A separate syllabus describes the lab associated with this course:

http://www.acad.carleton.edu/curricular/CHEM/courses/rrossi/Chem123_W03/LabSyllabus.PDF

Instructor (i.e. who to throw your rotten vegetables at)

Robert C. Rossi [Visiting Assistant Professor of Chemistry]

Favorite Hangout: 167 Mudd Phone: Extension 7145 e-mail: rrossi@carleton.edu

I'm ostensibly responsible for this course. As you are actually in charge, I'm at your mercy. Any similarity you notice between myself and any politicians who lost their primary race is purely coincidental.

Overview

Chemistry 123 is a one-term introductory-level chemistry course with an associated lab. [There is a separate syllabus for the lab portion of the course.] We will discuss the internal structure of atoms, interactions between atoms, and how the statistical behavior of large numbers of atoms can be predicted on the basis of energetic and entropic considerations. Each of these requires thought at a different level of abstraction, and the ability to think between such levels is one of the key skills I hope you will develop. In order to make the course more interesting and meaningful, we will focus on as many applied, "real-life" examples as possible.

Objective

The aim of this course is to provide you with a collection of fundamental concepts and seminal experiences capable of serving as a solid foundation for the further study of chemistry and other subjects involving chemistry. As your instructor I feel a strong obligation to equip you with tools you'll need to succeed in the future, and thus (in contrast to a survey course) the pace will be determined by how fast you actually come to fully understand new material, not how much you like it or how fast we can "cover" it.

Prerequisites (or lack thereof)

Chem123 has no formal prerequisites, but it assumes a strong high school chemistry background. You should have taken, and felt nifty about, the self-administered Chemistry Placement Evaluation, which can be found at

http://www.acad.carleton.edu/curricular/CHEM/SelfEval/SelfEval_Main.html

You should come into this course already familiar with the review topics listed there. We will spend a couple days brushing up on this stuff, but if you need more help than that please let me know. If almost everything you see on the first few days is baffling, consider taking Chem 122 instead of Chem 123.

Class Meeting Times

Chem 123 meets Mondays, Wednesdays, and Fridays at 8:30 a.m. in Olin G04. (I'll try to make it lively!) The associated (required) lab meets on Tuesdays at 8:00 a.m. or 1:00 p.m., depending on which lab section you sign(ed) up for, in 260 Mudd. Please note that the **lab sections will meet next week**, starting January 7. Read the lab syllabus thoroughly, buy your supplies, and do the pre-lab assignment before the first lab period!

Grades and Assessment

I don't like grades. I understand their pragmatic necessity, but in truth nobody knows better than you whether you understand something, or whether you have learned anything. Since the assessment process has a very big impact on you as a student, I used to leave it to the students, within certain constraints, to decide how they would be assessed in this course. I have come to the conclusion that Carleton students are a sadomasochistic bunch. Past classes have chosen things that have made their lives miserable, and then been rather unhappy.

Grades and Assessment, continued…

So, this term, I'll propose something, and if you have suggestions for improvement, please let me know:

25% Homework (assessed about equally on effort and demonstrated understanding)
35% Lab (assessment here emphasizing effort and learning rather than the correctness of end results)
25% 2 written exams given over the course of the term (assessed primarily on demonstrated understanding)
15% An individual paper or a small group project (your choice) based on a popular science topic that interests you and involves chemistry, either of your own choosing or based on your final lab.

Required Textbook

The following textbook is required. It will be assumed you have access to all the information in it:

Chemistry, 5th Ed., Zumdahl & Zumdahl, Houghton Mifflin Company (2000).

New copies may be purchased at the Carleton Bookstore at the bargain-basement price of $127. (Actually, the bookstore typically charges less than, say, Amazon.com, even before shipping!) The bookstore also has used copies at $95 a pop. If you want to look for used copies online the ISBN is 0-618-03591-5. The CD bundled with the book is of questionable utility, but as I find things of potential educational value on them, I'll be sure to let you know. The CD isn't required, though, and I certainly wouldn't pay extra for the CD if you have any choice in the matter. (You can often get a used copy of this book on the cheap because the seller lost the CD.)

References (Non-required books mentioned in this syllabus)

There's one book that I'd like to recommend, but don't require because I think the price is simply ludicrous:

Chemistry in Context, 3rd Ed., American Chemical Society, McGraw-Hill Higher Education (2000).

It runs $94 new, and it's a freaking paperback. Thanks ACS. But it does cover the skeleton of several of the more involved applied chemistry topics we will actually be focusing on in class. Sadly, it is at too simple a level to work as a course textbook. So we'll talk about what's in this book at more of a Zumdahl level.

There's another book I would informally recommend if you expect to continue taking chemistry:

Quantitative Chemical Analysis, 5th Ed., Daniel C. Harris, W. H. Freeman and Co. (1999).

