

# COURSE: General Chemistry I, Chem 1110

Spring 2010

SECTION: Chem 1110-07 (CRN 2788)  
CREDIT: 4 hours  
LOCATION: E305 Sundquist  
TIMES: MF 11:15 a.m.– 1:15 p.m.  
CO-REQUISITE: Math 1730 (Pre-calculus); Chem 1111 (General Chemistry I Lab)

## INSTRUCTOR:

Dr. Ron Robertson	Home phone 615-763-2146
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Office hours posted but you are welcome to come by anytime	Discussion Board: <a href="http://pauling.apsu.edu/discus/">pauling.apsu.edu/discus/</a>

## TEXT

*Chemistry*, Chang, 10<sup>th</sup> edition, McGraw-Hill, 2010. ARIS Online Homework Code (Section Enrollment Code = 8A9-88-EFD, for this section)

- If buying a new text book, this code is part of the bundle package
- If buying a used text book, you can purchase the code online at <http://www.mharis.com/registration/>

## SUPPLEMENTARY MATERIALS

A scientific calculator is essential. Special function keys should include scientific notation, fractional roots, natural and common logarithms, and exponential functions ( $e^x$  and  $10^x$ ).

### Use of calculators on exams

The use of any programmable/graphing calculator is not permitted on the 4 hour exams and final exam. A non-programmable scientific calculator is permitted and indeed necessary for our exams. If you have any questions at all as to whether your calculator is "legal" for exam use, please contact me.

## COURSE DESCRIPTION

This is our highest level introductory chemistry course. One of my goals in teaching this course is to enhance your thinking and reasoning skills through the development of mental models that we have formulated to explain how our natural world operates, specifically in the area that we have defined to be chemistry. Mathematics is a language that often allows us to communicate ideas to each other in a concise way, and I do emphasize it in my teaching.

Another goal of the course is to help you understand how science and technology affect the human condition. (how do "things" work and how does it affect me?) These goals guide my teaching and relate to the APSU general education core areas of reasoning, literacy, numerical understanding, and scientific knowledge.

We will cover much of the material contained in chapters 1-10 of the text with the following objectives:

- understanding and using different measurement systems
- using scientific notation and dimensional analysis to solve chemistry problems
- understanding the nature and organization of matter

- writing and using formulas for elements and compounds
- using those formulas to symbolize chemical reactions via chemical equations
- recognizing acids, bases and salts; and predicting their behavior in solution
- understanding the concepts of oxidation and reduction in reactions
- using equations of reactions to predict quantitative information about those reactions (stoichiometry)
- determining the properties of gases through simple kinetic theory
- determining the nature of chemical reactivity from the viewpoints of "will it happen?" (thermodynamics)
- seeing systematic chemical and physical properties of the elements (the periodic table)
- understanding and predicting the consequences of chemical bonding
- predicting molecular geometry for covalent compounds and the properties that result

The principles covered in this material will challenge you to think about the world in a different way and will hopefully guide you to a better understanding of the specific scientific area in which you are interested. Chemistry is a basic science to many careers in engineering and the health professions, because the actual course material as well as the analytical reasoning skills essential to understanding it are fundamental to succeeding in these careers. This means that the course is more important than just the material covered; *the way you understand the material is just as important.* This is why I will use terms such as "mental models" and "conceptual understanding".

I encourage your active participation in class. Feel free to ask questions before, during and after class. I would hope to pull you "kicking and screaming" through this course. My definition of science is "organized curiosity". Don't lose your sense of wonder as we explore together the complexities of Mother Nature. If you find yourself having difficulty, please come and see me before you get too far behind.

Your ability to succeed in this course will be related to three areas:

- study habits
- mathematical background
- ability to think abstractly

You should expect to spend roughly 2 hours or more of study time for each hour in class. This will depend on your background in chemistry as well as math. Since our time together in class is short, I will focus first on the presentation of ideas and concepts. My presentations will sometimes be summaries of the text's treatment, but at other times my presentation may approach the subject in a different way - a way that I think is clearer or easier. It is vital that you read the text *and* study the class notes to get the best understanding of the material. A review of the class notes as soon as possible after class is the best way to maximize learning. After you think that you have an understanding of the ideas and concepts presented (after you have the mental model) you should attempt the homework problems. Some problems will merely be review type questions, but others will allow you to "flex" your intellectual muscles and see how the concepts presented can be used to answer questions that a scientist would be asked. Study groups are also often helpful in learning the material.

