

Drexel University
CHEM 425: Inorganic Chemistry Laboratory
Spring 2016 Syllabus

INSTRUCTORS

- Dr. Molly A. O'Connor (*course coordinator*)
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- Mr. Pedro Amaral
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- Mr. Kyle Hess
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- Dr. Vaidy Mathrubooth
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 - **Phone:** (215) 895-1697
 - **Office Hours:** Tuesdays 10:30 am – 2 pm
- Dr. Curtis Wahlgren
 - **Email:** cgw24@drexel.edu.
 - **Office Hours:** available by appointment

CLASS SCHEDULE

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|--------------------------------------|-----------|--------------------|--------------|
| • Lab Lecture (All sections): | Monday | 10:00 – 10:50 am | Stratton 101 |
| • Lab (Section 061): | Wednesday | 11:00 am – 1:50 pm | Disqué 409 |
| | Friday | 1:00 – 3:50 pm | Disqué 409 |
| • Lab (Section 062): | Tuesday | 2:00 – 4:50 pm | Disqué 409 |
| | Friday | 4:00 – 6:50 pm | Disqué 409 |

COURSE OBJECTIVES

- To improve your skills in the handling of chemical reagents.
- To learn about some types of reactions that are new to you.
- To apply and experience principles learned in the Inorganic lectures.
- To increase your skills in the interpretation of experimental results.

Note – CHEM 422 is a pre or co-requisite for CHEM 425 (the inverse does not apply).

COURSE MATERIALS

- Lab Experiments will be provided for students during the course.
- Eye protection and lab coat are required during the lab period.
- Additional laboratory texts can be found in Hagerty Reserves.

COURSE EXPECTATIONS

Lab:

The lab sequence involves (a) regularly scheduled experiments performed by everybody in the class, plus (b) an "individual project", chosen and performed by one pair of students. Your grade for the course will be determined according to your laboratory reports. A lab report should communicate not only the quantitative results of the experiment but also the quality of your data and your understanding of the experiment. Reports should be done using the appropriate software and are typically due 2 weeks after the completion of the experiment (*see tentative course schedule*). If a report is submitted late, then for each Drexel class day by which a report is overdue, **5% of the marks are deducted**. Any and all lab reports **must be submitted no later than 11:59 PM, Tuesday June 7th**. Your grade is also dependent on timely attendance at the lab-lecture, and participation in the attendant discussion. By far the major part of your grade is derived from doing the experiments and writing good lab reports that are submitted on time. Labs are often completed in groups, however the lab reports must be written independently, even though the data would be utilized in common. The lowest lab grade will be dropped for each student, excluding the individual project grade.

Lab reports:

The format of the reports should be that of a research paper in ACS *Inorganic Chemistry*. Be sure to include the following elements: (1) *Title or Title Page*; (2) *Abstract*; (3) *Introduction* (be concise); (4) *Experimental Procedure*; (5) *Experimental Data* (tabular format, with proper units); (6) *Results & Conclusions*; (7) *References*. In (8) an *Appendix*: show the calculations used in obtaining intermediate and final results, including any equations used in proceeding from data to results. In case of multiple sets of data, only one set of calculations need be shown, but all results should be listed in tabular form. When averaging or data-fitting is called for, a standard deviation should be listed as well as a mean. Also include any graphs, charts, and spectra from the experiment. Answers to any specific questions asked within the experiment are typically incorporated into the applicable sections of the lab report, though it is very helpful to the instructors to include a section in the Appendix stating where the answers to the questions can be found.

