; (b) the student is unable to complete all coursework or final exam due to unusual circumstances that are beyond personal control and are acceptable to the instructor, and (c) the student presents these reasons before the time that the final grade roster is due. The semester credit hours for an Incomplete will not be used to calculate the grade point average. The student and the instructor must submit an Incomplete Form detailing the work required and the time by which the work must be completed to their respective department chair or college dean for approval. The time limit established must not exceed one year. Should the student fail to meet all the work for the course within the time limit, then the instructor may assign zeros to the unfinished work, compute the course average for the student, and assign the appropriate grade. If a grade has yet to be assigned within one year, then the Incomplete will be changed to an F, or NC. If the course was initially taken under the CR/NC grading basis, this may adversely affect the student's academic standing.

GRADE APPEAL POLICY

Disputes regarding grades must be initiated within sixty (60) days from the date of receiving the final course grade by filing a Grade Appeal Form with the instructor who assigned the grade. A grade appeal should be used when the student thinks the final course grade awarded does not reflect the grades earned on assessments or follow the grading scale as documented in the syllabus. The student should provide the rationale for the grade appeal and attach supporting document about the grades earned. The form should be sent via email to the faculty member who assigned the grade. The faculty member reviews the rationale and supporting documentation and completes the instruction section of the form. The instructor should return the form to the student, even if a grade change is made at this level. If the student is not satisfied with the decision, the student may appeal in writing to the Chairperson of the department from which the grade was issued. In situations where there is an allegation of capricious grading, discrimination, or unlawful actions, appeals may go beyond the Chairperson to the Dean or the Dean's designee of the college from which the grade was issued, with that decision being final. The Grade Appeal form is found in the [Registrar's Form Library](#). NOTE: The Grade Appeal Form is different from the Application for Appeal form submitted to the Student Appeals Committee, which does not rule on grade disputes as described in this policy.

University Policies and Information (cont.)

DISABILITY/ACCESSIBILITY SERVICES

In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA), the University of Texas at Tyler offers accommodations to students with learning, physical, and/or psychological disabilities. If you have a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or a history of modifications or accommodations in a previous educational environment, you are encouraged to visit <https://hood.accessiblelearning.com/UTTyler/> and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with the Assistant Director Student Accessibility and Resources/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at <https://www.uttyler.edu/disability-services>, the SAR office located in the Robert Muntz Library, LIB 460, email saroffice@uttyler.edu, or call 903.566.7079.

MILITARY AFFILIATED STUDENTS

UT Tyler honors the service and sacrifices of our military-affiliated students. If you are a student who is a veteran, on active duty, in the reserves or National Guard, or a military spouse or dependent, please stay in contact with your faculty member if any aspect of your present or prior service or family situation makes it difficult for you to fulfill the requirements of a course or creates disruption in your academic progress. It is important to make your faculty member aware of any complications as far in advance as possible. Your faculty member is willing to work with you and, if needed, put you in contact with university staff who are trained to assist you. The [Military and Veterans Success Center \(MVSC\)](#) has campus resources for military-affiliated students. The MVSC can be reached at MVSC@uttyler.edu or via phone at 903.565.5972.

STUDENTS ON AN F-1 VISA

To remain in compliance with Federal Regulations requirements you must do the following:

- Traditional face-to-face classes: Attend classes on the regular meeting days/times.
- Hybrid Classes: Attend all face-to-face classes convened by the instructor according to the schedule set for your specific course.
- Online course: Only one online course can count toward your full-time enrollment. Students are expected to be fully engaged and meet all requirements for the online course.

ACADEMIC HONESTY AND ACADEMIC MISCONDUCT

The UT Tyler community comes together to pledge that "Honor and integrity will not allow me to lie, cheat, or steal, nor to accept the actions of those who do." Therefore, we enforce the [Student Conduct and Discipline policy](#) in the Student Manual Of Operating Procedures (Section 8).

FERPA

UT Tyler follows the Family Educational Rights and Privacy Act (FERPA) as noted in [University Policy 5.2.3](#). The course instructor will follow all requirements to protect your confidential information.

ABSENCE FOR OFFICIAL UNIVERSITY EVENTS OR ACTIVITIES

This course follows the practices related to [Excused Absences for University Events or Activities](#) as noted in the Catalog.

ABSENCE FOR RELIGIOUS HOLIDAYS

This course follows the practices related to [Excused Absences for Religious Holy Days as noted in the Catalog](#).

ABSENCE FOR PREGNANT STUDENTS

This course follows the requirements of Texas Laws SB 412, SB 459, SB 597/HB 1361 to meet the needs of pregnant and parenting students. Part of the supports afforded pregnant students includes excused absences. Faculty who are informed by a student of needing this support should make a referral to the Parenting Student Liaison. NOTE: Students must work with the Parenting Student Liaison in order to receive these supports. Students should reach out to the Parenting Student Liaison at parents@uttyler.edu and also complete the [Pregnant and Parenting Self-Reporting Form](#).

CAMPUS CARRY

We respect the right and privacy of students who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at <http://www.uttyler.edu/about/campus-carry/index.php>.

