Chemistry 121-02 -- General Chemistry I **Fall 2006**

Peter Kuhlman

Welcome to the first semester of General Chemistry at Denison! This fall we will explore the fundamentals of the way chemists look at the world, and the language they speak. Along the way, I hope that the language and tools of chemistry become *your* language and *your* tools -- things that help you better understand the world in which you live.

This syllabus is intended to help you prepare for what I hope will be an exciting and challenging exploration. Please view it both as an introduction to the course and as an explanation of why I have designed this course this way. I'll be frank -- it's long (a "syllabook", almost), and probably more long-winded than necessary, but I feel that it is very important that you understand my educational philosophy in order to get the most out of this class. So please read the whole thing, so that you have a good sense for what is coming in the next fourteen weeks. And please let me know if there is anything in this syllabus that you either don't understand or don't agree with. It is my belief that you will be in the best position to learn Chemistry if we can honestly discuss both the learning process and the chemical content of the course.

What I want to achieve in this course this semester:

- Science and chemistry are processes of inquiry, not static collections of facts. While I certainly want to facilitate your understanding of chemical concepts and the "language" chemists speak, I also want you to come to see chemistry as a *way of learning*. A significant portion of this class will therefore be aimed at helping you to improve your skill in applying chemical logic to the investigation and analysis of your world.
- In the same vein, I want to share with you, and hopefully pass on to you, my passion for the explanatory power of chemistry and its relevance to our daily lives. To experience the excitement of delving beneath the observable, everyday landscape to the fascinating molecular world that forms its fabric, you need to see differently, to apply a *mental microscope* to the world around you. Many of the exercises in this course revolve around the goal of helping you calibrate your mental microscope.
- I also want to guide you towards a working familiarity with the logical approach to asking questions about your world that we term "the scientific method". This methodology is far more than a set of steps for designing laboratory experiments. It is truly a way of interacting with life and with information.

Fundamental to my approach to this class is a firm belief in the Liberal Arts approach to learning. At its core, this philosophy states that learning is not so much a process of accumulating information as a process of developing ways to examine and make sense of information. Therefore I most decidedly do NOT view my role as teacher to be the person who tells you all there is to know about chemistry. Rather, I strive to be the person who encourages you to think critically about chemical information, who helps you to construct your own view of the chemical world.

In this course you will probably cover fewer names, reactions, and chemical phenomena than you might in a comparable course at a large university. On the other hand, you will be asked to go beyond simply knowing about the things we cover, to truly understanding them and predicting outcomes of experiments you've never encountered before. I seek to teach you to think, to question, and to learn. The universe of knowledge is constantly expanding, and no one can expect to know everything, even in a small subfield, such as thermodynamics. But if you learn to think critically and learn to learn, then you will always be ready to master new worlds of knowledge as you encounter them.

An important part of thinking critically about a situation is the willingness to explore ideas that run counter to one's preconceived notions. I hope that over the course of the coming semester you will come up against some ideas that you find strange, perplexing, or challenging to your worldview. I will make every effort to support you as you explore these ideas, and I strive to allow you to think about challenging ideas in a non-threatening environment. If you ever feel uncomfortable about

confronting new ideas in this class, please do not hesitate to come by and talk with me about it. For a principled discussion of the role of provocative ideas in the Liberal Arts education, I encourage you to visit the website of the American Association of Colleges and Universities at http://209.29.150.40/About/statements/academic_freedom.cfm

Who I am and how to get in touch with me:

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Office hours: To optimize our opportunities to meet outside of class hours to discuss any questions or difficulties you are having, I don't have regular "office hours", but instead set up individual or group appointments. I will make every effort to ensure that you and I can find a time to meet outside of class hours to discuss any topics that are of concern to you. *I will be available for at least 3 hours of appointments each week*, as long as they are scheduled by the end of the preceding week.

Course material:

Text: *Chemistry: the central science* by Brown, LeMay, and Bursten (Tenth edition).

Laboratory Manual: *Guide to Experimental Chemistry*, Denison University faculty (2006 edition). The manual will be released in two parts, covering Experiments 1~5, and 6~13. (A Laboratory Notebook and Goggles are also required; a lab coat is strongly recommended.)

