# Physical Measurements: CHEM 3440

The University of Iowa  
Department of Chemistry  
Fall 2020

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Dr. Nicole Becker</th>
<th>Office hours:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Email: <a href="mailto:nicole-becker@uiowa.edu">nicole-becker@uiowa.edu</a></td>
<td>M/Th 12:30 – 2:00 pm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching assistants</th>
<th>Dagen Hughes</th>
<th>T/Th 10 – 11 am</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Email: <a href="mailto:dagen-hughes@uiowa.edu">dagen-hughes@uiowa.edu</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nicholas Luedtke</td>
<td>M/T 9 – 10 am</td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:nicholas-luedtke@uiowa.edu">nicholas-luedtke@uiowa.edu</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lecture Component</th>
<th>CHEM 3440</th>
<th>Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Component</td>
<td>CHEM 3440:A01</td>
<td>TTh 2:00 – 4:50 pm</td>
</tr>
<tr>
<td></td>
<td>CHEM 3440:A02</td>
<td>TTh 2:00 – 4:50 pm</td>
</tr>
</tbody>
</table>

All TA office hours will be held on zoom. See Icon pages for Zoom links.

## Course materials:
- Course website: [https://icon.uiowa.edu](https://icon.uiowa.edu)
- Required:
  - *Laboratory manual for Physical Measurements* by Mark Young, Renee Cole, and Alexei Tivanski, August 2019 (access through ICON)
  - Laboratory notebook equipped with pre-paginated numbered pages (not a composition notebook)
  - Safety goggles
- Recommended:
  - Physical chemistry textbook for reference
- Optional:

SAFETY NOTE* Appropriate safety guidelines must be followed at all times, including wearing goggles, face masks, 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.

## Overview of Course
The lecture portion of the course will be asynchronously online. Videos will be posted on ICON in modules for students to view independently during the scheduled lecture time. Lecture will cover some of the experimental and theoretical aspects of the selected laboratory experiments, and may also address statistical treatment of experimental data (error analysis, graphical analysis, etc.).

To promote social distancing this semester, each student will work as *individually* to collect data.
for 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. Laboratory reports are to be prepared individually by each student unless otherwise instructed.

**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 progress 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 macroscopic, sub-microscopic, and symbolic descriptions of physical systems
   - Content knowledge in chemical concepts
   - Basic knowledge of laboratory practices, including knowledge concerning measurement, record keeping, data collection, data analysis and interpretation, and safety

2) **Ability to evaluate and apply information**, including ability to:
   - Express thoughts and results in writing
   - Engage in problem solving using the scientific method
   - Search for and evaluate information
   - Critically read and evaluate the chemical literature
   - Interpret results

3) **Knowledge of the profession in society** by learning about
   - The mechanics of journal publication
   - Current jobs and roles chemists occupy (what chemists do)
   - Current topics in chemistry and their societal impact
   - Ethics in science

**Grading**
Your grade will be determined based on your scores on the laboratory experiments and scores on additional assignments. Each laboratory report must include: 1) prelab assignment, 2) a written laboratory report, and 3) your laboratory notebook pages. Additional assessments will include the safety laboratory activity and laboratory technique assessments. Plus and minus letter 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>
</tr>
</thead>
<tbody>
<tr>
<td>Online prelab quizzes (6 experiments)</td>
<td>30</td>
</tr>
<tr>
<td>Pre-lab written assignments</td>
<td>80</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>475</td>
</tr>
<tr>
<td>Laboratory notebook pages</td>
<td>80</td>
</tr>
<tr>
<td>Safety</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory technique</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total points</strong></td>
<td>765</td>
</tr>
</tbody>
</table>

*This is a laboratory course. Students must complete all of the experiments in order to receive a grade higher than D.*

**Laboratory reports**

Laboratory reports will be completed for each experiment. A guide for general expectations for laboratory report is posted on the ICON pages. Different experiments will have different report formats (see table below). Grading rubrics will be posted on ICON.

<table>
<thead>
<tr>
<th>Report type</th>
<th>Required for</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long</td>
<td>CIC, EK, ES</td>
<td>75</td>
</tr>
<tr>
<td>Short</td>
<td>CO, PIB, CH, Comp</td>
<td>50</td>
</tr>
<tr>
<td>Analysis report</td>
<td>PMV lab</td>
<td>50</td>
</tr>
</tbody>
</table>

The laboratory report will be due at midnight one week from the last day scheduled for the experiment.

Late reports and assignments will be penalized at a rate of 3 pts per day late, up to 50% of the possible points.

**Laboratory Prelab**

There are two pre-lab activities that you will need to complete before coming to lab.

- an online ICON quiz (5 pts) (quizzes will be posted for 6 of the 8 experiments)
- a written portion (10 pts).

