CHEMISTRY 4432: Physical Chemistry II
Spring 2021

Instructor: Dr. James Shepherd
Email: james-shepherd@uiowa.edu

Course: CHEM 4432, 3 Credit Hours
Lecture: MWF 8:30-9:20 am, web based on Zoom
Discussion: M 4:30 - 5:20 pm or T 9:30 - 10:20 pm, web based on Zoom

Office Hours:

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<tr>
<th>Individual</th>
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| Dr. James Shepherd          | Zoom     | Tue 11:00 am – 12:30 pm
                               |          | Thu 2:00 pm – 3:30 pm
                               |          | Or by appointment                        |
| William Van Benschoten      | Zoom     | Wed 3:00 pm – 4:00 pm
                               |          | Fri 12:30 pm – 1:30 pm                   |

Note: According to University policy, the Spring 2021 semester runs from 1/25 to 5/14 with no Spring Break. Classes and office hours will not be held on Tuesday, March 2 and Wednesday, April 14 (these are non-instruction days).

Course Description:

Physical chemistry is the study of the interaction and transfer of energy and matter. Being a chemist requires that you can describe interatomic bonding and intermolecular interactions in terms of the fundamentals of quantum mechanics.

Topics covered by this course include: a basic primer on essential quantum mechanics, models for molecular energy level transitions, spectroscopy, the hydrogen atom, electron spin, and molecular orbital theory.

We will also conclude the semester with the kinetic theory of gases.
The course is intended primarily for chemistry, biochemistry, environmental science, and chemical and biochemical engineering majors. The course requires limited use of differential and integral calculus and skill in mathematical problem solving.

This course is challenging predominantly because it requires you to interpret diagrams and mathematical expressions in varying contexts to extract new concepts that you have not seen before. In practice, you do this almost every day, but it’s rare to be asked to do this explicitly in a classroom/coursework setting. Reading out information from abstract representations is an information processing skill rather than one of technical/mathematical fluency and must be practiced. We have taken care in this course to separate practicing the process skill from the technical one. Our goal through this course will be to facilitate the learning of information processing and other process skills which will allow you to succeed in class, in the homeworks/exams of this course, and in your future career.

Course special policies:

- **Attendance:** Classroom attendance is extremely important for this class and is your most efficient route to learn the material for the exams. This is reflected in the grading structure for this course.
- **Workbook:** We require that you physically write in the POGIL workbook (listed below) in every class. Please ensure you have this by the first lesson.
- **Email policy:** To facilitate instruction, we will answer emails as a team. In general, we will answer emails during or immediately after our office hours. For chemistry-related questions, you will need to book appointments or come during office hours. If you have a dispute over grading, you will need to wait 24 hours after the grade comes back, then you have 7 days to raise a dispute. You will need to raise this dispute in person at office hours.
- **Use of zoom:** Participation in this class requires you to be present in the Zoom room for class, discussion, and exam sessions (dates posted on MyUI, proctored on Zoom). Your camera must be on for the whole of these sessions and you will also need to have your microphone on when asked a question or interacting with your peers (unless you have arranged an accommodation in advance). You are invited to contact the instructors if you have any problems or concerns about this.

**Texts:**


**Course Organization:**

This course has been designed and organized to help you learn physical chemistry, but no course or instructor can learn for you. **Learning is something only you can do.**

Lectures will be conducted in a guided inquiry format. Virtually all of the activities in class will involve teamwork. Part of your responsibility for this course is to assist the other members of your group (and the entire class) in understanding the material.

The homework consists of two parts:

- There will be pre-activity questions assigned for most lessons. These should take no longer than 15-20 minutes, and will be taken in for grading during the next lesson and you will typically be allowed to have these in front of you when we do in-class quizzes.
- Longer problem sets will also be provided once a week. Since problem solving is a very important aspect of this course, these provide opportunities for you to practice applying your knowledge and help you determine which material you do not understand well. Homework problems to be turned in and graded will be assigned approximately weekly throughout the semester.

There will be three hourly exams and a cumulative final for this course. Exams provide an opportunity for you to demonstrate your knowledge of the material and let me know what students have mastered and where the problem areas are.

**Grading & Grade scale:**

Grades will be determined by classroom activities, homeworks, quizzes, performance on three midterm exams, and a cumulative final exam. **We believe the variety of assessment methods will improve your ability to learn in this course.** Final grades will include +/- grades. Those grades will not necessarily be evenly split among the three categories. The College and EPC has recommended that the A+ grade be omitted altogether.