This book is exceedingly well written, and it will prove helpful in writing up your labs and in this class when we get to equilibria. A subsequent chemistry class will likely require it (Chem 230 does this year) but a new edition is now out, so I'd hold off buying it if I were you. (It's unclear if 230 will use the 5th or 6th editions.) I'll put a copy on reserve at the library; they also have an older circulating copy of it. Any edition will do, they are all great. (Actually, I like the early editions better. I have the second edition myself…can you say "old man?") However, the page and chapter references I'll give will be to the fifth (1999) edition.

Jones and Atkins is a different textbook that we've recently tried using in Chemistry 123:

Chemistry: Molecules, Matter, and Change, 4th Ed., Jones & Atkins, W. H. Freeman and Co. (2000).

Jones/Atkins does a much better job with physical chemistry, but I think it is harder to learn from. If you find both Jones/Atkins and Zumdahl pokey and pedantic, or want a third opinion, try looking in

Principals of Modern Chemistry, 3rd Ed., Oxtoby & Nachtrieb, Saunders Publishing (1996).

The fourth edition has come out, so you can pick up copies on the cheap. I will put one of my copies of this book on open reserve at the library, along with a few others I have duplicates of. I have tons of other books that might help you in my office. Stop by and browse if you feel like you would like another reference!

Electronica

The Chem 123 web page provides lots of useful information, around the clock! You can access it directly, at
http://www.acad.carleton.edu/curricular/CHEM/courses/rrossi/Chem123_W03
or via Carleton's homepage (Academic Departments:Chemistry:Courses:Chem 123:Rossi).

Homework

On a semi-regular basis, I will assign some form of homework. Each assignment will have a due date, which will become progressively less negotiable as it approaches. If you are swamped or are having trouble with the homework, please let me know as soon as you get the jitters. I will do my level best to ensure that you get each homework well before it is due and that each one is completely workable in light of what you have learned up to that point in time. ***Assignments will not be accepted after the due date! I'm sorry, no exceptions!***

I encourage you to help each other **understand** the homework. However, plagiarism of solutions from other students, textbooks, or any other source is NOT permissible. I expect each of you to personally complete the homework you hand in, and be able to individually reconstruct the work you hand in, entirely on your own. Now I don't want to go off on a rant here, but I don't tolerate cheating. I'm a pretty libertarian academic mind, but if you ever intentionally do anything that takes unfair advantage of me or your fellow students, expect no mercy from me. *I will periodically do things to entrap people who are cheating. You have been warned.*

If the homework consists of written problems, you must show and explain your work (in detail) for full credit. Please turn in such assignments stapled together, with your name and the assignment description page on top. If I am not around, please slide the goods under my door or put them in the box outside my door. [If I ever assign something too thick to slide under the door, beat me soundly.] When the homework consists of conventional problems, the solutions will be put on the web shortly after the due date. Please make your work neat and legible, so we can grade it and you can learn from any mistakes you might have made. ***We will not grade illegible, disorganized work!***

About Group Work *(This is an official statement from the Chemistry Department's top brass.)*

In your chemistry courses, there are many times when you will be expected to participate in group work (e.g., laboratory team work, group quizzes, and group homework assignments). This reflects the belief of the Chemistry faculty that gaining experience with both formal and informal group work is indispensable toward the learning and practice of modern chemical science. The department values and expects mutual respect, cooperation, and communication among team members as well as an equitable distribution of effort. If you encounter anything which interferes with your ability to learn from and complete group work, we want to know about it. Please consult with your instructor (Robert Rossi, rrossi@carleton.edu, Mudd 167, x7145), the Chemistry Department Chair (Steve Drew, sdrew@carleton.edu, Mudd 170, x5861), or the Associate Chair (Trish Ferrett, tferrett@carleton.edu, Mudd 168, x4408) so that the situation may be promptly resolved.

Office Hours and Extra Help

I will post office hours outside my office door and on the web. I will adjust these hours, or dump them entirely, in response to their level of utilization and the due dates of the assignments. Please check my webpage for my up-to-date office hours. Official office hours or no, feel free to call or drop by my office anytime to see if I am available to answer questions (with the exception of just before class, when I panic...er, I prep for class, yes, prep for class). You may also schedule an appointment to see me. E-mail is the best way to do that.

This term Charlie Weiss will be offering his services as a prefect. He'll ask you in class about what kind of help he might offer that would be of the greatest utility to you. Understand that Charlie's role may change in response to utilization of the help he offers. Please don't ask for something you don't plan on taking advantage of! Charlie is also available for one-on-one help if you need extra help; please contact him directly about that.

Please consider using the helpful tutoring service offered by veteran chemistry students on Sunday through Thursday nights. The exact location and times have yet to be set, but I'll keep you posted. You might also find classmates to work with on the problem sets at these tutoring sessions. I hope to visit them occasionally myself, if nobody chases me away. Private and semi-private tutoring may also be arranged through the Tutoring Center. If you have a learning disability or any other special need or concern, you should discuss this with me at the beginning of the term. Any such conversation will remain confidential.

