

Chemistry 109 (3 credit hours)
Honors General Chemistry Lecture, Part I; fall 2009

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Class Hours: MWF 9:30-10:25, 1-019 CST

Office Hours: M, F 3 - 4 pm

Undergrad.

Office: LSB, 1st floor

Prerequisite: None

Textbook: Zumdahl and Zumdahl, Chemistry, 7th Edition, (Houghton Mifflin). A student solutions manual will be available separately if desired. Used copies of the book have been ordered. For students who purchase a used book and would like to use the online service smart thinking, a separate license can be purchased. The book may contain an unused CD, in this case, the online services should be available without charge. A limited number of the online tutoring program OWL is available as well. This program provides additional examples for topics discussed. All you need should be available though the book and smart thinking, OWL is truly optional. You might want to consider this if your previous preparation was very limited.

Corequisite: CHE 129- Honors General Chemistry laboratory, instructor Abhilasha Verma. Please be aware that the grades for the lab are completely independent from those in lecture. The CHE 129 laboratory will begin in the first week of classes.

Course Description: General chemistry for students in the Honors Program, chemistry majors, and others with strong science interests. Topics covered include quantitative, physical, and inorganic chemistry; and applications in current research. Credit is given for CHE 106, 116 or CHE 109, 119, but not both.

This course is the first semester of the General Chemistry course. General chemistry is required for the chemistry major and some other curricula, and is a prerequisite for other Chemistry courses. In General Chemistry we introduce you to all areas of chemistry: physical, organic, inorganic, quantum, biophysical, and analytical. While imparting some knowledge of all of these subjects, we attempt to show you how chemists and other scientists think and solve problems. By illustrating these examples we will show how important chemistry is for all of us.

In the first semester for General Chemistry we will cover the first 9 chapters of the text. Some of this consists of definitions and rules. Precise definitions are important in science, and aid logical thinking in any field. We discuss chemistry from both a macroscopic and molecular perspective, and will show the connections between the two.

After some very brief general definitions relating to scientific measurements and basic laws of physics (chapter 1) we will review rapidly some ideas about atomic structure (chapter 2). More detail on atomic structure will come at the end of the semester. Turning to more specific chemical subjects we will explain the meaning of chemical formulas and equations (chapter 3), followed by calculations and a discussion of stoichiometry (chapter 3). In chapter 4 we will review different kinds of chemical reactions, with some applications to quantitative analysis. The gaseous state is described in chapter 5. We will discuss it first in terms of general laws and then in terms of molecules. We turn then to thermochemistry, (chapter 6). Chemical reactions are almost always connected with energy changes; in fact, energy changes are often the reason why chemical reactions happen! Then we will discuss in detail atomic and molecular structures, starting with some quantum mechanics (chapter 7), which is needed to understand the behavior of submicroscopic (molecules) particles like electrons, atoms and molecules. Atomic structures come next (chapter 7). From the atomic structures one can understand the chemical properties of the elements and periodic trends within the periodic table (chapter 7). Turning to the formation of compounds we consider ionic and covalent chemical bonds (chapter 8). In chapter 9 we consider two useful and much used theories of chemical bonding, Valence shell electron pair repulsion and molecular orbital theory, and show how they are used to predict molecular properties.

Assignments and Lectures: Reading assignments from the text are given on the course calendar. I *expect* that you will read the assignments *before* the class meetings for which they are listed. I also *expect* that you will attend all lectures. In lecture, we will reinforce important concepts from the readings and work through problems that build on these concepts. You will be tested on material from the readings *and* from lecture. Some of this material will come *only* from the book, and some will come *only* from lecture. In the early chapters in the book, coverage in lecture will be brief to ensure enough time for the important and more advanced topics covered in the later chapters. Much of this material is a repetition of material covered in your High School chemistry class, and carefully reading the book will ensure that you will remember these topics.

