CHEMISTRY 212/213: INORGANIC CHEMISTRY I SPRING 2018 SYLLABUS

Instructor: Dr. Chip Nataro
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Web page: This course is available on Moodle
Drop-in hrs: Feel free to stop by any time. If I am not in my office, I could be in my lab (223 Hugel). I cannot promise you I will always have available time, but you can try.
Lectures: M, W, F 8:00 – 8:50 a.m. Honest, not my choice
Lab (213): T 8:00 – 10:50 a.m.
Text: Inorganic Chemistry, 5th Ed.; by G.L. Miessler, P.J. Fischer and D.A. Tarr (Pearson, 2014)

Objectives: The purpose of this course is to introduce you to modern idea concerning the structures of atoms and to describe models for bonding in compounds. The emphasis throughout the course will be on the way in which structures and observable properties of compounds are influenced by their electronic structures. While this course will deal primarily with inorganic compounds, the principles that are developed will apply directly to ***organic*** compounds as well. Consequently, ***organic*** compounds may be used as examples. However, no background for this course other than general chemistry is assumed or necessary.

Students enrolled in Chemistry 213 will take the laboratory component of the course. Enrollment in Chemistry 213 is only required for B.S. Chemistry majors. A different version of the syllabus is available for Chemistry 212 and 213.

Expectations: Read the material.
Bring a scientific calculator to class.
Work the homework sets.
Actively participate in class, particularly homework sets.
Show up to class. For the lecture portion of the course, there is no formal attendance policy. However, it is highly unlikely that any student will receive an above average grade without regular attendance in lecture.

Outcomes: In keeping with the chemistry department student learning goals, this course will 1) contribute to the student's general knowledge of chemistry with a particular emphasis on modern inorganic concepts and 2) enhance the student's ability to apply new knowledge to solve problems. Students enrolled in the laboratory will also have a hands-on experience in a chemical laboratory emphasizing proper technique in obtaining and recording data, proper use of instrumentation and the use of SciFinder Scholar to search the chemical literature.

Grading:

3 exams	18% each	(Feb 12, Mar 7, Apr 11)
Final exam	21%	To be determined
Lab/Project	20%	
Problem Sets	5%	

Grades will be assigned using the standard scale.

Exams: Three exams and a final will be given over the course of the semester. I tend to write slightly long exams and I do not like students to feel rushed while they are taking exams. I would rather see what you know as opposed to what you can write in 50 minutes. Therefore, exams will be given either at night or early in the morning on the days scheduled with a three hour time limit. Classes on those

days will be used for review if the exams are at night. If you are unavailable to take the exam in the evening (and you must tell me why AT LEAST ONE WEEK prior to the exam), you will either take it during class time or at a time we agree upon. Make-up exams will only be given for extreme cases requiring dean's excuses. The final will only be partially cumulative. My early estimate has it at 70% final few weeks of material, 30% cumulative.

Homework: Problem sets will be assigned and graded during the course of the semester. There will be approximately two problem sets per test period. They will be due approximately one week after being assigned. We will discuss the problem sets in class. Students in **Chemistry 212** will be assigned to put a problem up on the board during these discussion periods. We will analyze the work presented on the board as well as entertain different ideas from the rest of the class. Students are strongly encouraged to put notes/corrections on their problem sets as we discuss them as long as a different color pen or pencil is used. You are encouraged to work together or talk about the problem sets with one another. However, simply copying another person's work will not be of any benefit to the student.

Moodle: Moodle will be used extensively. Laboratory materials, student lecture guides and problem sets will be posted. In addition, grades will be posted. Previous exams can also be found, although the course may have undergone some revision and different material may be present. If you have any problems viewing this material, please inform the instructor.

Cell phones: I expect you to come to class and be prepared to focus on the material being covered. Texting, checking various forms of social media, etc. will only serve to distract you during class. Students doing this during class may be asked to leave. If this is an ongoing problem, I will exercise my right to have a student withdraw from the class.

Other: Maybe because I am old-fashioned or maybe because I was required to do so, you will become very familiar with the periodic table during this course. So familiar in fact, that you might even say you will have to memorize the atomic symbols and their location on the table excluding the d-block and f-block metals. It will be worth points on the first exam and a complete table will not be provided on any exams.