Course Outline (Tentative – How fast you learn the stuff determines how fast we actually go!)

[Abbreviations: pp. = pages; § = section(s); wks = weeks; Ch = Chapter; **Bold = Jones & Atkins**; *Italic = Oxtoby & Nachtrieb*]

Units and Topics Covered [Note: These are the basic topics…but the course will be built around real-life stuff!!!]	**Time Estimate**	**What to Read in Zumdahl, 5th Ed.**	**Other Useful References**
Unit 0: Bricks and Mortar (and Solutions)	(Waaaaaah!)	(Specific assignments in class)	(Totally optional: alternate sources of information)
We will briefly review the topics listed at http://www.acad.carleton.edu/curricular/CHEM/SelfEval/ReviewTopics.html	1 or 2 days	Review anything in Chapters 1 through 5 that seems fuzzy	**Chapters 1-5** *Ch 1 §6-7, Ch 3 §1-4, Appendices A-C*
Solutions, Colloids, and Colligative Properties	1 day	Ch 11 *except* §11.2	**12.1-7, 12.11-14** *Ch 4 §3, 5, and 7*
Unit 1: Thermochemistry and Thermodynamics	**~ 3 wks**		**Chapters 6 & 17**
Enthalpy, Work, & Heat; State *vs.* Path Functions	2 days	6.1 to 6.4	**6.1-8, 6.12-16;** *Ch 8 §1-4*
Bond strengths and Bond Energies	½ day	8.5 and 8.8	**9.6-7, 8.3**; *8-4*
Entropy, Probability, and Driving Forces	1 day	16.1 to 16.3	**17.1 to 17.5**; *9-1 to 3*
Free Energy and Spontaneous Reactions	½ day	16.4 to 16.8	**17.6-12**; *9-4*
Phase Diagrams and Phase Transition Energies	1 day	10.8 and 10.9	**10.14–17, 6.9–10**; *4-1, 8-4*
Engines and Energy Sources; Nuclear Chemistry	2 days	16.9; 6.5, 6.6; Ch 21	**pp. 416–9, Ch 22**; *8-5, 8-6*
Unit 2: Properties of Atoms	**~ 1 week**		**Chapter 7**
The Bohr Model of the Atom + Dead White Guys	1 day	7.1 to 7.4	**7.1 to 7.4;** *13-1, 13-2*
Quantum Mechanics + More Dead White Guys	½ day	7.5 to 7.8	**7.5 to 7.9;** *13-3, 13-5*
Multi-Electron Atoms and Periodic Trends: Electron Affinities, Ionization Energies, etc.	1 day	7.9 to 7.13	**7.10 to 7.19;** *2-1, 13-6, 13-7, 14-2*
Unit 3: Properties of Molecules	**~ 1 week**		**Chapters 8 and 9**
Molecular Orbital Theory	2 days	9.2 to 9.4	**9.14 to 17;** *14-4, 14-6*
The Covalent – Ionic Bond Continuum	¼ day	8.1 to 8.4, 8.6 & 8.7	**9.4–5, 8.14–15;** *14-2*
Lewis Structures and the Octet "Rule"	½ day	8.9 to 8.11	**8.1, 8.2, 8.5 - 7;** *2-2, 2-3*
Resonance and Formal Charges	¼ day	8.12	**8.8 to 8.11;** *2-3, 14-2*
VSEPR Theory – Mythology that works (sort of)	½ day	8.13	**9.1, 9.2;** *14-3*
Unit 4: Condensed Matter	**~ 1 week**		**Chapter 10**
Intermolecular Forces	1 day	10.1 and 10.2	**10.1 to 10.5, 8.4;** *4-2*
Bonding in Solids	2 days	10.3 to 10.7	**10.6 to 10.13;** *Ch 17*
Semiconductors and Semiconductor Devices	1 day	pp. 476-8, 481, 498-9	*20-4*
Unit 5: Kinetics	**~ 1 week**		**Chapter 13**
Rate Laws and Reaction Order	1 day	12.1 to 12.5	**13.1 to 13.4;** *11-1, 11-2*
Reaction Mechanisms	½ day	12.6	**13.12 to 13.14;** *11-3, 11-4*
Activation Energy and Catalysis	1 day	12.7 and 12.8	**13.8 to 13.11;** *11-5, 11-7*
Unit 6: Equilibria	**~ 2 wks**		**Chapters 14 - 16**
General Equilibria and Le Châtelier's Principle	2 days	Chapter 13	**Ch 14, qualitatively;** *Ch 5* Harris: 6-1, 6-2
Acids, Bases, and Acid-Base Equilibria	2 days	Ch 14, 15.1 to 15.5	**Ch 15, 16.4 to 7;** *Ch 6* Harris: 6-7 to 6-9, Ch 9-11
Solubility and Complex Ion Equilibria	1 day	15.6 to 15.8	**16.11 to 16.17;** *Ch 7* Harris: 6-3, 6-4, and 6-6