Physical Measurements: Chem 3440
Fall 2015

The University of Iowa
The College of Liberal Arts and Sciences
Department of Chemistry

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Office Hours: M/T 9:30-11 am
I will also generally be available during lab hours

Hansol Lee (T/Th)
Office Hours: MW 10:30-11:30 am E208 CB

Zhen Li (M/W)
Office Hours: MW 5:30-6:30 pm E208 CB

Teaching Assistants:

William Marquardt (M/W)
Office Hours: T/Th 10:30 am – 11:30 pm E208 CB

Paul Morales (T/Th)
Office Hours: Th 8:30-10:30 am E208 CB

Lecture: MW 1:30 – 2:20 pm E203 CB
Laboratory: CHEM 3440:A01 MW 2:30 – 5:20 pm W428 & W444 CB
CHEM 3440:A02 TTh 2:00 – 4:50 pm W428 & W444 CB

Course Materials:
• Course web site: (https://icon.uiowa.edu)
• Required:
  ✓ Laboratory Manual for Physical Measurements by Mark Young, Renée Cole, and Alexei Tivanski, August 2015. (access experiments from ICON)
  ✓ Laboratory notebook equipped with carbon copy duplicate pages
  ✓ Safety goggles
• Recommended:
  ✓ Physical Chemistry textbook
• Optional:

*SAFETY NOTE* Appropriate safety guidelines must be followed at all times, including wearing goggles and appropriate apparel. Violation of this policy without the express permission of the instructor will result in dismissal from the lab and a grade of zero for that lab period.

Description of Course
The lecture portion of the course will provide background for the statistical treatment of experimental data (error analysis, graphical analysis, etc.). In addition, the lectures will cover some
of the experimental and theoretical aspects of the planned laboratory experiments. Most of these will be available as short on-line videos so students can review as appropriate for each experiment. Each student will work as part of a team to perform a number of experiments that have been selected to represent various techniques and concepts of relevance to physical chemistry and which utilize modern instrumentation.

Each student will perform 8 experiments that have been selected to represent various techniques and concepts of relevance to physical chemistry, including thermodynamics, kinetics, quantum mechanics, and spectroscopy. Laboratory experiments provide for the development of technical skills as well as critical thinking and analytical skills. Students will work in assigned teams on a schedule of experiments, but the laboratory reports are to be prepared individually by each student unless otherwise instructed. Students will also complete assignments designed to address writing and

Objectives and Goals of the Course
This course seeks to develop the following knowledge and skills required by graduates of the UI chemistry program (and scientists in general). Specifically, students should gain skills in their ...

1) Knowledge and understanding of Chemistry: including a working knowledge of
   • Quantification and the use of mathematical models in chemistry
   • The relationship between the microscopic, macroscopic, and symbolic descriptions of matter
   • Content knowledge in physical chemistry.
   • Basic laboratory skills, including knowledge concerning measurement, record keeping, data collection and presentation, data analysis and interpretation, and safety.

2) Skills to analyze and apply to facts:
   • An understanding of how to acquire advanced content knowledge (how to look stuff up)
   • How to read the chemical literature critically
   • Problem solving using the scientific method
   • The ability to clearly express thoughts and result in writing

3) Independent and creative thought: the ability to
   • Assess facts
   • Interpret results

4) Knowledge of the profession in society: an understanding of
   • The mechanics of journal publication
   • The jobs and roles chemists occupy (what chemists do)
   • Current topics in chemistry and their societal context
   • Ethics in science

Grading:
Your grade will be determined from 8 laboratory experiments (which include a prelab assignment for each experiment, an assessment of the laboratory notebook and a written report), the safety laboratory activity, laboratory technique, chemical literature assignments, writing assignments, and peer review activities. Plus and minus grades will be awarded.
The following grading scale is guaranteed if you score the minimum percentile for that range. If warranted, minor adjustments to minimum percentages may be made at the end of the semester.