Course meeting time:

We will meet on Mondays, , Wednesdays, Thursdays, and Fridays from 9:30 a.m. until 10:20 p.m. in Ebaugh room 102. In consultation with the class, I will also schedule an hour-long supplementary meeting at a regular time each week to provide interested students an opportunity to spend more time in explanation, or review, or further application of material that we have covered in the regular class sessions.

Finally, we will also meet in the laboratory for three hours each Tuesday from 9:30 until 12:20 p.m. The lab will be closed at 12:30 whether everyone is done or not, so failure to properly prepare for lab may mean that you have to finish the exercise at another time. Let's not let that happen! For me, as for many scientists, the lab is a wonderful place -- a place to explore new ideas, a place to test whether what I *think* I know is borne out in reality, a place to see cool phenomena unfold. I hope that you will take advantage of your opportunities to explore Chemistry with your hands and eyes and mind this semester, and I hope that I will infect you with some of my passion for experimental science.

Our partnership in Learning

Because it is my fundamental assumption that I am here as your *partner* in learning, I invite you to join me in taking responsibility for your education. What does that mean?

For one, it means that I expect that you, as an experienced student, have learned to read textbooks in a fairly sophisticated fashion. I will provide you with a detailed course calendar and always encourage you to read ahead in your textbook and your case-study modules, but I view the texts as a complement to the material that I present in class and I will therefore *not* simply re-phrase them. If you aren't sure how to make best use of your text, I invite you to come scheme with me at your earliest convenience!

Similarly, I will recommend practice problems, and will sometimes pose questions for you to keep in mind while reading passages in the texts, but I will *not* collect your homework or watch over your shoulder to make sure that you are reading and working the problems. That is to say, I will provide

you with resources and opportunities, knowing that if you are serious about learning, you will take advantage of them.

Taking responsibility for your half of our partnership also means that you should demonstrate initiative. If you only do those things that I explicitly tell you to do, you will miss out on many opportunities to gain a deeper understanding of chemistry, of science, and of life. If you only come to class and hand in the required assignments, you will come out of the course with a correspondingly shallow perspective on chemistry. If you only do the problems that I recommend, without pursuing more problems of the kind that give you difficulty, you are unlikely to achieve mastery of the course material. If you only read the required passages in the text, without reflecting on what you've read and asking yourself whether you truly understand it, you are very likely to be surprised in class and on assignments when I ask you to think about the material in new ways. If you wait for me to initiate a conversation with you about your comfort level in the course, without asking yourself (daily!) how well you are doing, then you are apt to gain much less from the course than you would if you came to me as soon as you identified an area of confusion. Similarly, if you have *any* questions about the course material, you should not hesitate to seek me out before class, after class, or by appointment at another time. And if you never take the initiative to explore things that you find interesting, to ask me questions that go beyond the strict requirements of the material, if you never ask *yourself* to think outside the course box, then you are almost certainly not going to have as much fun or do as well as if you make the decision to be an active partner with me in your education.

Finally, I should add that there is no portion of your course grade that is for "taking responsibility for your own learning". However, in this course, as it so often is in life, it will be clear to others whether you are taking your share of the responsibility to help your classmates and me make the most of our time together. It will show up in the way you acquit yourself in class, in lab, and on assignments, and it will definitely be reflected in your course grade. The single biggest difference that I have found between "A" and "B" students over the years is that the former group takes a much more active role in the course, that they demonstrate a *personal* commitment to excellence in learning.

How we'll achieve the course goals:

It is my experience that learning is deepest if it engages multiple cognitive processes. Therefore I will try to give you opportunities to engage the course material by *reading about it, seeing it happen, doing it with your hands, thinking about it, and discussing it with your classmates*. I will structure our class time in ways intended to help you review, reinforce, and synthesize all the material in the course. This semester many of our class meetings will not be conventional lectures, but will instead be structured around active engagement of the chemical phenomena under investigation. I will do some lecturing, we will have both large and small group discussions, and I will at times ask probing questions. There will be opportunities over the course of the term for you to practice making *observations* and *reaching conclusions* on the basis of those observations, and there will be times when I will ask you to *make predictions* of the behavior of chemical phenomena on the basis of what you have observed and learned.

