

V25.0109001: General Chemistry I (Honors)

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Course Information

This dry but (hopefully) useful handout contains basic information about the course, how it will be run, when and where things will happen, grading policy, etc. Barring unforeseeable disasters or administrative whims (giving rise to remarkably predictable disasters), this information should not change. However, I will keep you informed should any changes occur.

Basic Information

This is the first semester of Honors General Chemistry, V25.0109. It is assumed that you have passed the entrance examination for the course or have special permission to be enrolled. If neither of these is the case, see me or Dr. Burt Goldberg, the Director of Undergraduate Studies in the Chemistry Department.

The text for the course is Peter Siska's *University Chemistry*. This book is required.

Lectures are scheduled to meet from 9:30 am to 10:45 am on Tuesdays and Thursdays in Room 1003 Silver (note the change from 514 Silver). In addition to the lecture periods, all students must sign up for one of the two Friday recitation sections. These will be held at 8:30 to 9:45 am in room 205 of the 194 Mercer Street building and the other from 11:00 am to 12:15 pm in room C-11 of the 25 West 4th Street building.

Midterm exam dates: Midterm exam dates are scheduled for Friday, Oct. 16 and Friday, Nov. 13. Times and locations will be announced.

Final exam date: The final exam is scheduled for Friday, Dec. 21. Location and time will be announced. I realize that this is just about the worst possible day and time for the final, it being the last day of the fall semester. Unfortunately, since final exam dates are set by a central office at NYU, there is nothing I can do about it. Anyway, you may find solace in the fact that once you are finished with the exam, my task of grading it and figuring out everybody's final grade for the course will just be starting.

General goals and philosophy of the course

Honors general chemistry is *not* a repeat of your high school chemistry course. Such a course, while easy to pass, would be of little additional value to you. Rather, honors general chemistry is an introductory course in physical chemistry. Physical chemistry is that subdiscipline of chemistry that seeks to describe chemical systems, including individual molecules, gases, liquids, solids, solutions, etc. in terms of basic physical principles. So, why do we choose this course to be an introduction to physical chemistry as opposed to an introduction to some other subfield like organic chemistry, inorganic chemistry, or medicinal chemistry, particularly when most of you will not take Physical Chemistry until your junior or senior year? The reason is that chemistry is a field that is grounded in the basic principles of physics, and therefore, physical chemistry is the most fundamental of all the subfields of chemistry. Other areas such as organic chemistry, inorganic chemistry, materials chemistry, nanoscience, medicinal chemistry, biochemistry,... are built upon the foundation of physical chemistry. You cannot fully understand the structure of an organic molecule, for example, without first understand what a chemical bond is. In order to understand the chemical bond, you need to understand

quantum theory, which is one of the cornerstones of modern physics. You cannot understand biochemical reactions without first understanding thermodynamics. Our goal, therefore, in the two semesters you will spend in this course, is to give you a solid introduction to the physical chemical principles and concepts you will need to understand the other areas of chemistry you will study in the upcoming years. These concepts include quantum theory, kinetic theory, thermodynamics, equilibria, rate theory, molecular spectroscopy, and various other topics that comprise physical chemistry. *You should, therefore, not expect this course to be anything like any of your high-school chemistry courses.*

Course content in brief

The first semester of honors general chemistry will cover chapters 1-8, 18, and Appendix B of the text (see attached course schedule). In brief, we will cover the physical principles underlying chemistry, quantum mechanics and the atom, the classical and quantum theories of chemical bonding, molecular spectroscopy, and the chemistry of carbon. A detailed lecture schedule including the specific topics we will cover is provided with this course overview. Although I will try to follow the schedule as closely as I can, I cannot promise that we will not deviate from it over time, particularly if we need to spend more (or less) than the allotted time on a particular topic (this varies from class to class).

In addition to the aforementioned book chapters, I want to make clear at the outset that the material in the book is a *subset* of what we will cover in the course. This means that we will also delve into topics that you will not find in the book. Supplementary topics are intended to give you a more modern and broad perspective. Much of this supplementary material will come from current research and has been selected to clue you in to some of the most recent exciting discoveries and newest methods in modern chemistry. Generally, everything we cover in class can be found in the lecture notes on the course Web page (see below).

The role of math and physics in the course

Chemistry, like physics, is a quantitative science rather than a descriptive one. Answers in chemistry are expressed as real numbers corresponding to observable properties of a system. In order to arrive at such numbers, you must be capable of translating a complicated situation into the appropriate mathematical language and then applying mathematical methods to solve the resulting equations. It should be clear, then, that mathematics is the underlying language of the quantitative sciences, and in order to use it, you must be reasonably fluent in its vocabulary.