We are also experimenting with the ARIS online homework system which should be of help to many of you. Not all the questions correlate exactly to our textbook and there are other small problems we are attempting to address with the system so it will be used for extra credit only this semester. I still recommend it highly as a valuable resource. It also provides some online tutorial help for many of the problems.

Mathematics is very important in chemistry. If your math background is not very strong, feel free to see me for extra help related to the math. The ability to solve simple algebraic equations, do dimensional analysis with units, and give answers to the proper number of significant figures in scientific notation will be emphasized the first semester. Solving quadratic equations, taking fractional roots, and using logs are additional mathematical skills needed next semester.

Some of you may study hard and have little difficulty with the math but still do poorly. This is often because you are having problems with the abstract thinking that is involved in chemistry. Visualizing things that are very small like atoms and molecules can be difficult. For example this semester we need to be able to visualize 3-d solid geometric figures in order to understand the properties of molecules. My experience with students is that if they continue to work hard they will acquire the ability to think abstractly. You can move to a higher level of thinking with practice!

I will not always be able to work as many problems or to explain things in as great a detail as I would like in class. For this reason it is important that you try to schedule a time to come and see me. If there is interest, I will also try to schedule weekly problem sessions for larger groups. True understanding and learning takes time; don't get discouraged!

## ATTENDANCE

I consider your attendance to be vital to your progress in this course. Your attendance will be monitored, and I reserve the right to lower your grade for excessive (more than 4) absences from class. Your final average may be lowered 2 percentage points for each day in excess of 4. Homework assignments are given on a daily basis and depend on the progress of the class. Since I do occasionally take up homework and give pop quizzes, your grade can be affected by your absence on any given day. See the evaluation policy below for an explanation.

## EVALUATION PHILOSOPHY

My general philosophy is "A grade is an inadequate report of an inaccurate judgment by a biased and variable judge of the extent to which a student has attained an undefined level of mastery of an unknown proportion of an indefinite material". (Paul Dressel) Grades are not perfect or always fair, but I will pledge to be consistent. All of you will probably not be able to make A's but all of you can be successful in this course. I like the definition of success by John Wooden (former coach of UCLA's great basketball teams): "Success is peace of mind that is the direct result of self-satisfaction in knowing you did your best to become the best that you are capable of becoming". My pledge is to help you become the best you can be within your situation and opportunities.

I will test for true understanding of ideas as well as recognition of facts. My tests are layered in complexity, and I evaluate in several areas: (1) a straightforward memorization of facts, (2) an understanding of ideas and concepts, and (3) an application of ideas to problem solving situations. Many types of questions are asked: short answer, multiple choice, mathematical problems, essay and discussion. My goal in evaluation is to obtain the most information possible about your progress in the course.

## NUTS AND BOLTS OF EVALUATION

- a) You will receive one grade for this course (lecture) and another grade for lab. Unless repeating either lecture or lab you must be concurrently enrolled in both lecture and lab. The grades are independent of one another.
- b) There will be five major exams during the term – 4 hour exams and a final exam. Each hour exam will be announced one week in advance. Roughly hour exams are given once every 3-4 weeks. The Final Exam will be comprehensive over the entire course and has been scheduled by the university to be Tuesday, May 4 from 8-10 A.M.
- c) Your grade will be based on your performance on about 550 - 600 possible points. Each exam will count 100 points and the Final will count 150 points. Your lowest exam grade (excluding the Final) will be dropped. The Final Exam must be taken

*If you miss an exam for any reason other than official university representation, that exam will qualify as*

*the exam to be dropped.* If you miss a 2nd exam, a doctor's note or other approved documentation for special circumstances (approved by the instructor on a case by case basis) is necessary for exam makeup. It is best to take every exam possible in order to allow for unforeseen circumstances.