Throughout these classroom activities, I will be looking more for evidence that you are trying to learn and trying to think than for evidence that you have the "right" answers. I will ask you for predictions and calculations and observations, *not* to be cruel or "tough" or to "put you on the spot", but rather because I believe it is my job to help you *learn to learn* and *learn to think critically*. (Even though I believe that this is one of the most effective ways to help you learn, I am also aware that different people learn best in different ways, so please let me know if you feel uncomfortable with this approach to classroom learning!)

This class will be most effective when every member of the class is engaged. If class members either dominate, distract from, or withdraw from the class, we are all likely to learn less. I will therefore base part of your grade on my evaluation of your contribution to the class discourse. That doesn't mean that you should feel compelled to say a lot in class, or that every comment or answer

you give has to be "right". On the contrary, we often learn much more from our mistaken answers than from our correct ones. Accordingly, I will note only whether your comments and answers indicate (a) that you are coming to class prepared and (b) that you are thinking. Of course, this also means that you must generally be present in class (and you must arrive on time), for if you aren't there, it will be difficult for you to contribute to the class and to show me that you're engaged and thinking.

Does that mean that I will take role everyday and penalize you for absences? No, but if you feel that you *must* be absent from any laboratory or exam day, please see me beforehand if at all possible, and in any case be prepared to rigorously justify your absence (with supporting documentation from, for example, Student Health or the Academic Support office). Absence on a test date will result in a score of zero for that test if you have not *previously* made an arrangement with me to take the test at another time. You *are* responsible for all class material whether you are present at all class meetings or not, so be sure to make arrangements with me and with your classmates to obtain the information that we covered in class on any days that you are not present.

I will strive to keep the format and content of this class flexible so that I can respond to your needs and interests as we go through the semester. I agree with past students that such flexibility enhances my ability to make this Chemistry course *your* Chemistry course. I also realize, however, that this very flexibility can be unsettling, and I will therefore also strive to make it very clear what my view of the class structure and priorities are, and I reserve the right to make final decisions about course structure, pacing, and assignments. Furthermore, in order to make changes to the course on the fly, we need to be in ready communication, and so I ask that you make it a habit to *check your e-mail daily* in case we need to be in touch about class-related matters. If your classmates or I ever make reference to an email message that you don't think you received, please contact me at once.

The demands of this course During this semester, we will be exploring a large body of material, and I will be asking you to gain more than a surface understanding of chemical concepts. While many of you will find the list of topics looks quite familiar from your high school training, most students in this class will encounter some subject matter that they were not introduced to in high school. More importantly, nearly all of your classmates will find that the college approach to chemistry puts a new and challenging stress on explanation and application of concepts rather than knowledge of details. I tell you this not to *warn* you that it will be a hard semester, but rather to *encourage* you to be honest with yourself about how well you are understanding the material, *from the very first week onwards*. This is one of my reasons for having a quiz after less than two weeks of class and a test at the end of week 3 -- I want to give you early feedback on your progress towards understanding. If you feel that you are struggling to master any aspect of the course material, I ask you *in the strongest terms* to make an appointment to see me to discuss strategies for improving what you get out of this class. There will be a wide range of opportunities for you to better master the subject matter -- personal meetings with me, group help sessions that I will hold weekly, Supplemental Instruction and help room sessions led by experienced students, one-on-one tutoring sessions, and workshops offered by the office of academic support. Please take full advantage of these opportunities.

Other ways to demonstrate your mastery of chemical concepts There is far more to chemistry than what you will encounter in Chem 121 and 122. I want to encourage you to experience some of the greater world of chemistry, and I also recognize that tests are not an effective way for many people to either be motivated to learn or to demonstrate what they *have* learned. If you know from experience that this is the case for you, I will be happy to explore alternatives to the course point breakdown laid out below. To take advantage of this opportunity, you must meet with me early enough to conclude our 'negotiations' about an alternate evaluation scheme before September 15th. Although I am ready to explore lots of creative approaches to evaluating your learning, there are a few aspects of student evaluation that I feel pretty strongly about, so in all cases, the percentage of course points coming from lab exercises and the final exam are non-negotiable.

