**Lewis & Clark College**

**Advanced Inorganic Laboratory, Chemistry 366**

**Fall 2017**

**Instructor:** Anne Bentley; Olin 221; x7579; bentley@lclark.edu

**Lecture:** T 9:10 – 10:10 am in Olin 306

**Lab:** W 1 – 5 pm orTh 8:30 am – 12:30 pm in Olin 239

**Office Hours:** M 11:30 – 12:30 am, T 1 – 2 pm, W 12 – 1 pm, Th 3:15 – 4:15 pm

**Course Website:**  http://moodle.lclark.edu

**Materials**

You will be expected to use the lab notebook provided. The course lab manual’s introductory material and each lab will be available on the course’s moodle site, in which you should be automatically enrolled. At a minimum, you should print the instructions for each lab and bring them with you to lab. You will also need a pair of goggles and a memory stick for transferring data.

## Student Learning Outcomes

By the end of this course, students will be able to:

1. Synthesize coordination complexes and use crystal field theory to explain their electronic structure and magnetism.

2. Demonstrate how the structures of common crystalline and ionic solids are derived from simple lattices.

3. Carry out chemical syntheses under an inert atmosphere using Schlenk and glove box techniques.

4. Use NMR, IR, fluorescence, and UV-vis spectroscopy, and X-ray diffraction to characterize inorganic molecules and extended solids.

5. Evaluate chemical safety hazards using a safety data sheet (SDS).

6. Present and analyze laboratory data in a written format.

7. Prepare and deliver an oral presentation to effectively communicate scientific results.

**Lab Schedule**

Students will work in pairs in lab. During the final four weeks of lab, half the class will carry out the two-week nickelocene experiment followed by two weeks of independent work; the other half of the class will work independently for the first two weeks and then spend two weeks carrying out the nickelocene experiment. The lab schedule below is subject to change.

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| **Date** | **Lab Experiment** |
| Sept. 6-7 | Safety Orientation and Fe complex synthesis |
| Sept. 13-14 | Fe complex characterization |
| Sept. 20-21 | Perovskites |
| Sept. 27-28 | Perovskites |
| Oct. 4-5 | CdSe nanoparticles |
| Oct. 11-12 | **Fall Break** |
| Oct. 18-19 | Mo – mesitylene – carbonyl complex |
| Oct. 25-26 | Mo – mesitylene – carbonyl complex |
| Nov. 1-2 | Nickelocene / Independent Project |
| Nov. 8-9 | Nickelocene / Independent Project |
| Nov 15-16 | Nickelocene / Independent Project |
| Nov. 22-23 | **Thanksgiving Break** |
| Nov. 29-30 | Nickelocene / Independent Project |
| Dec. 6-7 | Wrap-up all lab work |
| Friday, Dec. 15 | Final presentations, 8:30 – 11:30 am |

**Lab Safety**

Safety goggles must be worn in the lab at all times. You should wear closed-toe shoes, socks, and long pants or a long skirt to lab.

**Grading**

I will check your lab notebook at the beginning of each lab experiment (pre-lab). Three times during the semester, you will turn in your lab notebook so I can check it for clarity and completeness. There will be approximately five short assignments (either in-class or as homework). The points for the course will be divided as follows:

five lab reports 11% each

assignments (in-class or homework) 10%

lab notebook (pre-labs and in-labs) 10%

final project and presentation 25%

**Lab Notebook**

*Pre-lab*

There is a lot to accomplish during the 4-hour lab period, and careful preparation beforehand will help your lab experience go safely and smoothly. Before you begin each major experiment, prepare notes in your lab notebook following these guidelines:

* Introduction – Write a brief summary (2-3 sentences) of the work you will be doing in lab.
* Materials and Calculations
  + Write a balanced equation for any relevant chemical reaction.
  + Table of reagents: create a table listing the names and formulas of all chemicals needed for the experiment, including solvents. Consult the SDS (available online – try www.aldrich.com or even google) for each chemical and include any known hazards in your table.
* Procedure – List the individual steps you will take in lab. This should be a simplified version of the lab manual, but should contain enough information that you can work from your notes without needing to re-read the lab manual.

*In-lab*

Good lab records can help you analyze an experiment later, either to find out what went wrong *or* what went right. There’s nothing more frustrating than achieving a big research breakthrough but being unable to repeat it due to an unorganized lab notebook. I expect that you will take careful notes in lab detailing the procedures you follow, the observations you make in lab, and the names and locations of any associated data files. I will collect lab notebooks three times during the semester for grading.

**Independent Project**

Each student will spend two weeks near the end of the semester conducting an independent project, which may be an extension of one of the lab experiments included in the course or an exploration of an area not covered by the course curriculum. Students will work in pairs on each project, but I expect that each student will be responsible for their own independent component of the project. (For example, two students could synthesize a compound and then divide up the responsibilities for characterizing it.) The instructor will be available to consult on the choice of independent project. The final exam period for the course will be used for presentations made by each team of students.

**Absences**

In order to complete all the experiments, it is essential that you do not miss any lab sessions. Please contact me before the lab session if you fear you will miss a class due to extreme illness or a dire emergency.