

Physical Chemistry II (Chem 4120/6120) Course Syllabus – Spring 2019

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Office Hours: Wednesdays, 3:00 – 5:00 P.M., or e-mail in advance.

Lecture time and place: MWF 2:00 – 2:50 P.M. in Langdale Hall 529.

Course Prerequisites: This course relies on chemistry, physics and math concepts from Chem 1212K; Math 2212; Phys 2211K, and Phys 2212K.

Main Textbook: "**Physical Chemistry**" by Peter Atkins, Julio de Paula, and James Keeler, 11th Edition, Oxford University Press, 2017, ISBN 9780198769866.

Supplemental reading (optional, useful for more advanced topics): "Molecular Quantum Mechanics" by Peter Atkins and Ronald Friedman, 5th Edition, Oxford University Press, 2011, ISBN 9780199541423.

Course Description: Physical Chemistry II is a 3-credit semester course that covers the principles atomic and molecular structure (quantum chemistry) and statistical mechanics.

Learning outcomes: Understand the behavior of matter by deriving their properties at the atomic or molecular level from first principles. Students will also learn how to connect this molecular-level understanding with bulk properties through statistical mechanics.

Help Sessions: Special Course: CHEM 4121; Fridays from 10:00 - 11:40 a.m. at Petit Science Center 233. All undergraduate students are **strongly** encouraged to register for this course.

Practice Problems: Practice problems will be assigned to help you learn and test your knowledge of each of the topics covered in the course. The CHEM 4121 session on Fridays can be used as an opportunity to ask questions about these problems if you have difficulties with them. You should therefore try to solve problems independently sometime **before** the Chem 4121 session on Friday. Several quiz and exam questions will be based directly on homework problems or will be very similar, so solving the homework problems will be highly beneficial in this class.

Quizzes & Exams: There will be five quizzes, one ACS midterm, and one comprehensive final exam. The lowest quiz score will be dropped. **The ACS and final exams must be completed and cannot be dropped.** Quizzes will not be given at any time other than the scheduled lecture period. Should you miss one quiz, you will have the opportunity to do a makeup quiz near the end of the semester, but that makeup quiz will be comprehensive. If you miss a second quiz, that will be used as your drop grade, but you then lose the opportunity to drop another quiz with a low grade. Any additional quizzes missed will be automatically given a score of 0.

Grading:

CHEM 4120: The quizzes will count for **60%** of your overall grade (15% each). The ACS midterm counts for **20%** of the grade. The final exam will count for **20%** of the grade.

HONORS CHEM 4120: Quizzes will count for **40%** of the overall grade. The midterm counts for **20%** of the grade. The ACS Exam will count for **20%** of the grade. A problem set will count for **20%** of the overall grade. The problem set will be emailed at the end of the fourth week and the solutions are due on or before **April 29th, 2019**.

CHEM 6120: Quizzes will count for **40%** of the overall grade. The midterm counts for **20%** of the grade. The ACS Exam will count for **20%** of the grade. A problem set will count for **20%** of the overall grade. The problem set will be emailed at the end of the fourth week and the solutions are due on or before **April 29th, 2019**.

The following plus/minus grading system will be used for everyone:

<u>Grade</u>	<u>%</u>
A+	100
A	90-100
A-	87-90
B+	83-87
B	80-83
B-	77-80
C	73-77
C	70-73
C-	67-70
D	60-67
F	< 60

Last day to withdraw: Tuesday, Mar 5th, 2019

The University requires faculty, on a date set by the Provost after the mid-point of the course,
1. to give a WF to all those students who are on their rolls but no longer taking the class, and
2. to report the last day the student attended or turned in an assignment.

Problem Set Policy: The Chem 6120 / Honors Chem 4120 problem set must be handed in either as a physical copy or emailed to me as a clear and legible pdf file before midnight on April 29th, 2019. The problem set must represent your individual, unaided effort. Receiving unauthorized outside information or offering unauthorized information to another student is considered cheating. Any suspected offenses may be referred to the Department of Chemistry and the College of Arts and Sciences for appropriate action.

Quiz and Exam policies: The five quizzes will be open-book, so you may use the book or your notes during these quizzes. You may also use calculators during the quizzes. However, consider that you will not have a lot of time to browse through your book/notes, so use your time wisely.
The mid-term and ACS final are both closed-book, and you **cannot** use calculators during these two exams. Cell phones must be turned OFF (not just silent) during all exams and quizzes. Cell phones must not be in any place that is visible to you or me during the exam. In case of an emergency where you anticipate you might need your phone turned on during your exam, you must clear that with me first. Your cell phones may not be used in place of a calculator for the quizzes.
I reserve the right to move anyone during quizzes and exams without explanation. I typically use this simply as a way to spread people out. If you are asked to relocate, please gather your test and move to the newly assigned seat as quietly as possible.

Tentative Course Schedule:

Note: This is a tentative schedule. We may not adhere to this schedule exactly. If you miss a class, please check slides on iCollege or check with your classmates for actual material covered. Material covered by quizzes may also change and depends on what topics were completed the week before the quiz.

Holidays: Martin Luther King Day: January 21st, 2019 and Spring break: Mar 18-24th, 2019

<u>Dates</u>	<u>Chapter</u>	<u>Subject</u>
1/14		Introduction, what is this course about?
1/16, 1/18	7A	Energy quantization, wave/particle duality
1/21, 1/23, 1/25	7B, 7C	Postulates of quantum mechanics
1/28, 1/30	7D	Particles in a box
2/1		Quiz 1 (Chapters 7A, 7B, 7C)
2/4, 2/6, 2/8	7E, 7F	Rotations and Vibrations

2/11, 2/13	8A	Hydrogen atom
2/15		Quiz 2 (Chapters 7D, 7E, 7F)
2/18, 2/20, 2/22	8B, 8C	Many-electron atoms and atomic spectroscopy
2/28, 2/30	9A-9E	Molecular structure and chemical bonds
3/1		Quiz 3 (Chapters 8A, 8B, 8C)
3/4, 3/6, 3/8	9A-9E	Molecular structure and chemical bonds (continued)
3/11, 3/13	10	Molecular symmetry
3/15, 3/25, 3/27	11	Molecular Spectroscopy
3/29		Quiz 4 (Chapters 9,10)
4/1, 4/3	13A	Probability and Boltzmann distribution
4/5, 4/8, 4/10	13B	Molecular Partition Functions
4/12		ACS exam (all of quantum topics)
4/15, 4/17, 4/19	13C-E	Statistical Thermodynamics
4/22, 4/24	13F	Chemical Equilibria
4/26		Quiz 5 (Chapters 11, 13A, 13B)
4/29		Review
5/6, 1:30 P.M.		Final exam (comprehensive)