CHEMISTRY 4432
Physical Chemistry II, Spring 2020

Instructor: Dr. James Shepherd
Office: E435 CB
Email: james-shepherd@uiowa.edu

Course: CHEM 4432, 3 Credit Hours
Lecture: MWF 8:30-9:20 am 134 TH
Discussion: M 4:30 - 5:20 pm 140 BHC or T 9:30 - 10:20 pm 114 BHC

Office Hours:

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<tr>
<th>Individual</th>
<th>Location</th>
<th>Time</th>
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| Dr. James Shepherd| E435 CB  | Mon 3:30 pm to 5:00 pm
                |          | Wed 2:30 pm to 4:00 pm or by appointment |
| Hayley Petras     | E208     | Wed 11:30 am - 12:30 pm
                |          | Thurs 8:30 am – 9:30 am                  |

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.

**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:**

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.

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.

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.

<table>
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<tr>
<th>Category</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Discussion, class participation &amp; quizzes</td>
<td>~34%</td>
</tr>
<tr>
<td>Hour exams, final exam</td>
<td>~33%</td>
</tr>
<tr>
<td>Pre-activity homework problems</td>
<td>~33%</td>
</tr>
</tbody>
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80% – 100%   A  
70% – 79%     B  
60% – 69%     C
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.**

**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.

**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 Undergraduates**

**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 the absence policies for their courses, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, unavoidable circumstances, or University authorized activities (https://clas.uiowa.edu/students/handbook/attendance-absences). Students may use this absence form to communicate with instructors: https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM2019.pdf

**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 the UI email address (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.

**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 CLAS in 120 Schaeffer Hall. For more information, see 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. Visit https://registrar.uiowa.edu/final-examination-scheduling-policies.

Nondiscrimination in the Classroom
UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. 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 (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/.

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 Department of Public Safety website.