Regularly Scheduled Experiments:

The following experiments will be performed during the term (*see the tentative course schedule*)

- Crystal Field Properties of Ni²⁺/Cu²⁺ Compounds.
- Ligation Equilibrium of a Metalloprotein
- Assembly and Properties of a Macrocyclic Complex.
- Synthesis and Excited-State Chemistry of Ru(Bipy)₃²⁺
- An Inorganic Dye-Based Thin-film Photovoltaic Cell.
- Photosynthetic Preparation of an Organometallic Mn(0) Complex
- A Ruthenium Nitrosyl Complex from Diazald[®]
- Synthesis of a Silicone Polymer

Individual Projects:

You and your lab partner will choose one of the provided projects from the instructor's sign-up sheet. The list of experiments will be available by week 2. You may also wish to design your own experiment, pending instructor approval. The tentative schedule with regards to individual projects is as follows:

- By April 11th: sign up for your choice of project.
- By April 18th: submit your written proposal for performing the project.
 - You will need to outline: (1) Apparatus and (amounts of) reagents required; (2) The experimental procedure; (3) A description of the methods to be used for appropriately characterizing the product(s), indicating what measurements will be made; (4) your planned timetable for performing the work; (5) References. The Instructors will review and critique your proposal. It's obviously necessary to allow some time for purchasing any required reagents.

- You will have time in weeks 7, 8, and 9 to perform the experimental work. There is also free time (*e.g.*, while refluxing a reaction) during earlier experimental periods, when you can get started on your project.
- May 26 - June 7: write up your experiment. The written report should again be in the format of a research paper in ACS *Inorganic Chemistry*. **Note – only 1 lab report need be submitted per group.**

Web:

The BbLearn course websites will be used throughout the course. Lab lecture notes, lab materials, and course announcements will be regularly posted. Emails will also be sent to your Drexel email account. Students are responsible for checking the course website and email on a regular basis.

Americans with Disabilities Act:

Students requesting accommodations due to a disability at Drexel University need to present a current Accommodation Verification Letter (AVL) to faculty before accommodations can be made. AVL's are issued by the Office of Disability Resources (ODR). For additional information, visit the ODR website at <http://www.drexel.edu/oed/disabilityResources>, or contact the Office for more information: [215-895-1401](tel:215-895-1401) (V), or disability@drexel.edu

Add, Drop And Withdrawal Policies:

- You can **add** this course until the end of week 2
See http://www.drexel.edu/provost/policies/course_add.asp
- If you add this course after the start of the term, you are responsible for completing ALL work that you may have missed.
- You can **drop** this course until the end of week 2; the course will then be removed from your transcript – See http://www.drexel.edu/provost/policies/course_drop.asp
- The course **withdrawal** deadline is April 8th. You will have received some graded work prior to this deadline. If you have any questions about your progress at any time of the term, please contact me. If you choose to Withdraw, a “W” will be recorded in your transcript
See http://www.drexel.edu/provost/policies/pdf/course_withdrawal.pdf

Other University Policies:

Graduating Seniors might wish to review the university policies on Final Examinations and Senior Privilege. For more information, see the “examination and grading options” PDF under the “academic policies” tab at the following link: http://drexel.edu/studentaffairs/community_standards/studentHandbook/

Broad statement of the goals of 425 in the B.S. program context; development of abilities to:

- write scientific reports, with graphical presentation of data (technical writing skills)
- document scientific information and experimental data (keeping a lab notebook or other written record)
- use theory to understand/predict experimental observations
- make quantitative/structural measurements and interpret results (data collection and analysis)
- identify and handle hazardous materials (includes ability to access this information and to apply reasonable cautionary measures)
- plan and execute chemical transformations (experimental skills)
- select and use chemical instrumentation and spectroscopy
- work in teams and develop collaborations
- use the physical principles upon which chemical instrumentation is based
- understand and use reaction chemistry
- find and evaluate the validity and usefulness of information (*e.g.*, library or reputable online resources)
- discern and practice good scientific ethics (*e.g.*, avoiding plagiarism)
- discern sources of experimental error
- use statistics to judge limitations of data
- use math and logic to understand data and results

GRADING

Tentative grade cutoffs are shown below. The instructors reserve the right to lower some or all of the grade cutoffs.

Final Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F
%	100-93	92-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-65	Below 65

Academic Integrity:

Discussion of lecture material and lab assignments among class members is encouraged, but all final lab reports turned in for grading must be your own work, unless otherwise explicitly stated. Academic dishonesty in any form (plagiarism, cheating, copying lab reports, etc.) will not be tolerated and will result in an **AUTOMATIC ZERO** on the given assignment. Subsequent incidents of academic dishonesty will result in automatic failure of the course. For more information, see material in “academic dishonesty” under the “academic policies” tab at the following link: http://drexel.edu/studentaffairs/community_standards/studentHandbook/

TENTATIVE COURSE SCHEDULE

The instructors reserve the right to change the schedule of lab experiments and lab report due dates, if necessary. Appropriate advance notice will be given by in-class announcement and through the course website.