I also think that it is important for you to learn how to decide which of the many, many bits of information that you encounter in this class are more important and which are less important. Similarly, I want to encourage you to reflect on which aspects of the material ***I*** think are important and am apt to stress on exams. To stimulate these kinds of higher-order learning, I'll give you one extra point for every exam question that you predict I will ask. Of course, I don't expect you to come up with the exact questions, but with some work I think that you'll be able to predict the types of questions I'll ask. I will accept up to three of these sample questions for each exam. In order to receive credit for your submissions, you must *send me sample questions and correct answers in plain (unformatted) text by email before the test is administered*. Questions that address similar concepts as those on the test, but are much simpler or shorter than the questions that I ask will receive minimal credit.

There will be a few other opportunities to demonstrate your mastery of chemistry outside of the normal class structure. We'll discuss these as they come up during the course of the semester.

Sample problems:

I will recommend homework problems from your textbook and from other sources during many class periods. These problems will be designed to help you apply the material that you have read or that we have covered in class, and/or to encourage you to think beyond what you have encountered thus far in the course. These recommended problems are just that: *recommended, not required*. I encourage you to try your hand at them because I believe this will accelerate your learning of chemistry and your exposure to more examples of chemical analysis. If at any point you want additional practice problems, please do not hesitate to ask me!

Laboratory:

The laboratory component of this course is an integral part of it. It is your chance to explore with your hands and your senses some of the things you will be exploring with your mind in the classroom. Moreover, the laboratory periods will be an opportunity for you to learn how to test ideas through the design and critical analysis of experiments. As such, the lab is in many ways more important to my goals for the course than is the classroom. And as a result, to pass this course, you MUST complete all laboratory work. Period.

Before you come to lab each week To make the most of lab, especially given how little time we have to play with these experiments each week, you must prime your mental pump -- you must read and think about the experimental situation.

Based on what is in the description of the week's investigation in the lab manual, you should write a brief title and objective in your notebook before each meeting. Some people also like to write a thumbnail overview of the procedure in their notebook, to follow as they go through the exercise in lab, while others prefer to write down the procedure and their observations as they go along. The choice is yours, so long as you have a good mental image of what you will do *before* you come into lab, and you have a written procedure in your notebook at the end of the day.

If you don't understand the background information in the lab manual, please ask for help. I will sometimes send out corrections or comments on the lab in the days leading up to our weekly lab sessions. Although I will try to remember to mention these in class, I will usually distribute them by email, so please be in the habit of checking your email regularly.

Your laboratory notebook is your record of what you did and what you observed in lab. Good lab notebook entries will allow you to go back and reconstruct what happened during each experiment hours, days, or even years later. This permits you, as a scientist, to do two fundamental things -- to *reflect* on your experiments, and to *repeat* them should the need arise. Although most of us develop a personal style in our notebooks with practice, I recommend the following organization to get you started:

a) leave a few blank pages for a table of contents
b) for each lab,

- put your name, the date, and the name(s) of your lab partner(s) on the top of *every* page
- begin the description of the week's lab with a title and a few lines describing the purpose of the experiment(s) -- as noted above, to receive maximum benefit from thinking about why you are conducting the experiment, you must do this *before* coming to lab each week
- as mentioned above, before you come to lab you may wish to write out a summary of the procedure in your own words so that it will be easier for you to move quickly through the experiment. Again, this is up to you -- what matters is that you have a written procedure in your notebook by the time you are actually doing the experiment. Many people find that it is useful to diagram key portions of the lab procedure in their notebooks -- for instance, to indicate a particular apparatus configuration, or to sketch out the flow of a complex experimental procedure
- as I go through the lab procedure during the pre-lab discussion, you should enter a "Notes On Procedure" section in your notebook. I ask you to do this to ensure that you are following along and taking note of what are often key points in the experimental protocol. Your alertness and accurate recording of these points should reduce your frustration with the particulars of the experiment and enhance everyone's safety in the laboratory.
- record the procedure you are following and *your observations as you follow it* in enough detail for a complete stranger to reconstruct what you did. You do not need to include painstaking detail, as long as you make reference to the step you are following from the lab manual. Remember, this is the fundamental purpose of your laboratory notebook: to document what you did and what you experienced in a manner that will be intelligible days, months, or years from now. If you find that it is illegible, you may certainly re-write it, but *never throw out the original data*; simply add the prettier version to the original.