As you look through it, you will discover that the book assumes you have a basic knowledge of vectors, calculus, and functions of several variables. It is assumed that you either have previously encountered these topics or are learning them concurrently. If this is not the case, you should speak to me as soon as possible. Calculus, vectors, and functions of several variables will be used in lecture, especially where it helps to see how something is derived, and you are likely to see these things on exams and in homework assignments. Math is an integral (no pun intended) part of science and will therefore figure prominently in the course. You will find, if you should go on in science or any other technical field, that facility in math will give you a competitive edge and make new opportunities available.

It is also assumed that you have some prior knowledge of basic physics. Since honors general chemistry is an introduction to physical chemistry, we will pay particular attention to the physical principles that underly many of the chemical concepts we will discuss. This interdisciplinary approach will introduce you to a trend that is becoming more and more prevalent in science, namely, that the boundaries between the traditional disciplines, e.g. physics, chemistry and biology, are becoming blurred as researchers refocus their efforts in fields such as materials design, nanoscience, rational drug design, proteomics, etc. which require knowledge of several of the traditional disciplines.

Teaching assistant

Your teaching assistants (TAs) for the course are Eli Taicher and Mia Huang. Eli and Mia are graduate student in the department working in the area of physical chemistry and bio-organic/biomolecular chemistry, respectively. Consequently, they bring a unique perspective to the course material. Although Eli, Mia and I will be working together throughout the course, the person ultimately responsible for the content of the

course and the grading is me. Therefore, please do **NOT** go badgering the TAs about issues/concerns that you should be discussing with me.

My coordinates, office hours, and all that

My office is located in Room 1001L Silver. I will hold regularly scheduled office hours each week at a time to be agreed upon by the class based on availability. During scheduled office hours, you are welcome to show up whenever you like. If you cannot make it to office hours or need to see me at another time for some reason, I will be happy to set up an appointment with you, where I can give you my undivided attention. I am often in my office and generally like to maintain an open-door policy. You should not feel intimidated about coming during office hours, and I do not mind if you drop by outside of office hours. I enjoy interacting with new students and want to get to know you better. However, just keep in mind that outside of office hours, there is a good chance that I will not be immediately available and that you might have to wait to have your question answered. Apart from teaching this class, I run a full-time research group, have numerous research projects of my own, and will be teaching the graduate level course, Mathematical Methods in Chemistry. Thus, you will often find me talking with one of my graduate students or postdocs, analyzing data myself, or preparing a grant proposal. This does not mean that I do not take undergraduate teaching seriously. In fact, part of what makes research-active professors effective teachers is the emphasis they place on research.

You can always reach me by e-mail if you need to. I will be happy to answer your questions or set up appointments this way. If I don't respond to your e-mail right away, it either means that I am out of town (which is often the case) or simply unable to respond to your inquiry at that moment. Be patient! I will get back to you as soon as I am able to do so.

There is a web page for the course. The URL is:

<http://www.nyu.edu/classes/tuckerman/honors.chem>

This course introduction will be posted there as well as lecture notes, interesting links, and who knows what else. This is a new page and is continually under construction, so you log onto it often.

We will also be making use of the online Blackboard system. The Blackboard site can be accessed through your home.nyu.edu account by clicking on the "Academics" tab. You should see the link to the course there. If you do not have such an account, you can create one for yourself by going to <http://start.nyu.edu>

Blackboard is an interactive forum for the course that contains discussion board and real-time chatrooms. Please **RESTRICT YOUR USE OF THESE UTILITIES TO COURSE-RELATED DISCUSSIONS!** I will be checking in often to make sure that posted questions are answered and that discussions do not go too far astray. I anticipate that Blackboard will be a useful addition to the course, and I encourage everyone to take advantage of it.

Grading

This is an *honors* course. This means that the material covered and the homework are more challenging than the regular course. However, as honors students, I am assuming that you are up to such a challenge. The main thing I want to see is that you are thinking about the material and trying to solve the homework problems (see below). The course may not come easily to you. However, keep in mind that I will grade on the expectation that you are an A/A- student. This does not mean that you *will* receive such a grade. But there are no grade quotas, so in principle, everyone *can* earn an A.

The grading will be as follows: The midterms will count for 20% each, the final for another 20%, quizzes, 15% and homework 25%. Yes, you read that correctly, homework, at least part of it (see below), will be graded

and count for a full one-quarter of your grade. Why is this? It is to encourage you to do the homework. Science and math courses cannot be taken as “spectator sports.” The only way to learn the material is to solve problems.

As I said above, you are bright students. This means that more is expected of you and that you can meet larger challenges. The course moves quickly and covers a lot of material in a short period of time. Thus, *expect to work much harder than you ever did in high school!* If you do, you are likely to do well. If you don't, you will find yourself quickly falling behind the rest of the class.

