

Inorganic Chemistry Lab CHEM 345 Spring 2025

Instructor: Adharsh Raghavan
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Lab: Wednesday, 1:00 – 3:50 PM; JEPS 416
Office Hrs: M 12:00 – 1:00 pm ([Zoom; click here for link](#)), 3:00 – 5:00 pm ([Zoom; click here for link](#))
T 4:00 – 5:00 pm
W 10:00 am – 12:00 pm

Materials: Carbonless duplication lab notebook, approved safety goggles and lab coat, scientific calculator

Web Site: This course will make use of the Canvas course management system. Pre-lab materials and experimental procedures will be posted here.

Content: This course will focus mainly on the d-block of the periodic table and include analysis of the structure and reactivity of these metals and the coordination complexes that they form. The labs will focus on inorganic synthesis techniques and different methods of characterization of inorganic complexes. After completing this course, a student should be able to

- Prepare and characterize inorganic and organometallic complexes using inorganic laboratory techniques and various spectroscopic methods
- Interpret collected data in light of the principles of inorganic chemistry
- Use the chemical literature and communicate your science using standard literature formats

Grading:	Points	Total
Abstract Assignment	30	30
Lab Technique	50	50
Lab Reports with lab notebook pages (4)	100	400
Research Project Synthesis Plan with Rationale	200	200
RAMP Safety Analysis for Research Project	50	50
Weekly Research Project Plans (7)	10	70
Research Project Lab Report	200	<u>200</u>
		1000

Students with a C average or lower will receive a Mid-Semester Deficiency Report.

Attendance: Attendance and completion of the experiments is mandatory. Please contact me as soon as possible if you are absent from the laboratory. Missed experiments may be made up only in the case of an emergency. You need to notify me immediately of such an emergency. It is important to note that due to the hands-on nature of the laboratory, **if a student misses three (3) lab periods, they will fail the course.**

Lateness to the pre-laboratory lecture is distracting to others, and students should attempt to be on time. The pre-lab lectures cover important safety and procedural information. If an individual is repeatedly tardy, a ten point deduction will occur for each instance. If a student is excessively late, they may not be permitted to perform the lab, and this will count as an unexcused absence.

You should complete as much of the work and planning of your experiments as possible during the assigned laboratory time. **No unauthorized access to the laboratory is permitted.**

Lab

Notebook:

You will utilize carbonless, duplicate, permanently bound laboratory notebooks, and all recordings must be done **in ink**. The notebook must be recorded neatly and legibly. Mistakes are crossed out with a **single line**, so that the original mistake can be seen. A mistake is **never** obliterated. On each page of the notebook, include the title of the experiment, the date, and your name. Pre-laboratory assignments must be completed in the notebook prior to entering the lab and will include, at the least, a statement of the purpose of the lab, important safety concerns, and a brief summary of the procedure to be followed. Other components, such as necessary calculations, may also be required. **No pre-lab assignment means the lab may not be conducted.**

Each new experiment is started on a new page of the laboratory notebook, and the pages should be numbered in successive order. All data and observations should be recorded, as well as the chemicals used (with their sources) and the instrumentation used. Calculations performed in the laboratory are recorded in the laboratory notebook. Deviations from the stated experimental procedure and any (seemingly) odd occurrences are also recorded. A laboratory notebook never contains too much information. The more information recorded, the better the conclusions that can be drawn from the data.

The copy pages must be submitted when the corresponding lab report is turned in.

Lab Reports: Lab reports will be prepared in the style and at the level of the American Chemical Society (ACS) journal *Inorganic Chemistry*. This is done in an effort to prepare you for the expectations of the discipline. Any references included in the lab report must be cited according to the *ACS Style Guide*. Occasionally, additional questions will be assigned and should be included in the formal lab report. Lab reports must be turned in on the day assigned, typically at the start of the lab period after the completion of the experiment. Late work will not be accepted without prior arrangements with me and may be subject to a penalty.

Lab Report Format:

TITLE: The title should accurately, clearly, and concisely reflect the emphasis and content of the paper. The title must be brief and grammatically correct.

AUTHOR NAMES: *Include in the byline all those who have made substantial contributions to the work, even if the paper was actually written by only one person. One author must be designated with an asterisk as the author to whom correspondence should be addressed.*

RECEIVED DATE: Date the report is due.

ABSTRACT: All reports must be accompanied by an abstract. The abstract should briefly state the problem or purpose of the research, indicate the theoretical or experimental plan used, summarize the principal findings (with an emphasis on numerical results and spectroscopic data), and point out major conclusions. The abstract may be no longer than 300 words. Characteristics of a well-written abstract will be discussed in the first lab session.

REPORT TEXT: For each lab, you will prepare an experimental section and a results and discussion section. The article sections should follow the format of the ACS journal *Inorganic Chemistry* and should include the level of detail that is indicated by representative articles from this journal. The report should be prepared in the past tense and should not be written in first-person.