All descriptions of laboratory observations and data should be recorded *directly* into your lab notebook *IN PEN*. Mistakes should be lined out with a single line, rather than obliterated or whited-out. To help you to develop good note-taking skills in the laboratory, we will spend the beginning of the lab period in week 4 (September 19) in group evaluation and discussion of good lab documentation habits. Then, during weeks 5 and 6 of the semester, I will meet with you individually to discuss and evaluate your lab notebook, and you will submit to me a written summary of our discussion. In your summary, you will identify things you do well and things you want to improve. I will compare your notebook evaluation summary with your completed lab notebook (handed in at the end of the semester) and give you an overall grade based on the overall quality of your notes and the improvement you demonstrate after the interview.

There is an excellent set of guidelines for lab notebooks online at
http://www.swarthmore.edu/NatSci/cpurrin1/notebookadvice.htm

Lab reports will be opportunities for you to reflect on what you did in lab and what your results mean. Typically, I will ask you to focus on only one or two questions. Therefore it is *imperative that you pay attention to what it is that I want you to turn in*. In order to make this easier, I will usually hand out a special report form or send you my guidelines for each report by email. Be sure to refer to these materials when you are composing your report. Reports will be due on the Monday following the lab investigation.

Proper laboratory Attire is a very important way to minimize the potential danger to you of accidents that can occur in any laboratory. Therefore, I will insist that you observe the following clothing guidelines AT ALL TIMES:

- goggles must be worn while you are within the laboratory
- no open-toed shoes are allowed in the laboratory
- no shirts that expose your midriff nor above-knee skirts, shorts, or dresses are allowed in the laboratory unless they are worn underneath a lab coat.

If you cannot meet these requirements in the lab, I will send you back to your room to change your clothing. I don't do this to aggravate you or because I want to enforce a particular style of dress, but

rather because I believe that it is far more important to be safe in lab than to be fashionably dressed in lab.

Finally, let me repeat: the laboratory component of this course is an integral part of it. Although they are spatially and temporally separated, "classroom chemistry" and "laboratory chemistry" are inseparable in my mind. To reinforce this notion, I will make every effort to stress ways in which the concepts you are learning in lab apply to what you are learning in class, and vice versa. I encourage you to ask me questions about lab exercises during classroom meetings, and ask about concepts explored in class during lab meetings. And I will ask you to apply lessons from class in lab and to answer questions from lab on classroom tests.

Learning from your mistakes

I believe very firmly that learning is an iterative process; very few of us get things exactly right the first time through, and there is often a great opportunity for learning in repeating an assignment after receiving feedback on it. This philosophy underlies much of my approach to grading and point values for assignments in this class. I want you to feel that you can learn and benefit from your mistakes, that you will be rewarded for getting it right the second time around. Accordingly, if you ever want to revise an assignment and submit it for reconsideration, you are welcome to come and discuss that with me. And for *any* assignment on which you receive a grade of 50% or less, you are strongly encouraged to revise and submit the assignment for regrading.

In the same vein, if you receive any assignment back on which any part of one of your answers has been marked in orange highlighter, you should interpret this as an invitation to revise your answer and submit it for regrading. Typically this will indicate that I had trouble understanding the logic behind your answer, or felt that you answered a different question from the one I asked. In any event, this indicates that I think you have a better grasp on the material than your answer shows, and I'd like to give you another chance to demonstrate your mastery.

In any resubmission situation, please

- ensure that you include the original graded version of the assignment so that I can compare my original comments with your revised version. Resubmissions that are not accompanied by the original version will not be regraded. I strongly encourage you to make a copy of your original assignment before giving it back to me, so that you can study from it. Resubmissions get the lowest priority on my grading to-do list, and I won't guarantee getting them back to you before the end of finals week.
- ensure that you carefully address the deficiencies of the original. I try to put care and time into the comments on your assignments when I hand them back, with the intent that my comments will help you think more carefully about your work. Revised versions that come back to me with the original problems un-addressed are likely to receive a less-than-generous review. If you have any questions about my comments, by all means come to talk with me about them *before* making your revisions.
- be aware that I grade at least as stringently on revisions as on the originals -- on the revision, I assume that you understand my expectations, so I am less likely to give you the benefit of the doubt when your intent or procedure is not clear from your work.
- understand that your final grade for the assignment will be the average of your original and revised grades. With a substantial improvement over the original assignment, this can make a very meaningful difference in your overall grade.