The online quiz is based on the prelab videos and safety issues pertaining to the lab. The written portion is a brief description of the experiment to be performed and an analysis of safety issues that may arise and should be written in the lab notebook. Students may not begin an experiment unless they have completed both the pre-lab quiz and written prelab assignment. Late prelabs will not be accepted.
The written prelab must include the following components:

- **Title of the experiment**
- **Question being addressed by the experiment**
- **Safety analysis**
  - Discussion of potential risks and hazards
  - Appropriate personal protective equipment (PPE) and procedures to minimize risks and hazards
- **Procedure**
  - Create a procedure that can be followed in lab and detail what data you will collect
  - You must create tables you will use to record data during the experiment. Take time to think about what data you will collect and how it should be organized.
- **Answers to any prelab questions**

**Laboratory notebooks**

Your laboratory notebook is the means by which you convey what you have done when completing an experiment. Keeping a lab book is an essential part of “doing good science.” Therefore, the contents of your lab notebook should be organized, neat, easy to read, and reflect your understanding and activities during the completion of the experiment. Other than sharing data with your lab partner(s), never allow other students to copy from your lab notebook without permission of the instructor. See the University policy for further discussion of academic honesty and plagiarism.

The laboratory notebook should contain: the prelab, experimental details and observations, and an appendix containing the original experimental data. Important observations might include details such as the make and model of commercial equipment, or the purity and source of chemicals used. Read and follow the guidelines in the Laboratory Manual for the preparation of your lab notebook. Be sure to note all original graphical, numerical, and spectrometer output in your notebook.

Notebooks with numbered pages should be used. You will scan and submit pdfs of your notebook pages along with your laboratory reports in ICON (10 pts per experiment).

**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. This is part of the prelab that must be completed and submitted 24 hours before the laboratory period.

**Laboratory technique**

You will be awarded up to 50 points at the end of the semester based on your demonstrated use of proper and safe laboratory technique for each lab. 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 only during scheduled laboratory times while your team is collecting data.* When scheduled for data analysis days, you are expected to work synchronously with a team of peers via Zoom to complete the laboratory data analysis.

Only University approved absences are permitted and appropriate documentation is required. Arrangements for making up the missed laboratory work must be made with Prof. Becker within one week of the missed laboratory period. If at all possible, arrangements should be made before missing a laboratory period.

Safety

Face masks, 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 technique 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 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 classmates’s answers.

*Lab notebook:* Each student should record data and observations in their own notebook.

*Individual lab reports:* Students may collaborate with classmates 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/](http://www.uiowa.edu/~writingc/)
Absences and Attendance
Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing their course absence policies, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, unavoidable circumstances, or University authorized activities (https://clas.uiowa.edu/students/handbook/attendance-absences). Students may use the CLAS absence form to aid communication with the instructor who will decide if the absence is excused or unexcused. The form is located on ICON within the top banner under "Student Tools."

Academic Integrity
All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty. Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through UI email. Visit this page for information: (https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code).

Accommodations for Disabilities
UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at https://sds.studentlife.uiowa.edu/.

Administrative Home of the Course
The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other colleges may have different policies. CLAS policies may be found here: https://clas.uiowa.edu/students/handbook.

Classroom Expectations
Students are expected to comply with University policies regarding appropriate classroom behavior as outlined in the Code of Student Life. This includes the policies and procedures that all students have agreed to regarding the Steps Forward for Fall 2020 in response to the COVID-19 pandemic. Particularly, all students are required to wear a face cover when in a UI building, including a classroom. In addition, the density of seats in classrooms has been reduced. In some instances, this will allow 6 feet or more of distance while other cases, it may be less. Regardless, wearing face coverings and maintaining as much distance as is possible are vital to slowing the spread of COVID-19. In the event that a student disrupts the classroom environment through their failure to comply with the reasonable directive of an instructor or the University, the instructor has the authority to ask that the student immediately leave the space for the remainder of the class period. Additionally, the instructor is asked to report the incident to the Office of Student Accountability for the possibility of additional follow-up. Students who need a
temporary alternative learning arrangement related to COVID-19 expectations should contact Student Disability Services (https://sds.studentlife.uiowa.edu/fall-2020/covid-19-temporary-learning-arrangements/; +1 319 335-1462).

Class Recordings: Privacy and Sharing
Some sessions of a course could be recorded or live-streamed. Such a recording or streaming will only be available to students registered for the course. These recordings are the intellectual property of the faculty, and they may not be shared or reproduced without the explicit written consent of the faculty member. Students may not share these sessions with those not in the class; likewise, students may not upload recordings to any other online environment. Doing so is a breach of the Code of Student Conduct and, in some cases, a violation of the Federal Education Rights and Privacy Act (FERPA).

Communication and the Required Use of UI Email
Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within UI (Operations Manual, III.15.2).

Complaints
Students with a complaint about an academic issue should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to the College of Liberal Arts and Sciences; see this page for more information: https://clas.uiowa.edu/students/handbook/student-rights-responsibilities.

Final Examination Policies
The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals with a few exceptions made for particular types of courses such as labs or off-cycle courses: https://registrar.uiowa.edu/final-examination-scheduling-policies.

Nondiscrimination in the Classroom
The University of Iowa is committed to making the classroom a respectful and inclusive space for people of all gender, sexual, racial, religious, and other identities. Toward this goal, students are invited in MyUI to optionally share the names and pronouns they would like their instructors and advisors to use to address them. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University’s Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity (https://diversity.uiowa.edu/eod; +1 319 335-0705 or diversity.uiowa.edu)

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 must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see https://osmrc.uiowa.edu/.