In addition to the reading, exercises from the textbook will be assigned. It is strongly suggested and expected that you will do these exercises (and preferably more than the few that are assigned), because there is *no substitute* for this experience in the learning of chemical concepts! If you "do" the problems by looking up the answers in the solutions manual, you will learn very little. For effective use, the solutions manual should be referred to only after you have finished the problem. It is strongly recommended that you do these problems, it is *very* likely that related material will be included in the exams. Also: Doing the problems is the only way to be sure you really understand the material. If you have difficulties with the problems, seek assistance from any CHE 129 TA or your instructor - and please **DO NOT** wait until the day before an exam.

Getting help: There are multiple ways to get help, such as coming to me or to go to the CHE 129 TA's office hours. If you cannot make it during the posted times because you have a class scheduled you can make an appointment preferably by sending an e-mail request or talking to me or the TA's in class. One other possibility of getting help is associated with your textbook- it's called smart thinking. The publisher of your book has hired faculty members to answer your questions over the web. These faculty members are all College instructors who are using Zumdahl and Zumdahl in their classes. You can either post your question or have a one-on-one chat with a tutor (using a program called whiteboard) to get the help you need. Online tutors are available from 2-5pm and 9pm - 1am Sunday through Thursday. Outside of these times you can post a question and it will be answered within 24 hours. You will need to create an account, info on this is in the media guide that is bound with your book or you can purchase an access code separately. With this you will have 10 hours of free tutoring (a value of \$350), beyond those an hour is \$35. Typically students spend 5 hours a semester with a tutor, so the 10 hours should be ok. We will be using the same book in the spring, and again, you will be getting 10 hours of free tutoring. If you like a tutor especially well, you can schedule time with him/her. You can save all communications with the tutor by saving them in the archives. That might come in handy if you study for an exam or a final.

For additional help you can also try the website www.ChemReview.NET. Many students have found it very helpful. It is free, but it is not interactive but it will provide additional help on difficult topics.

Examinations: There will be three one-hour examinations and a comprehensive two-hour final exam. All hour examinations will be held during the regular class times. No make-up examinations will be given. A student absent from a one-hour exam will receive a zero grade. If you have a proper medical or emergency excuse, (a written excuse from the health center (a note that you had an appointment is not sufficient!) or the emergency room) a missed exam will not be counted, the final grade will be based on the remaining examinations.

First Examination:	Sept 30 (in class)
Second Examination:	Nov 2 (in class)
Third Examination:	Dec 11 (in class)
Final Examination:	Dec 16, 7:15-9:15 PM (will be confirmed!)

Assignments: Homework assignments would be given and students are expected to hand them in at the following class. These assignments would be graded and would account for 10% of the overall grade. *Late submissions would not be accepted and thus no credit would be given.*

Policies: *Students should read and subscribe to the Syracuse University policy on academic honesty. This means not giving or receiving aid on examinations, both the giver and the receiver are guilty of cheating and subject to academic discipline.*

Students with any sort of disability who may need special consideration or accommodation should see me immediately to make arrangements! Accommodations cannot be made retroactively! If you will be absent due to religious holidays please make arrangement before your absence. No retroactive accommodation is possible.

Grade Calculation Information:

Final Grades will be assigned upon the average of two examinations (since three examinations are given the lowest exam score will be dropped and not used in the calculation), the 5-minute element talk, the homework assignments, and the final examination.

Grading scheme

Hourly examinations, (3x20%)	60%
Homework assignments	10%
Final examination	<u>30%</u>
	100%

Approximate Course Schedule

<u>Date</u>	<u>Topic</u>	<u>Chapter</u>	<u>Read. Assign.</u>
Aug 31	Syllabus		
	Introduction	1.1, 1.2	
	Units, Uncertainty	1.3- 1.5	Chapter 1
Sept 2	Significant Figures	1.5	2.1 – 2.5
	Dimensional analysis	1.6	
	Temperature	1.7	
	Density	1.8	
	Classification of Matter	1.9	
Sept 4	Fundamental Chemical Laws	2.1, 2.2	2.6 – 2.8
	Atomic Theory	2.3	
	Atomic Structure	2.4	
	Modern view of atomic structure	2.5	
Sept 7	<i>no class- Labor day</i>		
Sept 9	Molecules and ions	2.6	3.1 – 3.3
	Periodic Table	2.7	
	Naming	2.8	
Sept 11	Atomic masses	3.1	3.4, 3.5 (Homework)
	The mole	3.2	
	Molar Mass	3.3	
Sept 14	Percent composition	3.4	3.6, 3.7
	Determining the formula	3.5	
Sept 16	Chemical equations	3.6	3.8, 3.9, 3.10
	Balancing equations	3.7	

