

# CHE 161: Accelerated General Chemistry

## Block 3 2007-2008

### Instructor

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West Science 313

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Office hours: M 11am-noon; M, T, R, F 3-4:30pm; afternoons when not in lab

These office hours are a minimum; feel free to stop by my office anytime

### Lab Instructor

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More details will be handed out in lab

### Quantitative Reasoning Consultant

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### Course goals

In this block we will lay the foundation for your study of the chemical sciences. Topics covered include the scientific method; characteristics and transformations of matter, including atomic theory, chemical reactions, and the behavior of gases; an introduction to energy; and bonding and shapes of molecules. We will then use the pictures of atoms, molecules, and ions that we develop to understand the physical properties of substances and solutions. We will consider the rates and mechanisms of chemical reactions, and we will study qualitative and quantitative aspects of chemical equilibria as applied to reactions (including acid-base reactions). Finally, we will study thermodynamics and relate this topic to chemical equilibrium.

Chemists deal with these topics every day, but these concepts are also crucially important to other branches of science. In addition to learning these fundamental topics in chemistry, you will further develop your problem solving and laboratory skills.

### Texts and other materials

*Required:*

Chemistry: The Molecular Nature of Matter and Change, 4e, by Silberberg

A scientific calculator (graphing not necessary)

Safety goggles (available in the chemistry stockroom for \$5)

A bound (not spiral) notebook for lab

*Optional:*

Student Solutions Manual for the text

Student Study Guide for the text

The Physical Basis of Chemistry, 2e, by Warren

### Meeting times, format, and expectations

We will meet each day from 9:00-11:00am and from 12:30-3:00pm. Class will be a mixture of lecture, discussion, problem solving, group work, and labs. Prompt attendance at all class sessions is expected, although attendance will not count specifically in the grade. Active participation in class is expected, and you will get more from the class if you are more involved. In addition to the formal meeting times, optional problem solving sessions will be held each day at 8:45am. Among other things, we will discuss representative problems during this time.

Reading a chemistry text is not like reading a novel; plan to spend a substantial amount of time reading and working example problems. See below for notes on the reading assignments; we will not emphasize all sections equally in this course.

In addition to the graded assignments listed below, it will be to your great advantage to do and understand the representative problems from the text. These are listed in the schedule below. I will be happy to discuss these problems in detail, but I will not grade your work. These are for your own benefit; it is essential that you be able to solve problems in chemistry. Working together on problems is appropriate and even encouraged; science is a collaborative endeavor. However, by exam time each of you should understand all of these problems.

### Point distribution and explanation

ECQs, class participation, and group work		20
Quizzes and worksheets	13@10	130
Laboratory	lab grade scaled to:	200
Two midterm exams	2@125	250
<u>Final exam</u>		<u>200</u>
Total		800

*End of Class Questions (ECQs):* At the end of a class session, I will often ask you to write down one or a few questions you have regarding the material covered so far. We will then often begin the next class session by addressing one or more of these questions. There are no ‘stupid questions.’ The points in this subsection are nothing more than an effort grade.

*Quizzes:* These will be short, in-class problems to work. When given, quizzes will be at the beginning of class, but they will not necessarily be announced the day before.

*Worksheets:* These will be in-class activities usually carried out in groups. Each person in the group should turn in a worksheet.

*Labs:* In addition to the weighting shown above, you must perform satisfactorily in the lab portion of the course to pass the course. More details regarding lab will be handed out later.

*Midterm exams:* These will cover a specific portion of the course.

*Final exam:* The final exam will be comprehensive, but the material in the latter portion of the course (since the last midterm exam) will be weighted more heavily to provide balance to all material covered.

### Extra credit:

*Textbook errors:* If you find a legitimate error in the textbook and are the first student to report this error to me in writing, you will receive bonus points. The number of bonus points will be dependent on how many errors the class finds as a whole throughout the entire block. This offer is good for the text only (i.e., not the optional texts).

### **Grading**

Cutoffs will be no higher than:

A-/B+            720

B-/C+            640

C-/D+            560

D-/F              480

Cutoffs may be lower depending on the difficulty of the exams.

### **Miscellaneous**

Tutors are available; please see me for more information. In addition, the College's Quantitative Reasoning Consultant and her office are glad to assist you.

Students may transfer into CHE 121 as late as the fifth or sixth day if space is available. Students wishing to drop on the 15<sup>th</sup> day must have faithfully attended and participated in class. This includes labs, ECQs, quizzes, worksheets, and exams.

*Late work will not be accepted, and makeup quizzes or 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/](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 problem sets 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 (including copying from a current or former student's lab notebook), 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

The following schedule is tentative; deviations will be announced in class.