90 – 100% A-range; 80 – 89% B-range; 70 – 79% C-range; 60 – 69% D-range

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Online Prelab Quizzes</td>
<td>35</td>
</tr>
<tr>
<td>Laboratory Experiments (report + prelab write-up + lab notebook)</td>
<td>645</td>
</tr>
<tr>
<td>Chemical literature assignments</td>
<td>75</td>
</tr>
<tr>
<td>Peer review of reports</td>
<td>30</td>
</tr>
<tr>
<td>Safety</td>
<td>25</td>
</tr>
<tr>
<td>Laboratory technique</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>830</strong></td>
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*This is a laboratory course. Students must complete all of the experiments in order to receive a grade higher than D.*

**Laboratory Reports**

Separate laboratory reports must be completed for each experiment. A guide for writing formal reports and general expectations is posted on ICON. Different experiments will have different report formats and requirements. A lab report guide will be posted for each experiment. The laboratory report is due one week from the last day scheduled for the experiment. For reports undergoing review and revision, the revised reports will be due one week after receipt of the reviews. Late reports will be penalized at a rate of 3 pts per day late up to 50% of the possible points.

<table>
<thead>
<tr>
<th>Report type</th>
<th>Required for</th>
<th>Points</th>
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<tbody>
<tr>
<td>Long</td>
<td>2 out of CMS, EK, CIC</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>2 out of AFM, CO, CD/QD</td>
<td></td>
</tr>
<tr>
<td>Short</td>
<td>1 out of CMS, EK, CIC</td>
<td>50</td>
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<tr>
<td></td>
<td>1 out of AFM, CO, CD/QD</td>
<td></td>
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<tr>
<td>Memo Series</td>
<td>Spartan lab</td>
<td>75</td>
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<tr>
<td>Analysis report</td>
<td>PMV lab</td>
<td>50</td>
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**Laboratory Prelab**

The laboratory prelab has two components: an online quiz for 7 experiments (5 pts) and a written portion (10 pts per experiment). The online quiz is based on the prelab videos and key safety issues. The written portion is a brief description of the experiment to be performed and should be written in the notebook. The carbon copy of the prelab must be submitted at the beginning of the scheduled period for the particular experiment and will not be accepted late. The TA will initial each section of the prelab as they check that all components have been addressed. Students may not begin an experiment prior to completing the prelab quiz posted on ICON and presenting the prelab pages of their lab notebook for review. The actual pages will be turned in with the lab report.

The prelab is expected to include the following components:

- Title of the Experiment
- Question being answered/addressed by completing the experiment
- Safety
  - Complete the analysis identifying:
- Risks & hazards
- Appropriate PPE and procedures to minimize these risks and hazards

- Procedure
  - Create a procedure that can be followed in lab with all relevant information.
  - You must include data tables for recording data during the experiment. Take time to think about the data you will collect and how it should be organized.
  - If you need to make changes to your procedure during the lab, simply mark one line through a mistake and initial next to it.

- Answers to any prelab questions

**Laboratory Notebooks**

Your laboratory notebook is the means by which you convey to the reader (your instructor/TA in this case) what you have done when completing an experiment. Keeping a lab book is an essential part of "doing good science". Therefore, you will want the contents of your lab book to be organized, neat, and easy to read, and reflect your understanding and completion of the experiment. Other than sharing data with your lab partner(s), never allow other students to copy from your lab book or otherwise obtain information from your lab book without permission of the instructor. See the University Policy for a discussion of plagiarism and academic honesty.

The laboratory notebook should contain the prelab, experimental details and observations, and the original experimental data. Important observations might include such details as the make and model of commercial equipment or the purity and source of the chemicals used. Follow the guidelines in the Laboratory Manual and/or in Garland et. al, Chapter 1 for the preparation of the notebook. Be sure to note all original graphical, numerical, and spectrometer output in your notebook. Only notebooks with numbered pages and capable of making carbon copies are to be used. The carbon pages will be part of each laboratory report. The original notebook pages will be handed in with each report (and will count up to 5 pts towards the experiment grade).

**Chemical Literature Assignments**

You will complete a series of assignments that will further develop your skills in reading and critiquing the chemical literature.

**Peer Review of Reports**

You will provide peer review for two laboratory reports. Part of scientific communication is the peer-review process for providing a critique of research results before they are widely disseminated. You will use the author/reviewer guidelines for chemistry journals to prepare a written review of lab reports for two different experiments.

**Safety**

You must complete the safety protocol analysis and complete the relevant safety modules before you will be permitted to conduct experiments in the laboratory.

