

Chem 4511W Physical Chemistry Laboratory Syllabus: Fall 2017

Instructor: Prof. Aaron Massari (massari@umn.edu)

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Prerequisites: Chem 4501 and Chem 4502

Class Goals: This course will expose students to a variety of experiments in physical chemistry, and teach them proper methods for assessing and analyzing numerical data. These experiments provide hands-on reinforcement of basic concepts developed throughout the Physical Chemistry lecture courses, including quantum mechanics, spectroscopy, thermodynamics, equilibrium, and reaction kinetics. Students are expected to perform the experiments and to gain a thorough understanding of how the instruments used in the laboratory actually make measurements. Finally, this is a writing intensive course and students will write scientific journal-style short papers describing their experiments, results, and interpretations.

Class Location: Lecture: Appleby Hall 303 on Mondays, 1:25 – 2:15 pm
Lab Sections: Kolthoff Hall 465 on Tuesday or Wednesday, 1:25 – 5:15 pm

Course Website: <https://ay17.moodle.umn.edu/course/view.php?id=5115>

The online website for this class will serve as the primary repository for course materials. In addition, students will be expected to submit written assignments online where they will be checked for plagiarism against common resources.

Course Text and Resources: The lab manual for this class is available from the Moodle website and contains the necessary experimental details. In addition, because Chem 4501 and 4502 are prerequisites for the class, students are expected to have access to a physical chemistry textbook. The required book for those classes “Physical Chemistry” by Atkins is sufficient. For clarification, perspective, or different writing style, the books “Physical Chemistry” by MacQuarrie and “Introduction to Quantum Mechanics in Chemistry” by Ratner and Schatz are recommended. These are both available in the library, but are not required for the course. We will also be using current journal articles as resources for the lecture component. These will be posted on the Moodle site as needed.

Safety: The University of Minnesota lab dress code governs proper lab attire for this course: <http://www.chem.umn.edu/services/safety/ChemHygPlan.html>. Goggles must be worn at all times by students in the laboratory. Open-toed shoes and shorts (including Capri pants) are not allowed in the laboratory. Students will not be allowed to perform the laboratory experiments in these types of clothing. For safety reasons, the use of cell phones, personal music players, or other electronic “distractions” is not allowed in the laboratory or during the laboratory period.

Any student found performing unauthorized experiments or behaving in an unsafe manner in the laboratory may be removed from laboratory at any time. Unsafe behavior will be determined by the instructors, and includes failure to respond to instructions in a timely manner. The removal from the laboratory may be as short as the remainder of the current lab period or as long as the remainder of the course, depending on the circumstances.

Academic Integrity: All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else’s work as your own, can result in disciplinary action. The University Student Conduct Code defines scholastic dishonesty as follows:

Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course. If you have any questions regarding the expectations for a specific assignment or exam, please ask. Students should become familiar with the Regent's Policy on Student Conduct, found at:

http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf

Grading: Although each lab will be performed in small groups (2-4 people), the grading will be done on an individual basis and each assignment must be completed by each individual. Discussion of assignments including lab work, results, concepts, and analysis methods are highly encouraged; however, sharing data between groups and duplicating writing is strictly prohibited.

The final grade in the class will be assessed based on:

- 8 Lab reports (100 points each)
- Lab based worksheets and assignments (10-50 points each)

Writing, like most skills, is best learned through active practice and iteration. Therefore, you will be re-writing several of the lab reports this semester after your first attempt has been graded. The grade from a revised lab report will replace the old grade, **regardless of which grade is higher. Re-writes will be held to a higher standard than the original reports.**

Absences and Make-up: Students will not be penalized for missing or delaying assignments due to a university approved activity or legitimate circumstances. For questions of what counts as an approved circumstance, students are referred to the university policy online on make-up work below. If an excused absence results in missing an experiment, a make-up experiment can be arranged during the semester. It is the student's responsibility to contact the instructor to schedule this time. (<http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>). Unapproved circumstances resulting in late assignments and will result in a loss of 33 % of their total score **per day including weekends.**

Lab Atmosphere: Lab work in this class is done in a group environment, and it is important that everyone in the group be allowed to contribute both in physically performing the labs and in intellectually interpreting their results. If you have special requirements and are registered with disability services, please let the instructor know as soon as possible so that appropriate accommodations can be made.

Harassment and behavior that excludes students from full participation will not be tolerated. For more information, refer to the University policies quoted below:

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: <http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

Equity, Diversity, Equal Opportunity, and Affirmative Action: The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf.

We will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this change via email or in person at the beginning of the semester so that the teaching assistants and I can address you properly in or outside of class.

September

Monday	Tuesday / Wednesday	Friday
4 Labor Day, no class	5 / 6 Welcome! meet in Kolthoff 465 discuss course and syllabus group member assignments	8 <ul style="list-style-type: none"> due: 4 pages of plagiarized text/data to course site by midnight. Read Ch. 1 and 2 by Mon
11 Error analysis Diffraction Scientific Writing: Data presentation and formatting	12 / 13 <ul style="list-style-type: none"> lab: Electron & Optical Diffraction posted: Electronic Structure worksheet 	15 <ul style="list-style-type: none"> due: Error analysis worksheet due: Experimental and Results sections for Diffraction lab
18 Spectroscopic tools Hydrogen atom Scientific Writing: Full report format	19 / 20 <ul style="list-style-type: none"> lab: H₂/D₂ Emission lab: Electronic Structure (in microlab) 	22 <ul style="list-style-type: none"> due: Diffraction full lab report
25 Rotational and vibrational spectroscopy How to look up references Assign times to come to lab	26 / 27 <ul style="list-style-type: none"> lab: Ro-vibrational Spectroscopy (HCl/DCI absorption) due: H₂/D₂ worksheet due: Electronic Structure worksheet 	29 <ul style="list-style-type: none"> due: Diffraction report re-write

October

2 Potential energy surfaces, vibrational and electronic spectroscopy	3 / 4 <ul style="list-style-type: none"> lab: Vibronic Spectroscopy (laser induced fluorescence) due: Ro-vibrational Spectroscopy full lab report 	6
9 Kinetics topics Assign groups for Thermo / Kinetics	10 / 11 <ul style="list-style-type: none"> no lab this week due: Vibronic Spectroscopy full lab report 	13
16 Free Energy Heat Capacity	17 / 18 <ul style="list-style-type: none"> lab: Thermo / Kinetics 1 due: re-write of either Ro-vibrational or Vibronic Spectroscopy lab report 	20
23 TBD	24 / 25 <ul style="list-style-type: none"> lab: Thermo / Kinetics 2 due: Thermo / Kinetics full report from previous week 	27
30 TBD	31 <ul style="list-style-type: none"> lab: Thermo / Kinetics 3 due: Thermo / Kinetics full report from previous week 	

November

	1 <ul style="list-style-type: none"> lab: Thermo / Kinetics 3 due: Thermo / Kinetics full report from previous week 	3
6 TBD	7 / 8 <ul style="list-style-type: none"> lab: Thermo / Kinetics 4 due: Thermo / Kinetics full report from previous week 	10
13 TBD	14 / 15 <ul style="list-style-type: none"> lab: Thermo / Kinetics 5 due: Thermo / Kinetics full report from previous week 	17
20 TBD	21 / 22 <ul style="list-style-type: none"> due: Thermo / Kinetics full report from previous week 	(Thanksgiving week)
27 no lecture	28 / 29 <ul style="list-style-type: none"> due: (optional) re-write of any one of the Thermo / Kinetics reports 	