If you do find yourself falling behind, or having trouble with a homework assignment, exam, or quiz, contact me as soon as possible. Although I will already know that you are having trouble, the onus is on *you* to do something about it. I will do everything I can to help you catch up, address specific issues, or clear up any misunderstandings.

Homework and quizzes

Homework will be divided into two parts. For each chapter, I will assign a small number of problems from the book. These should be regarded as practice problems, by which you can gauge how well you have understood the basic concepts covered in that chapter. Although you will be required to turn these in, they will *not* be graded. I will simply check to see that you have done them. In total, these practice problems will count for 5% of the 25% homework grade. This means that you will receive full credit simply for doing them.

Then, for each chapter, there will be a separate set of typically 3-5 problems designed to make you think more deeply about the material and to stretch you beyond just the basic concepts. These must also be turned in and *will* be graded. In total, these separate problem sets will count for the remaining 20% of the 25% homework grade. I encourage you to work together on these more difficult problems. Form study groups and discuss the problems together. Even if you feel that you have mastered the problems, you will benefit by having to explaining your ideas and your solutions to others. Working in groups, however, should not be a substitute for thinking about the problems independently, and everyone is expected to turn in their own work. Copying someone else's work is not only plagiarism (see below) but will only hurt you when you are finally asked to demonstrate your problem-solving skills on exams. After the problem sets have been turned in, I will post the solutions on the bulletin board across from Room 1001R Silver. Problem sets will generally be given out on Thursdays and due one week later at recitation, but, I will specify the due date with each assignment. *No late homeworks will be accepted!* If you do not turn in a homework assignment on time, you will receive a zero for that assignment. At the end of the semester, however, I will drop your lowest homework score. Keep in mind that no single homework score can affect your overall grade too dramatically, but an accumulation of many low scores will lower your overall grade significantly.

According to this schedule, recitations will focus on going over the problem set just handed in.

There will be roughly one quiz per week, given either in recitation or at the beginning of the lecture period. They may be less frequent than this. In any case, they will be announced one or two days before they are given. Quizzes will be of a more straightforward nature, on the level of the practice problems, mainly so that I can monitor your basic mastery of the material.

Lecture/recitation attendance, missed exams, and other unpleasanties

Although attendance will not be taken at lectures or recitations, by not attending, you run the risk of missing possible quizzes, important announcements, homework assignments and other mundane but essential things. You also run the risk of missing something interesting. Lectures will *not* simply be recapitulations of the book. Remember that the book is only a subset of the course material. In addition, I look at things quite differently from the authors and will present an alternative perspective as well as supplementary material. Also, numerous visual demonstrations based on computer simulations from actual research problems will be presented. Therefore, I encourage you to attend both lectures and recitation sections.

On a more grim note, there is no makeup for the midterm exams. Students who miss a midterm for a valid, documented reason will have the exam dropped from their final grade. Standard CAS policy is to allow a makeup final exam for students with documented proof of serious illness. Students who manage to miss both midterms and the final will fail the course. Under certain very limited circumstances, I will allow quizzes to be made up. Again, a valid, documented excuse must be presented. A quiz can only be made up within 1 week of the original date of the quiz. Students who fail to make up a quiz within this time frame but who nevertheless have a valid excuse will simply have that quiz dropped from their final grade. In all other cases, students will receive a 0 for the missed quiz.

If you experience medical problems during the term or if, for some other valid reason, must miss a number of lectures, please come and talk to me as soon as you can. Often something can be worked out.

Cheating

Cheating is a **SERIOUS** issue. This includes any form of plagiarism, copying, or collusion during quizzes, the midterm or the final. Anyone caught cheating will be severely punished. It is *your* responsibility to avoid any hint of cheating.

It is an unfortunate fact that students cheat in college and sometimes get away with it. This department is particularly adept at catching cheaters. If you are caught cheating, you can expect:

1. an F in the course,
2. to be brought up on charges before the Dean of the College,
3. possibly to be thrown out of school with a notation on your record as to why.

In case you do not fully comprehend what this means, a notation on your record means no medical school, no graduate school and, quite possibly, severe difficulties finding a job.

Reread the above before you consider cheating.

You are all excellent students who have no need to cheat. You can do the work on your own, and if you find you are having difficulties, come talk to me. If you feel that you cannot do that, go to the Student Services section of the CAS Dean's Office on the 9th floor of Main.

Getting the most out of the course

Work together! It is quite possible to do very well on your own, but collaborative efforts often make greater breakthroughs. Not only can you learn from someone else and how they think about the material, but also answering someone's questions helps you arrange the material logically on your own mind. Come to lectures, and keep in mind that Eli, Mia and I are here to help you learn. Clearly, we cannot do this for you, but we can make it easier. Work hard and come talk to us when you need. Ultimately, we want everyone to do very well, enjoy the course, and get something out of it, for then we know that we have done our job.