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)
- Pen (no pencils!)
- Scientific calculator
- Appropriate lab attire (INDIRECT VENT safety goggles, close-toed shoes, pants, etc.)

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Contact Information:

- Dr. Jason Smee
- jsmeer@uttyler.edu (best)
- RBS 3030
- 903.566.7069

Office Hours

- MWF 10:30 am - 12:00 pm
- T 1:30-2:30 pm
- or 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 from January 13 through April 24 from 1:30-5:30 p.m. (F) and 5:30-9:30 p.m. (Th) in RBS 2015/4012, except during Spring Break and perhaps the week before Easter (April 19).
- You may be required to come in outside of class time to finish an experiment. These occasions will be kept to a bare minimum.
- The deadline for all registrations, schedule changes, and section changes (the “Census Date”) is Monday, January 27. Please see the University Policies section at the end of this syllabus for more information regarding dropping class, grade replacement, etc.
- The last day to drop the course with a W is Monday, March 30. If you wish to drop the course, it is YOUR responsibility; failure to officially withdraw from the course will result in a grade of F.
- Attendance will NOT be taken. However, it will be obvious that you are not there. Please notify me at your earliest convenience if you will be absent.

Grading Scale

The grading scale will tentatively be based on the 90/80/70/60 (A/B/C/D) scale. You will be evaluated based on your report summaries, one full lab report, and 2 assignments. There are no exams. The weighting of the grades is as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
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<tbody>
<tr>
<td>Notebook and result summaries</td>
<td>70%</td>
</tr>
<tr>
<td>Full lab report</td>
<td>20%</td>
</tr>
<tr>
<td>2 outside assignments</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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Laboratory Notebook (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 insert them, in order, at the end of your report.
Summary Reports
- For all experiments, except the B12 model experiment, 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 from 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 (e.g. “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 **OWN** summary through TurnItIn on Canvas.

Full Lab Report (B12 Model Experiment)
- Your report should include the following sections:
  - **Cover Page:** same as above plus an abstract (2 or 3 sentences that briefly describe your results)
  - **Introduction:** Briefly discuss the principle(s) of the experiment and give pertinent chemical equations.
  - **Procedure:** same as above
  - **Results:** same as above
  - **Discussion/Analysis:** same as above
  - **Conclusions:** any general comments regarding your results
  - **References:** same as above
  - Submit your **OWN** report through TurnItIn on Canvas.

Rubrics for Each Summary Report and the Full Lab Report will be provided on Canvas.
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)
☐ Pictures of notebook pages, pasted in order, are included at the end of your report
☐ Electronic copy submitted through TurnItIn
☐ Hard copy of report (optional)

List of Experiments

- Synthesis of Copper Complexes: K₂[Cu(ox)₂] · 0.5H₂O (basic synthesis techniques)
- Synthesis of [Cr₂(OAc)₆] (characterization by IR spectroscopy)
- Δₒ 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)
- Synthesis of [Mn(acac)₃] (characterization by magnetic susceptibility)
- Synthesis of [Co(Hdmg)₂(py)(Pr)] (characterization by ¹H NMR spectroscopy)
- Synthesis of Acetylferrocene (separation by column chromatography and characterization by cyclic voltammetry)

Outside Assignments

To supplement the lecture material, you will complete 2 assignments that will constitute a total of 10% of your grade. The assignments (and links to the software) will be posted as the relevant material is made available in lecture. You will complete these assignments, on your own time, outside of the normally scheduled lab time. They will be due by the last day of lab (April 23 or 24, depending on your section).

- The first assignment will be to use Wavefunction’s Spartan modeling software to look at the molecular orbitals of simple diatomic and triatomic molecules. For those who will go on to take Advanced Inorganic we will use this software again to calculate IR stretches for simple compounds and also look at bonding in more complicated structures.
- The second assignment will be using the CCDC (Cambridge Crystallographic Data Centre) Mercury software. This software lets you look at crystal structure data to get bond angle, bond length, and a variety of other geometric information.

Summary of Important Dates

- January 27 (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 23/4 (Thursday/Friday): last lab report due / lab cleanup day
UNIVERSITY POLICIES AND INFORMATION THAT MUST APPEAR IN EACH COURSE SYLLABUS

UT Tyler Honor Code
Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

Students Rights and Responsibilities
To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: http://www.utterly.edu/wellness/rightsresponsibilities.php

Campus Carry
We respect the right and privacy of students 21 and over 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.utterly.edu/about/campus-carry/index.php

UT Tyler a Tobacco-Free University
All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors.
Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products.

There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support. For more information on cessation programs please visit www.utterly.edu/tobacco-free.

Grade Replacement/Forgiveness and Census Date Policies
Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at http://www.utterly.edu/registrar. Each semester’s Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.

Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions of which students need to be aware. These include:

- Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a “W” grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

State-Mandated Course Drop Policy
Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date).

Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

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 you have 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 Cynthia Lowery, Assistant Director of Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at http://www.utterly.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079.

Student Absence due to Religious Observance
Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

Student Absence for University-Sponsored Events and Activities
If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.
UNIVERSITY POLICIES AND INFORMATION THAT MUST APPEAR IN EACH COURSE SYLLABUS (CONT.)

Social Security and FERPA Statement
It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Emergency Exits and Evacuation
Everyone is required to exit the building when a fire alarm goes off. Follow your instructor’s directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

Student Standards of Academic Conduct
Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

i. “Cheating” includes, but is not limited to:
   - copying from another student’s test paper;
   - using, during a test, materials not authorized by the person giving the test;
   - failure to comply with instructions given by the person administering the test;
   - possession during a test of materials which are not authorized by the person giving the test, such as class notes or specifically designed “crib notes”. The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;
   - using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
   - collaborating with or seeking aid from another student during a test or other assignment without authority;
   - discussing the contents of an examination with another student who will take the examination;
   - divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructors have designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
   - substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
   - paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
   - falsifying research data, laboratory reports, and/or other academic work offered for credit;
   - taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
   - misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.

ii. “Plagiarism” includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another’s work and the submission of it as one’s own academic work offered for credit.

iii. “Collusion” includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.

iv. All written work that is submitted will be subject to review by plagiarism software.

UT Tyler Resources for Students
- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu
- UT Tyler Tutoring Center (903.565.5964), tutoring@uttyler.edu
- The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.
- UT Tyler Counseling Center (903.566.7254)