The experimental section should include the names and suppliers of all chemicals used, as well as the make and model number for any instrumentation used. A brief explanation of the experimental method should be included here. If a novel technique or analytical method is used, it may be presented in further detail. Spectroscopic data and percent yield for synthesized compounds is included here. Characteristics of a well-written experimental section will be discussed in the first lab session.

The results and discussion section should include any relevant reaction mechanisms or structures (preferably done in ChemDraw, but can be hand-drawn neatly), graphs, tables, charts, spectra, etc. as needed to present and analyze the data. If indicated, answers should be incorporated into the results and discussion section for any provided questions pertaining to the lab. This section should contain an in-depth analysis of the data and results, including discussion of any trends, relation to course concepts, and must include comparison to published literature values or results, with proper citation. Care should be taken that the references are adequately incorporated into the discussion and add to the readers' understanding of either the background or the concepts being explored in the laboratory. These references should be included as endnotes and should be cited following the *ACS Style Guide* format.

Research Project: More information about the expectations and requirements for the course research project will be distributed prior to spring break.

Lab Technique: Your technique grade will be based on your punctuality, maintenance of a clean lab space and common areas, efficient use of lab time, observance of lab safety, and timely reporting of shared data to the class.

Academic Honesty: In accordance with the University's Honor Code, all work submitted for grading must be your own and be pledged as such by signing the complete honor pledge at the top of the assignment. Students may work together to collect data during the laboratory, but the analysis of the data and the lab report should be the student's own work in its entirety. All references must be properly cited. Academic dishonesty in any shape or form will not be tolerated. Suspected violations of the Honor Code will be addressed according to the policy established by the Honor Council.

Disability Resources: The Office of Disability Resources has been designated by the University as the primary office to guide, counsel, and assist students with disabilities. You will need to request appropriate accommodations through this office as soon as possible, and then make an appointment with me to discuss your approved accommodation needs. Please bring your accommodation letter with you to the appointment. I will hold any information you share with me in the strictest confidence unless you give me permission otherwise.

Chem 345 Lab Schedule

Date	Lab	Assignments due
1/15	Overview, Safety, Abstract Assignment	
1/22	Cool copper compounds	Abstract assignment
1/29	Synthesis of cobalt coordination compounds	Cool Cu compounds report
2/5	Identification of a Geometrical Isomer of $[\text{Mo}(\text{CO})_4\text{L}_2]$ by Group Theory	Co compounds report
2/12	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	Group theory report
2/19	An Investigation of Magnetism: $\text{M}(\text{acac})_n$ Complexes	
2/26	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	Paramagnetism report
3/5	SPRING BREAK	
3/12	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	RAMP Analysis
3/19	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	
3/26	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	
4/2	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	
4/9	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	
4/16	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	
4/23	Research Project: Design of Catalysts for the Dehydrogenation of Ammonia Borane	
5/1		Research project due by 5 PM

Important dates:

Drop deadline: Jan 31

Mid-semester grades due: Mar 14

Withdraw deadline: Mar 21

Final grades due: May 6

Title IX Statement

University of Mary Washington faculty are committed to supporting students and upholding the University's *Policy on Sexual and Gender Based Harassment and Other Forms of Interpersonal Violence*. Under Title IX and this Policy, discrimination based upon sex or gender is prohibited. If you experience an incident of sex or gender based discrimination, we encourage you to report it. ***While you may talk to me, understand that as a "Responsible Employee" of the University, I MUST report to UMW's Title IX Coordinator what you share.*** If you wish to speak to someone confidentially, please contact the below confidential resources. They can connect you with support services and help you explore your options. You may also seek assistance from UMW's Title IX Coordinator. Please visit [UMW's Title IX website](#) to view UMW's policy and to find further information on support and resources.

Ruth Davison
Title IX Coordinator
Fairfax House

Confidential Resources

On-Campus

Talley Center for Counselling Services
Lee Hall 106
540-654-1053
Student Health Center
Lee Hall 112
540-654-1040

Off-Campus

Empowerhouse
24-hr hotline: 540-373-9373

Rappahannock Council Against Sexual Assault
(RCASA)
24-hr hotline: 540-371-1666

Policy on Recording Class and Distribution of Course Materials

Classroom activities in this course may be recorded by students enrolled in the course for the personal, educational use of that student only, and may not be further copied, distributed, published, or otherwise used for any other purpose without the express written consent of the course instructor.

Distribution or sale of any and all class materials (any document or other item provided by or made available by the instructor to students enrolled, including but not limited to coursepacks, lecture videos, annotated lectures, handouts, laboratory experiments, quizzes, exams, review sheets or past exams) provided for this course (in the coursepack, during class or lab, or posted on Canvas or YouTube) without the express written permission of the instructor is a violation of copyright law.

****Students in violation of any part of this policy are subject to disciplinary action through the Office of Student Conduct and Responsibility.****

This policy is consistent with UMW's Policy on Recording Class and Distribution of Course Materials.