Grades will be earned in approximately the following distributions:

- Class activities (incl. attendance, discussion, class participation, quizzes, some homeworks graded in class) ~34%
- Hour exams, final exam ~33%
- Homework problems ~33%
No quizzes or exams will be given in the final week of instruction prior to finals week. Midterm exam dates are set on MyUI at the start of semester with the final date posted when they are confirmed by the registrar’s office.

For those students aiming for a C grade or above:
- We expect you to participate in every class, every discussion section, complete every homework, and problem set. Here, engaging with the practice of physical chemistry is more important to us than the mastery you obtain in the content knowledge.
- A lower grade boundary of 60% is anticipated for a C grade.

For those students aiming for grades A and B, in addition to the standard set forward by the statement above:
- We will award an A-grade to indicate a mostly complete mastery of the learning objectives for this course and a B-grade to indicate partial mastery.
- A lower grade boundary of 85% is anticipated for an A grade and a lower grade boundary of 75% is anticipated for a B grade.

Expectations for grades are based on degree of mastery of course content. Students may vary in their competency levels on these abilities. Students can expect to acquire these abilities only if they honor all course policies, attend class meetings regularly, complete all assigned work in good faith and on time, and meet all other course expectations. **Students whose achievement is in the indicated ranges will not receive a grade lower than that regardless of the distribution.** No limit is placed on the number or percentage of students who can attain each grade.

**Attendance Policy:**

Attendance at all lecture sessions is expected and attendance records are maintained. Legitimate reasons for absences are accepted and when possible prior notice of expected absences is expected. Homework will not be accepted late except for an excused absence.

As soon as you know that you will be absent for a class, report this to the instructors and then fill out the following form:
[https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM.pdf](https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM.pdf)

We will follow the CLAS policy regarding documentation which can be found here: [https://clas.uiowa.edu/faculty/student-attendance-and-absences#absences-short-term-illness](https://clas.uiowa.edu/faculty/student-attendance-and-absences#absences-short-term-illness)
COVID self-reporting:

If you require accommodations due to COVID-19, you are recommended to fill out the COVID self-report form (https://apps.its.uiowa.edu/forms/self-report) in addition to following the attendance policy above.

Prerequisites and Required Background Material:

The prerequisites for this course include calculus and elementary physics. I will make every effort to introduce important mathematical and physical concepts before we need them, but these elements are an essential part of physical chemistry. You will be expected to apply the necessary mathematical methods including multivariable calculus to be successful in this course.

Expected Student Workload

This is a 3 credit hour course, so under University policy you should expect to spend a minimum of six hours per week outside of class on activities related to this course.

Academic Misconduct:

In addition to the Academic Honesty code offenses detailed by the College, there are course specific expectations regarding Academic Honesty. Academic misconduct may result in a grade reduction and/or other serious penalties, up to and possibly including expulsion from the University of Iowa.

Examinations: You are expected to work alone. Cheating will not be tolerated. The instructor believes strongly in fairness for all students and objective appraisal of individual performance and understanding of material.

Problem Sets: The homework for this course is designed to help you master your knowledge related to the topics covered during lecture. As such, you may work on the homework problems with others or use online resources; however, please be aware that to master the skills needed for this class, practice is required and that to do well on exams you will need to work many of these problems multiple times without help. Be sure to test your knowledge by doing much of the homework on your own. I encourage you to ask your classmates for help, but be sure you ask them to explain their reasoning in a way that you can understand to ensure you acquire an independent understanding of the course material.

The above schedule, policies, procedures and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement and/or to ensure better student learning.
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 course absence policies, which 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, and 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. Academic misconduct affects a student's related grade and is reported to the College which applies an additional sanction including suspension. Outcomes about misconduct are communicated through UI email (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 a mental health, attention, learning, vision, and a 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 UI colleges may have different policies for courses offered by that college. 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 (https://dos.uiowa.edu/policies/code-of-student-life/). This includes related UI policies and procedures that all students have agreed to regarding the COVID-19 pandemic. Particularly, each student must wear a face mask when in a UI building, including a classroom. The density of seats in classrooms has been reduced, and in some instances, this will allow 6 feet or more of distance while other cases, it may be less.
Regardless, wearing a face mask 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 the failure to comply with a reasonable directive of an instructor or of the University, the instructor has the authority to ask that the student to leave the space immediately for the remainder of the class period. Additionally, the instructor is asked to report the incident to the UI Office of Student Accountability, with the possibility of additional follow-up with the student. Students who need temporary alternative learning arrangements (TALA) for a future semester related to COVID-19 should visit this website for more information: https://coronavirus.uiowa.edu/temporary-alternative-learning-arrangements-tala.

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 who are not enrolled in the course; 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 is 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 or with 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
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/.