

Chemistry 332a Syllabus, Fall 2017
Physical Chemistry with Applications in the Physical Sciences
MWF 9:25-10:15, SCL 160, Meets RP

Chemistry 332a is the first semester of a year-long sequence (332a & 333b). Chemistry 332a is open to students with a strong background in chemistry and who have been exposed to physics and calculus. This two-semester sequence establishes a firm base for understanding modern physical chemistry and chemical physics. The goal of Chemistry 332a is for the student to attain both qualitative and quantitative understanding of chemical phenomena and molecular behavior, as described in the topics below.

Text: "Physical Chemistry" by P. W. Atkins, 10th edition.

Instructors:

Fall (332a): C. A. Schmuttenmaer, SCL 113, 432-5049, charles.schmuttenmaer@yale.edu

Spring (333b): K. W. Zilm, SCL 119, 432-3956, kurt.zilm@yale.edu

Topics covered during the fall:

1. Thermodynamics. An understanding of the relationships among work, heat, and energy allow a great variety of processes and properties to be understood quantitatively. About one half of the fall semester will be spent on thermodynamics. Topics include: The first and second laws of thermodynamics, Gibbs free energy, material and reaction equilibrium, phase equilibrium, ideal and real gases, ideal and nonideal solutions.

2. Electrochemistry. Many reactions of ions involve the transfer of electrons, which can be studied and better understood by allowing them (or causing them) to take place in an electrochemical cell. Topics include: Electrochemical cells, the thermodynamics of ions.

3. Kinetics. Molecules in gases and liquids are in constant motion, and the rates at which molecules and energy diffuse can be understood through kinetic theory. Reaction rates and reaction dynamics also fall under the category of kinetics. Topics include: Transport processes, rates and mechanisms of chemical reactions.

Topics covered during the spring:

1. Quantum Mechanics. The structure of individual atoms and molecules, as well as the behavior of their electrons and nuclei, are understood through the laws of quantum mechanics. Topics include: Basic theory, wavefunctions, electronic structure and bonding.

2. Spectroscopy. Spectroscopic measurements open the window to detailed information regarding the structure, dynamics, composition, and energy levels of atomic, molecular, and condensed phases. Topics include: Electronic, vibrational, and rotational spectra, magnetic resonance spectroscopy (NMR and ESR).

3. Statistical Mechanics. The microscopic properties of individual molecules are related to the bulk, macroscopic properties of matter through statistical mechanics. Topics include: Statistical derivation of thermodynamics, the calculation of macroscopic properties from molecular spectroscopic data.

Physical Chemistry (Chemistry 332a), Fall 2017
Course policies

Exams:

First midterm exam on Wednesday, September 27. Will cover material through Friday, September 22.
Second midterm exam on Wednesday, October 25. Will cover material through Monday, October 16.
Third midterm exam on Wednesday, November 29. Will cover material through Friday, November 17.
You must give a dean's excuse to Prof. Schmittenmaer within 3 days of missing an exam to be eligible to take a makeup exam.

Final exam will be at time given in YCPS for exam group (32): Tuesday, December 19, 9:00 a.m.

Homework:

Problem sets are due every Friday, except for when there is a midterm exam.
You are encouraged to work together in study groups (but don't just copy each other's work).
Everyone must turn in their own copy of each homework assignment.
Show your work.
Homework is graded.
Homework is due at 5:00 p.m. Friday afternoon. Late homework will not be accepted.

Discussion Section:

You must attend a discussion section. Sign up online.

Meets RP:

We will probably meet on the first day of reading period (Monday December 11, 2017). We will not meet on the second day of reading period (Wednesday December 13, 2017).

Office hours:

C. A. Schmittenmaer (Instructor)
SCL 113; 432-5049 (office); charles.schmittenmaer@yale.edu
After class in the classroom or in my office, SCL 113. Other times by appointment.

Jacob Spies (TA, contact hours and information TBA)

Samuel Greene (TA, contact hours and information TBA)

Grading:

Final Exam	30 %
Midterm Exams (3)	20 % each
Homework	5 %
Discussion	5 %

Other Important Items:

- There is a 1 week "statute of limitations" on submitting exams or homework for a regrade.
- Roughly 20% of all exams are photocopied after they are graded and before they are returned.
- I will not hold office hours the day before an exam. This way, 1. I can write it without worrying that I am subconsciously giving unintended "advice", and 2. I don't want to encourage procrastination (I am a terrible procrastinator, and I don't want to be an enabler of others).

Academic integrity

The following text is provided by Yale's Graduate School:

Academic integrity is a core institutional value at Yale. It means, among other things, truth in presentation, diligence and precision in citing works and ideas we have used, and acknowledging our collaborations with others. In view of our commitment to maintaining the highest standards of academic integrity, the Graduate School Code of Conduct specifically prohibits the following forms of behavior: cheating on examinations, problem sets and all other forms of assessment; falsification and/or fabrication of data; plagiarism, that is, the failure in a dissertation, essay or other written exercise to acknowledge ideas, research, or language taken from others; and multiple submission of the same work without obtaining explicit written permission from both instructors before the material is submitted. Students found guilty of violations of academic integrity are subject to one or more of the following penalties: written reprimand, probation, suspension (noted on a student's transcript) or dismissal (noted on a student's transcript).