

CHE 324: Physical Chemistry II

Block 4 2007-08

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Office hours: officially, M-F 3-4pm; most days 11am-noon; unofficially, just stop by anytime

Course goals

In this block we will study topics that form the foundation for much of chemistry: statistical and bulk thermodynamics; applications of thermodynamics; equilibrium; and kinetics. These topics tell us whether a reaction or physical transformation will take place and, if so, to what extent and how fast. These fundamental topics will be approached from the bottom up: we start by filling the energy levels we developed in CHE 323. We do this by discussing statistical thermodynamics, the behavior of large numbers of small particles. We will use stat thermo to build up the modern view of how and why change takes place.

We will see that mathematics and physics play an important role in understanding chemistry at a fundamental level. This course will provide a foundation for your study of chemistry thus far—after all, we will discuss why reactions happen—and prepare you for future studies in physical chemistry. In addition, connections will be made to other branches of chemistry, including all the way back to general chemistry.

Texts and other materials

Required: Physical Chemistry by Engel and Reid; scientific calculator

Optional: Student Solutions Manual for Physical Chemistry by Engel and Reid; The Physical Basis of Chemistry, 2e, by Warren

Meeting times, format, and expectations

Plan to meet each day from 9:00-11:00 am and from 1:00-3:00 pm. We may need to adjust this schedule from time to time, including going past 11:00 am or resuming before 1:00 pm. Class will be a mixture of lecture, discussion, group work, and problem solving. We will have occasional labs as discussed below.

Prompt attendance at all class sessions is expected, although attendance will not specifically count in the grade. Active participation in class is expected, and you will get more from the class if you are more involved.

Reading the text more than once is strongly recommended; reading physical chemistry takes more ‘work’ than other types of reading. Ideally, you would read the material before class, we will discuss it in class, and you would read it again after class.

Working problems is also crucial to your success in this course, and the course will emphasize problem solving in several dimensions.

Point distribution and explanation

ECQs, class participation, group work, and worksheets		120
Laboratory		90
Problem sets	6@15	90
Midterm exams	2@125	250
<u>Final exam</u>		<u>250</u>
Total		800

End of Class Questions (ECQs): At the end of class sessions, I will often ask you to write down one or a few questions you have regarding the material covered so far. I will then often begin the next session by addressing one or more of these questions. There are no 'stupid questions.' The ECQs, class participation, and group work parts of the point distribution are essentially effort points, and these three items will be worth around 30 points.

Worksheets: These will carry the majority of the grading weight for this subsection, likely around 90 points. You will work on these in class and in groups, but you will each turn in your own worksheets.

Labs: More details will be handed out separately, as will lab report guidelines.

Problem sets: Working together on problem sets is appropriate and even encouraged; science is a collaborative endeavor. However, be certain that the work you hand in is your own (see below). You must be able to solve problems to understand physical chemistry. I will check for completeness in the problem sets, and keys will be posted after the fact. Due dates will be announced in class.

Midterm exams: There will be two covering specific portions of the course. Exams will emphasize problem solving as well as written explanations of chemical phenomena.

Final exam: In order to provide balance to all material covered, some points for the final will come specifically from material covered since the midterm. The remaining points will equally cover the entire block, including material since the midterm. My goal for exams is that all material is tested equally by the end of the block.

Standing bonus point offer: The first person to notify me, in writing, of a textbook error will receive bonus point(s). The number of points will depend on the severity of the error as well as the total number of errors found during the block. This offer is good for the required text only.

Grading

Cutoffs will be no higher than these; they may be lower depending on the difficulty of the exams.

A-/B+	704
B-/C+	608
C-/D+	512
D-/F	416

Miscellaneous

Students wishing to drop on the 15th day must complete all assignments and participate in class.

Late work will not be accepted, and makeup exams will not be given. If you need to miss class, let me know ahead of time; if the reason is good the assignment in question may be excused at my discretion. Please contact me if you are having difficulty with the course or if a serious sickness/incident occurs during the block.

Cornell College is committed to providing equal educational opportunities to all students. If you have a documented learning disability and will need any accommodation in this course, you must request the accommodation(s) from me as early as possible and no later than the third day of the term. Additional information about the policies and procedures for accommodation of learning disabilities is available at: http://cornellcollege.edu/academic_affairs/disabilities/.

Any student with a situation which could affect your learning (e.g., health condition, serious family trouble) must contact me by the third day of the term. Student Affairs staff members do not automatically notify faculty members concerning student health issues. You must inform me due to safety concerns in the lab.

As mentioned above, working on homework sets (as well as lab exercises) together is appropriate. However, academic and scientific misconduct will be dealt with harshly. Examples include, but are not limited to, ‘collaborating’ on exams, illegal material stored in your calculator, submitting another’s work as your own, and falsification of lab data. **Any** question about what is (or is not) appropriate in academia or science should be directed to me. If there is any doubt at all then please ask.

Schedule

Below is a tentative schedule of topics. This schedule is somewhat flexible, but there is a certain core of material that we must cover this block. This schedule will be correlated to the more specific outline of topics as we go along in class. You should be aware that I might not cover material in exactly the same order as the text, and for that reason the chapter designations given here are approximate. More specifics regarding which sections in the text are most important will also be given in class. Finally, deviations from this schedule will be announced in class.

Week 1: Statistical thermodynamics, gases, kinetic theory

Day 1	M	26 Nov	Ch. 30-31	Intro, Boltzmann distribution, partition function
2	T	27 Nov	32-33	Relationship to E, S, G, and K
3	W	28 Nov	33	Wrap up stat thermo, begin gases
4	R	29 Nov	34-35,7	Gases: ideal, mixtures, real
5	F	30 Nov	1-2	Intro to bulk thermo, first law

Week 2: The Three Laws

6	M	3 Dec		Exam 1
7	T	4 Dec	2-4	First law
8	W	5 Dec	5	Second law
9	R	6 Dec	5	Second and third laws, G, μ
10	F	7 Dec	8	Single component phase diagrams

Week 3: Applications of thermodynamics

11	M	10 Dec	9	Mixing
12	T	11 Dec		Exam 2
13	W	12 Dec		Multi component phase diagrams
14	R	13 Dec	6	Equilibrium
15	F	14 Dec	36	Kinetics

Week 4: Kinetics

16	M	17 Dec	37	Kinetics
17	T	18 Dec		Final Exam
18	W	19 Dec		Course wrap up