CHEMISTRY 4432: Physical Chemistry II
Spring 2022

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

Course: CHEM 4432, 3 Credit Hours
Lecture: MWF 8:30-9:20 am, 216 PH
Discussion: M 4:30 - 5:20 pm or T 9:30 - 10:20 am, C208 PBB

Office Hours:

<table>
<thead>
<tr>
<th>Individual</th>
<th>Location</th>
<th>Time</th>
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<tbody>
<tr>
<td>Dr. James Shepherd</td>
<td>E435 CB</td>
<td>Wed 1:30 pm – 3:00 pm Or by appointment</td>
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<td>Mon 3:00 pm – 4:30 pm Or by appointment</td>
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<tr>
<td>Gabriel Smith</td>
<td>E208 CB</td>
<td>Tues 1:30 pm – 2:30 pm Fri 12:30 pm – 1:30 pm</td>
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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 ICON:** Participation in this class requires you to check ICON regularly for updates to homework and announcements. 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 90-minute midterm 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, 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, depending on where the learning objectives are best assessed:

- Class activities (incl. attendance, discussion, class participation/activities, quizzes as needed, some homeworks graded in class, workbook completion) ~25-35%
- Hour exams, final exam ~33-50%
- Homework problems ~33-50%

Due to the weightings given above, the ICON gradebook may not reflect your overall performance in the course. You are invited to come to office hours to discuss grading concerns.
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 the C-/C/C+ grade range.

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-/A grade and a lower grade boundary of 75% is anticipated for the B-/B/B+ grade range.

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

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
COVID-19 Spring 2022:

The University of Iowa strongly encourages students, faculty, and staff to be vaccinated and boosted against COVID-19. The university also encourages students, faculty, and staff to wear a face mask while on campus, and strongly encourages the use of face masks in all classroom settings and during in-person office hours. However, face mask usage is not required except on CAMBUS and in specified research and healthcare settings.

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.

COLLEGE OF LIBERAL ARTS AND SCIENCES
Information for CLAS Undergraduates
Spring 2022

ATTENDANCE AND CLASSROOM EXPECTATIONS
Students are responsible for attending class and for knowing an instructor’s attendance policies, which vary by course and content area. All students are expected to attend class and to contribute to its learning environment in part by complying with University policies and directives regarding appropriate classroom behavior or other matters.

ABSENCES
Students are responsible for communicating with instructors as soon they know that an absence might occur or as soon as possible in the case of an illness or an unavoidable circumstance. Students can use the CLAS absence form to help communicate with instructors who will decide if the absence is excused or unexcused; the form is located on ICON within the top banner under “Student Tools.” Delays by students in communication with an instructor could result in a forfeit of what otherwise might be an excused absence (https://clas.uiowa.edu/students/handbook/attendance-absences).

ABSENCES: ILLNESS, UNAVOIDABLE CIRCUMSTANCES, AND UNIVERSITY SPONSORED ACTIVITIES
Students who are ill, in an unavoidable circumstance affecting academic work, or who miss class because of a University sponsored activity are allowed by UI policy to make up a missed exam. Documentation is required by the instructor except in the case of a brief illness. Students are responsible for communicating with instructors as soon as the absence is known (https://opsmanual.uiowa.edu/students/absences-class#8.1).

ABSENCES: HOLY DAYS
The University is prepared to make reasonable accommodations for students whose religious holy days coincide with their classroom assignments, test schedules, and classroom attendance expectations. Students must notify their instructors in writing of any such Religious Holy Day conflicts or absences within the first few days of the semester or session, and no later than the third week of the semester. If the conflict or absence will occur within the first three weeks of the semester, the student should notify the instructor as soon as possible. See Operations Manual 8.2 Absences for Religious Holy Days for additional information.

ABSENCES: MILITARY SERVICE OBLIGATIONS
Students absent from class due to U.S. veteran or U.S. military service obligations (including military service-related medical appointments, military orders, and National Guard Service obligations) must be excused without penalty. Instructors must make reasonable accommodations to allow students to make-up exams or other work. Students must communicate with their instructors about the expected possibility of missing class as soon as possible. (For more information, see https://opsmanual.uiowa.edu/iv-8-absences-class%C2%A0).

ACADEMIC MISCONDUCT
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 grade and is reported to the College which applies an additional sanction, such as suspension. Outcomes about misconduct are communicated through UI email (https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code).
ACADEMIC ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES
The University is committed to providing an educational experience that is accessible to all students. If a student has a diagnosed disability or other disabling condition that may impact the student’s ability to complete the course requirements as stated in the syllabus, the student may seek accommodations through Student Disability Services (SDS). SDS is responsible for making Letters of Accommodation (LOA) available to the student. The student must provide a LOA to the instructor as early in the semester as possible, but requests not made at least two weeks prior to the scheduled activity for which an accommodation is sought may not be accommodated. The LOA will specify what reasonable course accommodations the student is eligible for and those the instructor should provide. Note that accommodations are not granted retroactively but from the time of the student’s request to the instructor onward. Additional information can be found on the SDS website.