Sept 18	Stoichiometric calculations	3.8	4.1-4.3
	Limiting reagents	3.9	(Homework due)
Sept 21	<i>no class - Eid-ul-Fitr</i>		
Sept 23	Water	4.1	4.4, 4.5
	Ions in Solution	4.2	
Sept 25	Composition of solns	4.3	
	Types of chemical reactions	4.4	4.6 – 4.8
Sept 28	<i>no class – Yom Kippur</i>		
Sept 30	1st hour examination		
Oct 2	Precipitation	4.5	(Homework)
	Reactions in solution	4.6	4.9, 4.10
Oct 5	Stoichiometry	4.7	
	Acid-Base Rxn	4.8	
Oct 7	Oxidation/Reduction Rxn	4.9	
	Balancing Red/Ox reactions	4.10	
Oct 9	Pressure, Gas laws	5.1- 5.3	5.3, 5.4
	Ideal Gas Law, Stoichiometry	5.3, 5.4	5.5, 5.6
			(Homework due)
Oct 12	Ideal Gas Law, Stoichiometry	5.3, 5.4	5.7, 5.8
	Dalton	5.5	
Oct 14	Kinetic Theory	5.6	5.9, 5.10
	Diffusion, Effusion	5.7	
Oct 16	Real Gases	5.8	
Oct 19	Chemistry in the Atmosphere	5.9	6.1, 6.2
Oct 21	The nature of Energy	6.1	6.3, 6.4
	Enthalpy	6.2	

Oct 23	Hess' law Standard Enthalpies	6.3 6.4	6.5, 6.6
Oct 26	Present sources of energy New energy sources	6.5 6.6	7.1, 7.2
Oct 28	Electromagnetic radiation The nature of matter	7.1 7.2	7.3, 7.4
Oct 30	Spectrum of hydrogen Bohr's Theory	7.3 7.4	7.5 (Homework)
Nov 2	2nd hour examination		
Nov 4	Quantum mechanics		
Nov 6	Quantum numbers Orbitals	7.6 7.7	7.8, 7.9
Nov 9	Electronic Structure of Atoms Polyelectronic atom	7.8 7.9	7.10, 7.11 (Homework due)
Nov 11	History of Periodic Table Electronic Configurations	7.10 7.11	7.12
Nov 13	Periodic Properties	7.12	7.13
Nov 16	Properties of alkali metals	7.13	8.1 – 8.3
Nov 18	Types of chemical bonds Electronegativity	8.1 8.2	8.4 - 8.6
Nov 20	Bond polarity and Dipole moments Ions Binary ionic compounds	8.3 8.4 8.5	(Homework) 8.7 – 8.9
Nov 23	Partial ionic character Covalent bond Bond energies	8.6 8.7 8.8	8.10, 8.11
Nov 25/27	<i>No class - Thanksgiving break</i>		
Nov 30	Localized bonding model Lewis structures	8.9 8.10	8.12

Dec 2	Exceptions to octet rule	8.11	
	Resonance	8.12	8.13
Dec 4	VSEPR	8.13	9.1 (Homework due)
Dec 7	Hybridization	9.1	9.2
	Molecular Orbital Theory	9.2	9.3, 9.4
Dec 9	Homonuclear molecules	9.3	
	Heteronuclear molecules	9.4	
Dec 11	3rd hour examination		
Dec 14	Last day of classes – Review		
Dec 16	final examination (will be confirmed), 7:15-9:15 PM		