Special Needs

Different students come to this class with different training, different backgrounds, and different abilities. If you feel that because of personal factors you would benefit from some modification of course procedures, such as special test-taking arrangements, I ask that you contact me privately *at your earliest convenience*. I will work with you and with the Academic Support and Enrichment Center (Doane Hall, room 104) to optimize your learning experience. Certain accommodations will require verification of disability based on documentation on file in the Academic Support office.

Academic and personal honesty

My fundamental assumption about this class is that you are here to learn. All feedback that I provide you, all learning opportunities that I set up, are predicated on that assumption. For you to effectively learn, and for me to effectively advise you on your learning, you must be honest with me and with yourself about what you do and do not know. If the atmosphere of trust and learning that I try to create in this class is compromised by individuals behaving in an academically dishonest manner -- for instance, passing off someone else's work as their own -- I will be deeply disappointed and quite upset. Academic dishonesty is tantamount to intellectual theft. This standard applies to all work ranging from simple lab assignments to the final exam. I recommend that you carefully read the Denison University Academic Dishonesty Policy as printed in the student handbook, and the section in the Bedford Handbook entitled "Citing sources" on pages 592-608. Neither ignorance nor carelessness is an acceptable defense in cases of plagiarism.

The grade penalty associated with a confirmed case of dishonesty will ordinarily be a score of zero for that assignment. Furthermore, all instructors must refer every act of academic dishonesty to the Associate Provost, and violations may result in failure in the course, suspension, or expulsion.

How will your learning be assessed?

There will be a variety of opportunities for you to demonstrate to me your mastery of course concepts; these will probably add up as follows:

Subjective evaluation of intellectual engagement and contribution to the class (including lab)		40 pts	6 % of total
Laboratory exercises		160 pts	25 % of total
8 post-lab exercises		80 pts	
lab notebook check		30 pts	
(take-home portion of final exam		50 pts)	
Prediction points		40 pts	6 % of total
Tests (best 4 out of 5)	50 pts x 4 =	200 pts	31 % of total
Final exam (plus take-home portion noted above)		200 pts	31 % of total
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	TOTAL	640 pts	

Please note:

- The hour exams account for about one-third of your grade in this course, the same amount as the in-class portion of the final exam. I've done this for three reasons. First, it makes each in-class exam significantly shorter; I want to test how well you understand the material, not how quickly you can write. Second, it allows you to learn from your mistakes -- you can do poorly on a test, but if you learn what you did wrong and you address your deficiencies, then you will have the chance to score well on the final and come out of the class with a grade that reflects *what you learned in the end*. (This is especially true if you have a bad day and do quite poorly on one test, as I will drop your lowest test score. Gone. Vanished. No more bad days!) Third, this scoring system reflects my belief that what you know at the end of the semester is really important -- I don't want to reward you for cramming for one test and then immediately forgetting the material. Rather, I want to reward you for truly learning the material and for integrating each new topic into your mental picture of how the world works.

- Because this class has both important classroom and laboratory components, the following two conditions ***must*** be met for you to receive a passing grade in the class:
  1. You must complete all assigned laboratory work (as noted above).
  2. Your average exam grade (over the four tests and the final) must be greater than 50%.

- Because I want you to gain an appreciation for how the theoretical aspects of chemistry dovetail with experimental aspects, you should expect that both in-class and take-home tests will explore chemical questions that you engage in the lab.

- Grades will be assigned *roughly* according to the scale below. Note that I may change the scale so that it more accurately reflects what I feel to be the performance of members of the class. For instance, if everyone does poorly on the tests and if I conclude that it is because I did something wrong, then I will likely adjust all grades upward from the following distribution. On the other hand, if I think that the tests are sufficiently challenging but everyone does very well and is earning "A" marks, then I will be pleased as punch and am *un*likely to change the scale. For the most part, you may consider these to be the most demanding standards that I am apt to apply.

