CHE 385: Inorganic Chemistry II Laboratory
Syllabus and policies

Spring 2009
M 2:30 – 6:30 pm
Nobel Hall room 306

Dr. Brandy Russell
205A Nobel Hall
brussell@gustavus.edu

Dr. Todd Swanson
308 Nobel Hall
tswanso2@gustavus.edu

About this lab: This laboratory course is designed to highlight some inorganic chemistry principles and laboratory techniques while helping you learn and practice experimental design skills and independence in the laboratory. For experiment information and the most current laboratory plan, refer to the schedule posted on the course Moodle page.

Lab philosophy: You will NOT receive detailed instructions for most of the experiments in this course. Instead, your group will receive a general goal for the experiment and will have to work together to develop a plan to carry it out. You will begin by reading the literature and techniques manuals and consulting with local experts (including your instructors) to create your own protocol. You will do most of your own prep and cleanup work. If you need to use an unfamiliar technique or experiment, we will arrange for you to learn how. If you are unsure whether a certain technique or method is available at Gustavus, just ask! You will keep a detailed laboratory notebook and interpret your results in the context of the scientific literature and your understanding of inorganic chemistry. You will present, defend, and improve strategies for your work at informal "group meetings" twice during the semester. This approach to laboratory work more closely resembles what you might experience in a job or research project. Because I am expecting so much more of you in terms of planning than a typical lab course might, I will be allowing extra lab time for each experiment.

Materials in the lab "reference drawers":

- Physical Methods in Inorganic Chemistry, Drago
- Physical Methods in Bioinorganic Chemistry, Que
- Laboratory Introduction to Bio-inorganic Chemistry, Ochiai and Williams
- Synthesis and Technique in Inorganic Chemistry, Angelici
- Synthesis and Technique in Inorganic Chemistry, Girolami, Rauchfuss, and Angelici
- The Synthesis and Characterization of Inorganic Compounds, Jolly
- Experimental Methods in Inorganic Chemistry, Tanaka

For each experiment:

- You will be given a short handout explaining the experimental parameters and goals.
- Your lab group will work together to complete a planning worksheet, which MUST be approved by your lab instructor before you can begin the experiment.
- All groups in your section will collaborate to find and print Material Safety Data Sheets (MSDS's) for all reagents and solvents to be used in the upcoming experiment. These will be turned in to the instructor with the planning sheets.
- You will do the experiment as a group, keeping a notebook as you go
- You will complete the analysis of your results in your notebook, including discussion in the context of the scientific literature and class material.

Lab ground rules:

- Wear safety glasses/goggles at all times when *anyone* is handling chemicals or glassware in the room.
- Wear gloves when handling hazardous chemicals.
- Dress appropriately for lab, including shoes and clothing that adequately protect you from spills, splashes, and dropped objects.
- Become familiar with the hazards associated with your experiment before beginning.
- Before attempting any experiment, the experimental plan must be completed and approved by one of the lab instructors.
- If at any point, you are unsure that what you are about to do is safe, double check!
- All work will be done during the designated Monday class session. Work at other times must be approved by your instructor in advance. You must <u>never</u> work alone.
- You may find that you need to borrow chemicals and supplies from the third floor stockroom. Sign out everything you borrow, every time. Return items promptly.
- Do <u>not</u> scavenge or borrow supplies, equipment, or chemicals from any other location without checking with your lab instructor or obtaining permission from the rightful owner. Return carefully cleaned items promptly.
- Clean your messes fully before you leave the lab.
- If you need to use instrumentation for your experiment, be 100% sure you know how to operate the instrument properly. Better to get a quick refresher course than to break something or get bad data!
- Plan your time wisely. There are multiple people in your group; arrange your time so you are not all sitting around doing nothing.
- Lab attendance is required every week. You are expected to arrive on time, even if you know you will not need the whole lab period to accomplish your goals for the day.

Notebooks: Keeping a clear and detailed laboratory notebook is an essential skill for any experimental chemist. Each research group will keep a joint notebook. Write your protocols and observations while you carry out the experiment, not later. Notebooks must be kept in your group's lab drawer and may not be taken out of Nobel Hall. (This policy is common to research and development groups in academia and industry, and will also make it easier for all members of the group to have access to the notebook.)

There will be no formal written lab reports, so your laboratory notebook should contain all experimental objectives, procedures, data, observations, results, conclusions, discussion, and

references. Spectra or other printed data may either be attached to the notebook directly, or maintained in an indexed and referenced three-ring binder which must also remain in the lab.

Group meetings: Twice during the semester, your lab section will meet (probably in room 305) for group meetings. Your group must come to these meetings prepared to present and defend one of the experiments you have completed or begun. Presentations will be brief, but should use PowerPoint or overhead projection to show significant spectra and other data clearly. More details will be given as the dates approach.

Grades (worth 20% of your course grade):
You will be graded on the quality and completeness of your experimental plans, the execution of those plans, and your interpretation of results. Grades will also take into account your demonstration of good and **safe** laboratory technique, and the quality of your notebook and participation in group meetings.

We will grade and comment on your notebooks at approximately 3 random and unannounced times during the semester, and if your notebook is incomplete or missing from your drawer at these times, your grade will reflect this. At these times, your group will be assigned temporary grades for each completed experiment. Your group should review these grades and instructor comments, also taking into account feedback from group meetings, and consider whether you need to do more work on the experiment. No experiment grades are final until the end of the semester. You are encouraged (and expected) to continue working on past experiments to bring them up to the course standards (which will give you a higher grade). In fact, points will be deducted for groups that elect not to address significant problems in their work that were mentioned in the notebook grades or group meetings.

What if...?

- If you have to miss lab for a legitimate reason, you must notify your instructor as far in advance as possible. We will work with you and with your fellow group members to find a reasonable and fair solution. Repeated lab absences will have an impact on your grade, since part of the grade is based on execution and technique. Permission to miss lab time comes from your instructor, not your group members.
- If you have to miss lab on a group meeting day, you will be given an alternate assignment.
- If your group cannot complete the experimental planning worksheet during the designated time, you may work on it outside of lab, with two caveats:
    - You are expected to do the planning worksheets during lab unless you honestly run out of time.
    - You MUST get approval from your instructor at least 4 full days (96 hours) prior to beginning the experiment. If you do not meet this deadline, you may lose points or you may not be allowed to perform the experiment at all, depending on how far along your plans are at experiment time.
- If you feel not everyone in your group is pulling their weight, you will have opportunity to give feedback on group dynamics later in the semester. Negligent group members will see an impact on their grade.
- If you are having any problems with group dynamics, please see a lab instructor for advice and help.