While nice and useful some of the time, graphing/programmable calculators will only be allowed for the exams under special circumstances. The memories must be erased by me before the exams. It will save me, and you, a lot of time and trouble if you just pick up a cheap scientific calculator. If you wish to use a graphing calculator, I will erase the memory before each exam. I will not spend time looking through the programs to make sure they are ok. I will erase everything. If you want to keep something, I suggest saving it to a computer or maybe another calculator.

Intellectual Honesty: You will be held to the highest expectations of student conduct as outlined in the Lafayette College Student Handbook. If you violate these precepts, I will refer the matter to the Dean's office

CHEMISTRY 213: INORGANIC CHEMISTRY I
SPRING 2018 LAB SYLLABUS SUPPLIMENT

The purpose of this laboratory is to provide you with opportunities to improve your laboratory skills in the preparation of inorganic compounds and to introduce you to several techniques for their characterization through the use of various instruments in the department. You will not receive a separate grade for this course on your transcript, but the laboratory will count as 20% of your combined lecture/laboratory grade.

Instructor: Chip Nataro

Meeting Times: Tuesday 8:00 to 10:50 am

Attendance: Attendance at all lab sessions is required. You will receive zero credit for any experiment that you did not actually perform. Scheduling of make-up experiments is problematic and will only be considered under extreme circumstances.

Required Materials: Lab notebook (white & yellow sheets & carbon paper)
Goggles or other approved safety glasses
Pens (no pencils in the notebook)
Calculator
No formal text is required for the lab. Experimental background and procedures will be posted at least one week in advance as well and any necessary background material.

Safety: The importance of safe lab practices cannot be over emphasized. Any student who does not comply is subject to removal from lab and failure of the course.

Goals: The goal of all of the laboratory courses in the chemistry department is to train you to be able to function in the lab. There are various aspects to this goal and each lab course emphasizes different aspects. In this lab the primary focus is on experimental procedure.

1) A portion of your report grade will be based on the experimental procedures you write. They should be accurate and informative. I should be able to conduct the experiment exactly the way you did based on your experimental section.
2) The experimental procedures provided to you will be minimal. You will have to think about the glassware required and how best to perform an experiment. You should regularly consult with the instructor as you perform the experiment.
3) Your notebook is a key component of working in the lab.

Prelabs: Prelabs are provided to help you prepare for the experiment so that you may work efficiently and safely during the lab period. The prelab will be handed in after prelab discussion. You should take notes on the prelab, but they must be in a different color ink. Prelabs and prelab discussion will be significant components of the laboratory final.

Notebooks: Proper notebook entries will be required for every experiment. An outline of the proper way to enter information in your notebook is included at the end of this syllabus. I should be able to reproduce exactly what you did in your lab from your notebook entry. Mistakes should be crossed out using a single line so they remain readable. At the end of every lab period, you will be required to hand in copies of your notebook entries.

Reports: Reports for all experiments will be due **electronically** at the beginning of the lab period the week following completion of the

experiment. The style of the report and their relative point value will vary depending on the experiment. In general, the reports will be a short summary of your results and a brief discussion of what those results mean. They must include a title, purpose, experimental section and a results and discussion section. Late lab reports will lose 10% of the possible points per day late. The report will be considered late if it is not turned in by the beginning of the prelab session on the due date. Working on late reports during the lab period is forbidden.

Lab Exam: During the final week, a lab exam will be given. The exam will be more conceptual in nature, but may force you to recall details of specific labs.

Course Participation: The laboratory experience should be a time to discover, to think creatively, to test your understanding and to have informal discussions about chemical principles with the instructor and each other. You will work in groups, in some cases, groups of two, in other cases, larger groups. While it is not required, it is strongly suggested that you partner with everyone in the lab at least once. Your participation grade will be based on my observation of how well you work in lab.

Grading: The final lab grade will be determined by your performance on reports, your lab notebook and your course participation weighted as follows:

Reports:	65%
Prelab:	10%
Notebook:	10%
Exam:	10%
Participation:	5%

Owed time: You should finish some labs early during the course of the semester. To make up this lost time, you will be required to attend presentations given by your classmates that are taking 212. This will be done outside the normally scheduled class time, either during the noon hour, at night or on a Saturday. We will choose times suitable for the students giving presentations. Due to this scheduling, I understand you will not be able to attend every presentation. If you attend fewer than 35% of both the element and project talks, your laboratory grade will be dropped 10%.