90% and up	flavors of A
80 to 89%	flavors of B
70 to 79%	flavors of C
60 to 69%	flavors of D
below 60%	F

- Finally, I wish to make clear my interpretation of letter grades.
  I view an "F" as a strong indication that the level of preparation and/or commitment brought to the class by a student are incompatible with the goals of this course. I hope not to give your class any "F"s.
  I view a "D" as an indication that a student is passing the class, but performing well below my standards and failing to achieve a substantial portion of the course goals. Usually, this means that the student is performing well below her or his true abilities. I hope not to give your class any "D"s.
  I view a "C" as notice that the student is doing only a fair job. Frequently, this means that the student is present but not fully motivated or engaged. A "C" student is doing adequately but probably came to the class with insufficient preparation and/or has not committed the personal resources to learn most effectively.
  I view a "B" as a very respectable grade. The student to whom I give a "B" may be trying very hard but still struggling with mastery of the material, or may be working less hard and stopping short of achieving excellence.
  I view a "B+" as an indication that a student is doing a truly good job. This grade indicates to me that the student is expending significant care and effort to ensure that s/he is learning the material.
  I view an "A-" as a very good grade. I do not give this grade lightly or without evidence that a student is nearly approaching mastery of the material; this grade indicates that a student has met my expectations for the course.
  I view an "A" as an indication of true excellence. In order to achieve an "A" in my course, a student must demonstrate to me that s/he has not only committed the necessary resources to master the material, but also that s/he is *aggressively engaging the questions that we explore*. This is a grade to be proud of, a grade to be earned by serious work and mental sharpness.

Chemistry 121-02 -- General Chemistry I **Fall 2006**
Course Calendar

A few notes on this schedule:
***** This is an *approximate* schedule of when we will cover various topics over the course of the semester. I fully expect that the actual schedule will vary from this one in order to accommodate greater coverage of topics where you have greater interest or greater difficulty than I have anticipated. To minimize the problems that can cause, I will discuss changes to this calendar in class as they arise, and you should make an effort to ask me if you have ANY questions about what material we will be covering at what time.

***** I ***strongly*** recommend that you check this schedule *every* time that you sit down to prepare for or to review class material. Why? Because you are likely to be more successful in this class (in terms of learning and in terms of grading) if you are more aware of how the class is unfolding and of what topics I think are more deserving of your attention. Keeping an eye on what is to come will also help you budget your study and reading time more effectively.