<u>Day</u>	<u>Chap.</u>	<u>Daily Schedule</u>	<u>Representative Problems</u>
1 M 29 Oct	1	Fundamentals	1: 7, 21, 28, 35, 58, 79, 90
	2	Matter	2: 8, 18, 28, 40, 62, 111, 138
2 T 30 Oct	3	Stoichiometry	3: 2, 3, 9, 14, 25, 29, 32, 38, 44, 49, 56, 65, 73, 127
	4	Reactions 11am Chemistry Demos on the OC!	4: 3, 16, 25, 34, 48, 56, 61
3 W 31 Oct	5	Gases	5: 2, 14, 19, 33, 45, 60, 66 (skip part f)
	6	Thermochemistry	6: 9, 14, 36, 41, 57, 69, 76
4 R 1 Nov	7	Quantum theory	7: 12, 22, 32, 39, 48, 60, 74
5 F 2 Nov	8	Periodic properties	8: 6, 12, 18, 26, 54, 75, 107
6 M 5 Nov		<b>9am Exam 1</b>	
	9	12:30pm Bonding	9: 16, 23, 35, 38, 48, 55, 64
7 T 6 Nov	10	Molecular shape	10: 6, 10, 16, 20, 26, 61, 65, 28, 31, 35, 41, 51, 53, 64
8 W 7 Nov	11	Bonding theory	11: 2, 4, 8, 12, 19, 20, 34
9 R 8 Nov	12	Intermolecular forces	12: 2, 14bcd, 19, 34, 39, 41, 43, 47, 49, 119, 80, 86ac, 88, 129
10 F 9 Nov	13	Mixtures	13: 7, 9, 12, 44, 70, 75, 76, 90, 94abc, 100, 102, 106, 135
11 M 12 Nov	16	Kinetics	16: 5, 21, 23, 25, 26, 28, 34, 38, 49, 51, 54, 65, 67, 82, 87b, 100
12 T 13 Nov		<b>9am Exam 2</b>	
13 W 14 Nov	17	Equilibria	17: 7, 8, 16, 23, 35, 38, 53, 55, 56, 63, 69, 71, 76ab
14 R 15 Nov	18	Acids and bases	18: 22, 23, 27, 41, 43, 45, 63, 66, 81, 88, 90, 98, 108, 109, 119, 122, 123, 141, 179
15 F 16 Nov	19	Ionic equilibria	19: 14, 16, 25, 33, 117, 63, 65, 66, 70, 75, 82, 87
16 M 19 Nov	20	Thermodynamics	20: 18, 48, 33, 54, 60, 64, 67, 68, 78, 80, 83, 86a-g, 96
17 T 20 Nov	21	Electrochemistry	21: 10a-e, 22a-d,f, 27, 29a-d,f-h,j-k, 31, 33, 36, 40, 44, 47, 57, 61, 67, 69, 73, 81, 102, 104
18 W 21 Nov		<b>9am-noon Final exam</b>	

**Notes on the reading assignments:**

**Ch 1:** Keys to the study of chemistry. Skim. Read the "Section Summaries" to find out how familiar you are with this material. Pay particular attention to the words in boldface; make sure you understand and can use them. Be sure you can work the sample problems (examples) in the text. Note that sections 1.2 and 1.3 provide background material that is less essential to later chapters.

**Ch 2:** The components of matter. As with chapter 1, much of this material will be familiar to you. Test your knowledge by working (not reading) sample problems 1 - 4 and 13 (especially 4 and 13). If you have difficulty with any of the sample problems, work the "follow-up problem" that follows. (Answers to these follow-up problems are given at the end of each chapter.) "Picturing Molecules" (p. 72) is worth a good look, and Figure 2.22 (p. 76) provides a very useful overview of matter.

**Ch 3:** Stoichiometry: Mole-mass-number relationships. More fundamentals. Once again, work the examples for yourself to make sure you understand. Focus on sample problems 1-5, 7-8, and 10-15.

**Ch 4:** Chemical reactions. This chapter provides an overview of topics that we will cover in more depth later on. You can use Table 4.1 (p. 143) to answer questions about precipitation reactions; do not memorize the table. You will, however, need to know the rules for assigning oxidation numbers in Table 4.3 (p. 152). We will not cover balancing redox reactions, redox titrations, or section 4.6. Section 4.4: Skim this section for now, as we will come back to acids and bases in much more detail in the second half of the course. Most important sample problems: 1, 3, 6, 7.

**Ch 5:** Gases. We will give less attention to section 7. Sample problems 1-8 and 10.

**Ch 6:** Thermochemistry. Section 6.1 is less important than the other sections. Sample problems 3, 4, 7-9.

**Ch 7:** Quantum theory and atomic structure. Sections 7.2 and 7.4 are the most important. In section 1, you should be able to interrelate wavelength, frequency, and energy. Section 7.3 contains helpful background and historical information. Sample problems 1, 2, 5-7.

**Ch 8:** Electron configuration and chemical periodicity. All sections are important. All sample problems.

**Ch 9:** Chemical bonding. All sections are important; all sample problems.

**Ch 10:** Shapes of molecules. All sections, all sample problems! They're all important.

**Ch 11:** Covalent bonding. Sections 1 and 2 but not 3. Sample problem 2 only.

**Ch 12:** Intermolecular forces. In section 2, we will not talk about the Clausius-Clapeyron equation or phase diagrams. We will not spend much time on section 12.4. Section 12.6: You do not need to read "The crystal lattice and the unit cell" (pp. 450 - 454) or "Bonding in solids: molecular orbital theory" (pp. 460 - 463). We will not talk about section 12.7. Sample problems 2 and 3.

**Ch 13:** Solutions and colloids. Skim sections 13.1 - 13.3 only. Sample problem 1.