CLASS RECORDINGS: PRIVACY AND SHARING
Course lectures and discussions are sometimes recorded or live-streamed. These are only available to students registered for the course and are the intellectual property of the faculty member. These materials may not be shared or reproduced without the explicit written consent of the instructors. Students may not share these recordings 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 could be a violation of the Federal Education Rights and Privacy Act (FERPA); also see https://dos.uiowa.edu/policies/code-of-student-life/.

COMMUNICATION: UI EMAIL
Students are responsible for all official correspondences sent to their UI email address (uiowa.edu) and must use this address for any communication with instructors or staff in the UI community (Operations Manual, III.15.2). Emails should be respectful and brief, with complex matters addressed during the instructor’s drop-in hours, for example. Faculty are not expected to answer email after business hours or during the weekends.

COMPLAINTS ABOUT ACADEMIC MATTERS
Students with a complaint about a grade or a related academic issue should first visit with the instructor and then with the course supervisor (if one is assigned), and next with the Chair of the department or program offering the course. If not resolved, students may bring their concerns to the College of Liberal Arts and Sciences: https://clas.uiowa.edu/students/handbook/student-rights-responsibilities.

FINAL EXAMINATION POLICIES
The final exam schedule is published during the fifth week of the fall and spring semesters or on the first day of summer classes; students are responsible for knowing the date, time, and place of their final exams. Students should not make travel plans until knowing this information. A student with exams scheduled on the same day and time or who have more than two final exams on the same day should visit this page for how to resolve these problems by the given deadline: https://registrar.uiowa.edu/makeup-final-examination-policies. No exams may be scheduled the week before finals; some exception, however, have been made for labs, language courses, and off-cycle courses (https://registrar.uiowa.edu/final-examination-scheduling-policies).

FREE SPEECH AND EXPRESSION
The University of Iowa supports and upholds the First Amendment protection of freedom of speech and the principles of academic and artistic freedom. We are committed to open inquiry, vigorous debate, and creative expression inside and outside of the classroom. Visit Free Speech at Iowa for more information on the University’s policies on free speech and academic freedom (https://freespeech.uiowa.edu/).
HOME OF THE COURSE
The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the course’s add and drop deadlines, the “second-grade only” option (SG0), and other undergraduate policies and procedures. Different UI colleges may have other policies or deadlines. See https://clas.uiowa.edu/students/handbook. Questions? Contact CLAS at clasps@uiowa.edu or 319-335-2633.

MENTAL HEALTH
Students are encouraged to be mindful of their mental health and seek help as a preventive measure or if feeling overwhelmed and/or struggling to meet course expectations. Students are encouraged to talk to their instructor for assistance with specific class-related concerns. For additional support and counseling, students are encouraged to contact University Counseling Service (UCS). Information about UCS, including resources and how to schedule an appointment, can be found at counseling.uiowa.edu. Find out more about UI mental health services at: mentalhealth.uiowa.edu. Student Health can also address related concerns (https://studenthealth.uiowa.edu/). These visits are free to students. After hours, students are encouraged to call the Johnson County Community Crisis Line at (319) 351-0140 or dial 911 in an emergency.

NON-DISCRIMINATION STATEMENT
The University of Iowa prohibits discrimination in employment, educational programs, and activities on the basis of race, creed, color, religion, national origin, age, sex, pregnancy, disability, genetic information, status as a U.S. veteran, service in the U.S. military, sexual orientation, gender identity, associational preferences, or any other classification that deprives the person of consideration as an individual. The university also affirms its commitment to providing equal opportunities and equal access to university facilities. For additional information on nondiscrimination policies, contact the Director, Office of Institutional Equity, the University of Iowa, 202 Jessup Hall, Iowa City, IA 52242-1316, 319-335-0705, oie-ui@uiowa.edu. Students may share their pronouns and chosen/preferred names in MyUI, which is accessible to instructors and advisors.

SEXUAL HARASSMENT
The University of Iowa prohibits all forms of sexual harassment, sexual misconduct, and related retaliation. The Policy on Sexual Harassment and Sexual Misconduct governs actions by students, faculty, staff and visitors. Incidents of sexual harassment or sexual misconduct can be reported to the Title IX and Gender Equity Office or to the Department of Public Safety. Students impacted by sexual harassment or sexual misconduct may be eligible for academic supportive measures and can learn more by contacting the Title IX and Gender Equity Office. Information about confidential resources can be found here. Watch the video for an explanation of these resources.