Week	Day	Date	Reading	Topic	Important reminders
1	M	Aug. 28		Course Introduction: What is Chemistry?	
	T	Aug. 29		LAB: Popping Popcorn, Math Proficiency Assessment	
	W	Aug. 30	1.1 - 1.5	Measurements, uncertainty, and clear communication	
	R	Aug. 31	1.6	Units and unit conversions: computational *power* in a few easy	
	F	Sept. 1	box, p. 13	The scientific approach to problem solving	
2	M	Sept. 4	2.1 - 2.5	Atomic theory, atomic structure, and the Periodic Table	Hand in report on lab #1
	T	Sept. 5		LAB: Nuts and Bolts	
	W	Sept. 6	2.6 - 2.7	Molecular and Ionic compounds	
	R	Sept. 7		Approaching College Chemistry: how to study for this course	
	F	Sept. 8	2.8, 3.1	Learning to Speak Chemistry	
3	M	Sept. 11	3.1 - 3.2	The rich language of a chemical equation	Hand in report on lab #2
	T	Sept. 12		LAB: Chemical Reactions of Copper	Hand in lab notes before leaving lab
	W	Sept. 13	3.3 - 3.4 (& 3.5)	The Mole as a Microscope	
	R	Sept. 14		Seeing and Speaking chemical reactions	
	F	Sept. 15	**Test #1**		Test #1
4	M	Sept. 18	3.6	Stoichiometry: numerical logic in chemistry	
	T	Sept. 19		LAB: Synthesis of Copper Aspirinate	
	W	Sept. 20	3.7	Limiting Reagents and Theoretical Yield	Hand in percent yield calculation
	R	Sept. 21	4.1 - 4.2	Aqueous solutions, solubility, and electrolytes	for lab at end of class
	F	Sept. 22	4.2	Precipitation reactions and Solubility Rules	
5	M	Sept. 25	4.3 - 4.4	An introduction to acid-base and oxidation-reduction chemistry	
	T	Sept. 26		LAB: Analysis By Chemical Reaction	
	W	Sept. 27		What's really in there? Unpacking your mental microscope	
	R	Sept. 28	4.5 - 4.6	Solution stoichiometry	
	F	Sept. 29	3.1 - 4.6	Seeing and Speaking quantitative chemistry	
6	M	Oct. 2	3.1 - 4.6	Seeing and Speaking quantitative chemistry	Hand in report on lab #5
	T	Oct. 3		LAB: Seeing Reactions	
	W	Oct. 4	3.1 - 4.6	Seeing and Speaking quantitative chemistry	
	R	Oct. 5	**Test #2**		Test #2
	F	Oct. 6	6.1 - 6.3	Light and atoms	
7	M	Oct. 9	6.3	Electronic spectra	
	T	Oct. 10		LAB: Spreadsheets and Linear Regression	
	W	Oct. 11	6.4 - 6.7	Quantum Mechanics and electron orbitals	
	R	Oct. 12	6.8 - 6.9	Electron Configuration	
	F	Oct. 13	7.1 - 7.5	The Periodic Table	
8	M	Oct. 16	7.6 - 7.8	Periodic trends in elemental properties	Hand in report on lab #7
	T	Oct. 17		Exp. 8 Measuring the amount of Copper in CuAsp by Spectroscopy	
	W	Oct. 18		Review and application	
	R	Oct. 19	8.1 - 8.3	Ionic and Covalent Bonds	
	F	Oct. 20	8.1 - 8.4	Bonds and bond polarity	
9	M	Oct. 23	8.5 - 8.6	Picturing bonds	Hand in report on lab #8
	T	Oct. 24		Exp. 9 Acid/base Titration	
	W	Oct. 25	8.7 - 8.8	More About Bonds	
	R	Oct. 26	**Test #3**		Test #3
	F	Oct. 27	9.1 - 9.2	Molecular Geometry & VSEPR	
10	M	Oct. 30	9.4 - 9.6	Molecular Geometry and Polarity	
	T	Oct. 31		Exp. 10 Molecular Structure	
	W	Nov. 1	9.5 - 9.6	What VSEPR didn't tell you: valence-bond theory	
	R	Nov. 2	9.7 - 9.8	When Valence-Bond theory fails: Molecular Orbital Theory	
	F	Nov. 3	10.1, 10.7	Kinetic Molecular Theory	
11	M	Nov. 6	10.1 - 10.6	Ideal Gases	Hand in report on lab #10
	T	Nov. 7		Exp. 11 Molar Volume of a Gas	
	W	Nov. 8	10.8 - 10.9	Kinetic Molecular Theory and *Real* Gases	
	R	Nov. 9		Review and application	
	F	Nov. 10	11.1 - 11.2	Gases, liquids, & solids; Intermolecular Forces	
12	M	Nov. 13	11.3 - 11.6	Intermolecular forces and phase changes	Hand in report on lab #11
	T	Nov. 14		Exp. 12 Thin-Layer Chromatography	
	W	Nov. 15	11.7 - 11.8	Intermolecular forces and properties of solids	
	R	Nov. 16		Predicting physical properties based on molecular structure	
	F	Nov. 17	**test #4**		Test #4
		THANKSGIVING BREAK			RELAX!!

13	M	Nov. 27	14.1, 14.5	Why don't all reactions occur at the same rate?	Hand in report on lab #12
	T	Nov. 28		Exp. 13 Chemical Kinetics	
	W	Nov. 29	14.2 -14.3	Defining reaction rates	
	R	Nov. 30	14.1 - 14.6	Rate, time, and mechanism	
	F	Dec. 1	14.1 - 14.7	Kinetics as a microscope	
14	M	Dec. 4		Molecules in Motion: revisiting the Mental Microscope	
	T	Dec. 5		LAB: **Test #5**, Check-out	Test #5
	W	Dec. 6		Where have we been? The semester in review	
	R	Dec. 7		Where are we now?	
	F	Dec. 8		Where are you going?	
Finals week	**T**	**Dec. 12**	**FINAL EXAM at 9:00 am.**		
	R	**Dec. 14**	**Take-home portion of final exam due by 5 pm**		