Week	Laboratory Experiment	Notes and Due Dates
1 (3/28 – 4/1)	<ul style="list-style-type: none"> • Lab Day 1: Crystal Field Properties of $\text{Ni}^{2+}/\text{Cu}^{2+}$ Compounds • Lab Day 2: Crystal Field Properties of $\text{Ni}^{2+}/\text{Cu}^{2+}$ Compounds 	
2 (4/4 – 4/8)	<ul style="list-style-type: none"> • Lab Day 1: Ligation Equilibrium of a Metalloprotein • Lab Day 2: Assembly and Properties of a Macrocylic Complex 	
3 (4/11 – 4/15)	<ul style="list-style-type: none"> • Lab Day 1: Assembly and Properties of a Macrocylic Complex • Lab Day 2: Assembly and Properties of a Macrocylic Complex 	<ul style="list-style-type: none"> • Sign-up for Individual Project in Lab Lecture • $\text{Ni}^{2+}/\text{Cu}^{2+}$ Compounds report due Lab Day 2
4 (4/18 – 4/22)	<ul style="list-style-type: none"> • Lab Day 1: Synthesis and Excited-State Chemistry of $\text{Ru}(\text{Bipy})_3^{2+}$ • Lab Day 2: LAB CANCELLED! 	<ul style="list-style-type: none"> • Submit Individual Project written proposal in Lab Lecture • Metalloprotein report due Lab Day 2
5 (4/25 – 4/29)	<ul style="list-style-type: none"> • Lab Day 1: An Inorganic Dye-Based Thin-film Photovoltaic Cell • Lab Day 2: Characterization of $\text{Ru}(\text{Bipy})_3^{2+}$ 	<ul style="list-style-type: none"> • Ni Macro report due Sunday May 1st
6 (5/2 – 5/6)	<ul style="list-style-type: none"> • Lab Day 1: Set up for the Photosynthetic Prep of Organometallic $\text{Mn}(0)$ Complex • Lab Day 2: A Ruthenium Nitrosyl Complex from Diazald[®] 	<ul style="list-style-type: none"> • Photovoltaic Cell report due Sunday May 8th
7 (5/9 – 5/13)	<ul style="list-style-type: none"> • Lab Day 1: Characterization of Ruthenium Nitrosyl Complexes Collection and Characterization of $\text{Mn}(0)$ Complexes • Lab Day 2: Individual Projects 	<ul style="list-style-type: none"> • $\text{Ru}(\text{Bipy})_3^{2+}$ report due Sunday May 15th
8 (5/16 – 5/20)	<ul style="list-style-type: none"> • Lab Day 1: Individual Projects • Lab Day 2: Individual Projects 	<ul style="list-style-type: none"> • <i>No lab lecture this week!</i> • Organometallic $\text{Mn}(0)$ report due Sunday May 22nd
9 (5/23 – 5/27)	<ul style="list-style-type: none"> • Lab Day 1: Individual Projects • Lab Day 2: LAB CANCELLED! 	<ul style="list-style-type: none"> • <i>No lab lecture this week!</i> • Ruthenium Nitrosyl report due Sunday May 29th
10 (5/30 – 6/3)	<ul style="list-style-type: none"> • Lab Day 1: Synthesis of a Silicone Polymer (<i>short lecture prior to lab</i>) • Lab Day 2: Additional Individual Project time if needed 	<ul style="list-style-type: none"> • No Classes Monday May 30th
11 (6/6 – 6/10)	<ul style="list-style-type: none"> • Laboratory Drawer Check out During Lab Lecture Monday 6/6 	<ul style="list-style-type: none"> • Silly Putty report due TUESDAY June 7th • Individual Project report due TUESDAY June 7th • ALL REPORTS must be submitted by 11:59 pm on TUESDAY June 7th