CHEMISTRY 213: EXPERIMENT LIST

Lab #	Lab Name	Date(s)
Lab 1	Gas Chromatography-Mass Spectrometry	Jan 23
Lab 2	Isotopic Substitution in IR Spectroscopy	Jan 30
Lab 3	Identification of Isomers in a Ruthenium Compound	Feb 6
Lab 4	Complex Ion Composition by Job's Method	Feb 13
Lab 5	Crystal Structures of Solid-state Compounds	Feb 20
Lab 6	X-ray Powder Diffraction	2 weeks
	Synthesis	Feb 27
	X-ray	Mar 6
Lab 7	Computational Applications to VSEPR	Mar 20
Lab 8	Computational Applications to Molecular Orbitals	Mar 27
Lab 9	Synthesis, Characterization and Reactivity of $CuBH_4$	2 Weeks
	Synthesis	Apr 3
	Characterization	Apr 10
Lab 10	Lewis Acids and Bases	Apr 17
Lab 11	MCl_2 Compounds of 1,1'-bis(diphenylphosphino)ferrocene (dppf)	2 weeks
	Synthesis	Apr 24
	Magnetic Properties and Electrochemistry	May 1
	Final	May 1

During the first week, there will be a brief check-in.

During the final week course evaluations will be done.

CHEMISTRY 213: NOTEBOOK GUIDELINES

Experiment Reaction MM/DD/YY

Reagent	Source	MW (g/mol)	Mass (g)	mmol
Reagent name 1	Chemical Company	###	###	###
Reagent name 2	Initials-Notebook-Page #	###	###	###

Write a description in past tense of the procedure, with no first person.

If the experiment requires more than one day, leave a space and mark the new MM/DD/YY date.

Procedure Tips:

- Include all volumes of solvent, necessary time lengths, and everything else pertinent to replicating the experiment.
    - Example sentence: The green "Reagent 1" was dissolved in 10 mL methylene chloride in a flask to form a dark green solution.
- Refer to required content from General Chemistry.
- List any instruments used and data collected, such as NMR spectra.
- If using reagents made previously in the lab, and not purchased from a chemical company, follow the pattern of Initials-Notebook-Page #. The initials of the chemist who made the reagent, notebook and page number identifies the location of the procedure used to make the reagent.
- Other pertinent information, such as density, should be included in the header if necessary for calculations

Expected yield: ###
Total yield: ###
% yield: (Tot/Exp)*100

CHEMISTRY 213: NOTEBOOK EXAMPLE

$Pd(MeCN)_2Cl_2$ + dtbpf → $Pd(dtbpf)Cl_2$ + 2MeCN 1/15/14

Reagent	Source	MW (g/mol)	Mass (g)	mmol
$Pd(MeCN)_2Cl_2$	Aldrich	259.43	0.1583	0.61
dtbpf	Strem	474.42	0.2904	0.61

The orange $Pd(MeCN)_2Cl_2$ and dtbpf solids were dissolved in 40 mL methylene chloride (DCM) under argon to form an orange solution. The soln was stirred for 1.5 hrs and was a dark orange/maroon color. The soln was filtered and the DCM was reduced to about 10 mL. The dark brown/orange soln was layered with 15 mL diethyl ether (Et_2O). A black crystalline solid formed on the sides of the flask. 15 mL Et_2O was added and the soln was stirred for 5 min. The orange supernatant (S.N.) was filtered away from the dark solid. The solid was rinsed with 3x 5 mL Et_2O. The solid was dried and weighed 0.2029 g. The S.N. was dried and the resulting solid was dissolved in 5 mL DCM. 15 mL DCM was added. After stirring, more solid precipitated. The solid was rinsed with 3x 5 mL Et_2O and weighed 0.0346 g.

$Pd(dtbpf)Cl_2$ MW:	651.75 g/mol
Expected yield:	0.3976 g
Total yield:	0.2375 g
% yield:	59.7 %