**Laboratory Technique**

Points dependent on general laboratory skills, preparation, and participation will be awarded by the TA/instructor on a discretionary basis. Points will be deducted for inappropriate laboratory behavior.
**Course Policies**

**Course Attendance**
Prompt laboratory attendance is mandatory. You are expected to be in the laboratory during scheduled laboratory times even if you are not actively collecting data. Only University approved absences are permitted and appropriate documentation is required. Arrangements for making up the missed laboratory work must be made with Prof. Cole within one week of the missed laboratory period. If at all possible, arrangements should be made before missing a laboratory period.

**Safety**
Safety goggles and appropriate clothing and footwear must be worn at all times in the laboratory. All other safety precautions, as posted on the door to the laboratory, such as proper attire, must be adhered to. No food or drinks are permitted in the laboratory. Violation of this policy without the express permission of the instructor will result in dismissal from the lab and a grade of zero for that lab period.

**Laboratory Etiquette**
Students should leave all glassware, equipment, and bench tops in good condition when they are finished. Problems with equipment should be reported to the instructor or TAs as soon as possible. Students may lose points for leaving their laboratory areas in unsuitable condition. Students are financially responsible for the damage or destruction of glassware and equipment.

**Regrades**
If you feel that an error was made in the grading of your work, you may request a re-grade by notifying the instructor within one week of receiving the graded material. The request should be in writing and indicate the section of the material that is in question. Please note that the entire document may be subject to re-grade.

**Communication**
The instructor will respond to student questions via email with a typical response time of two working days (and often sooner). In addition, general notices concerning the course will be posted on ICON and/or sent to students using email. Due to privacy considerations, the official University of Iowa email address as listed on the class roster will be used for all communications. Each student is considered to be on notice for information sent to their official email address.

**Collaboration**
*Pre-lab:* Students in a team may collaborate on collecting information and answering questions. However, each student is required to write their own answers in their respective laboratory notebooks. Students should NOT simply copy a teammate’s answers.

*Lab-notebook:* Each student should record data and observations in their own notebook. It is expected that all members of a team will use the same data.

*Individual lab reports:* Students in a team may collaborate on analyzing data and finding appropriate references. However, each student should do their own calculations and writing (the only section that may look identical is the data tables). Students must write their own introduction and results/discussion sections, although discussion among partners is permitted.
Other assignments: Students are expected to work individually unless given express permission to collaborate.

Resources for Students

Computer Center
Most of the data analysis will be facilitated by a computer. The 20 Macintosh and PC workstations in the Chemistry Computer Facility, 238 CB, will be available to students for the duration of the semester. Access to the Facility is via an electronic cardkey system activated with a University ID card. Word processing, spreadsheet, plotting, and data analysis software is available on all computers.

Writing Center
Students may find the Writing Center useful for this course.
Writing Center: http://www.uiowa.edu/~writingc/
The College of Liberal Arts and Sciences: Important Policies and Procedures

**Administrative Home** - The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at [http://clas.uiowa.edu/students/handbook](http://clas.uiowa.edu/students/handbook).

**Electronic Communication** - University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondence ([Operations Manual, III.15.2, k.11](http://clas.uiowa.edu/students/handbook)).

**Accommodations for Disabilities** - A student seeking academic accommodations should first register with Student Disability Services and then meet privately with Prof. Cole to make particular arrangements. See [www.uiowa.edu/~sds/](http://www.uiowa.edu/~sds/) for more information.

**Academic Honesty** - All CLAS students have, in essence, agreed to the College’s [Code of Academic Honesty](http://clas.uiowa.edu/students/handbook): "I pledge to do my own academic work and to excel to the best of my abilities, upholding the [IOWA Challenge](http://clas.uiowa.edu/students/handbook). I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled ([CLAS Academic Policies Handbook](http://clas.uiowa.edu/students/handbook)).

**CLAS Final Examination Policies** – The final examination schedule for each class is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. **No exams of any kind are allowed during the last week of classes.** All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar’s web site and will be shared with instructors and students. It is the student’s responsibility to know the date, time, and place of the final exam.

**Making a Suggestion or a Complaint** - Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident ([CLAS Academic Policies Handbook](http://clas.uiowa.edu/students/handbook)).

**Understanding Sexual Harassment** - Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the [UI Comprehensive Guide on Sexual Harassment](http://clas.uiowa.edu/students/handbook) for assistance, definitions, and the full University policy.

**Reacting Safely to Severe Weather** - In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the [Public Safety website](http://clas.uiowa.edu/students/handbook).