Another roughly 100-150 points will come from homework, and pop quizzes. I give announced and unannounced quizzes and take up homework randomly. These evaluations will be about 10-15 pts each. If you miss class due to illness and have a written doctor's note, or if you have other special circumstances which have been approved by the instructor, you will receive your average percentage exam grade for the semester for that quiz or homework. If you do not fulfill the above requirements and are absent, you will receive a zero for that quiz or homework.

There is no set cutoff for your semester grade but I will guarantee you the following: A 85%, B 72%, C 60%, D 50%. A mark of 84.50% will be rounded to an A, 71.50% to a B, 59.5% to a C, and 49.5% to a D.

A mid-term grade will be awarded for all students in this course. The grade awarded may not necessarily be based on 50% of the course requirements and may or may not differ from the final grade. Your mid-term grade will be posted on AP Web.

- d) Extra credit will be available through involvement in XEM (the chemistry club) and other outreach activities. You will be given information on these activities in class and on the class Discussion Board as they occur. Another source of extra credit will be through the ARIS (Achievement Reporting & Innovation System) online homework system. The due dates for each of these assignments are given in ARIS. As the class progresses I may be changing some of the due dates so keep this in mind. The maximum extra credit points allowed will equal 6% of the total possible points for the semester.
- e) You can work with others on all out of class assignments (homework) unless specifically indicated (for example a problem set). Cheating on exams and quizzes will not be tolerated. A grade of zero will be assigned for that exam or quiz as a first step, and the matter will be referred to student affairs for further action.
- f) I do love to see your worked out solutions to the problems as well as supporting background information on essay questions. An answer alone to a mathematical problem will receive no credit. I want to see how the wheels are turning!
- g) If you have a condition that may affect your academic performance, I encourage you to make an appointment with me or with the coordinator of disability issues (telephone 221-6230; tty 221-6278; fax 221-7102) in order to discuss this matter.

### DROP/ADD DATES

I truly hope that you will not want to or feel the need to drop this course, but if you do . . . the following dates are important.

Last day to drop without a record	January 27
Last day to drop with an automatic "W"	February 25
Last day to drop before a mandatory "F"	March 26

### OTHER COMMENTS

1. Policy on Minors: According to APSU policy #3:032, minors (defined as those under the age of 18) are not allowed in classrooms. While I recognize that extenuating circumstances occur and make it difficult for some

students to attend without bringing children with them on occasion, I must enforce University policy and thus will deny any request for a child in my classroom. You should also be aware that minors are not allowed in academic labs, computer labs, science labs, or the library. Further, children cannot be left in halls outside classrooms. Please be aware that the policy on unattended minors is for the purpose of ensuring that our classrooms are conducive to learning and for the safety and protection of minors. For additional information on minors on campus, contact the Office of Student Affairs in the Morgan University Center.

2. Academic and Classroom Misconduct: Students are expected to conduct themselves appropriately at all times. Academic and classroom misconduct will not be tolerated. Students must read the "Code of Student Conduct" in the new Student Handbook for an understanding of what will be expected of them within the academic setting. It is everyone's responsibility to maintain an environment in the classroom that is conducive to learning, and it is my responsibility to ask for such behavior. Everyone needs to respect others' rights to learn in a classroom without unnecessary distractions. Please make sure to turn off or silence all cell phones, pagers, iPods®, computers, etc., before coming into class. This means that "texting" during class is prohibited. Excessive talking during lecture can also be a distraction to others in class as well as myself. You may be asked to leave class if your disturbance is excessive.

3. Class Web Site and Discussion Board: Most class notes and activities can be found at our class web site (see [http://www.apsu.edu/robertsonr/chem1110-20/chem\\_1110-20.htm](http://www.apsu.edu/robertsonr/chem1110-20/chem_1110-20.htm)). It is your responsibility to print out these notes for class. They are available in a reduced format of 4 slides per page. The Discussion Board is also a way that I use to communicate with you and also a way for you to communicate with others easily in the class. Comments on a homework assignment, extra credit opportunities, and specific answers to homework questions are among the areas that are covered in Discussion Board postings. From time to time I may also e-mail you at your APSU address so be sure to check it daily.

I truly enjoy teaching chemistry and hope that we will have a profitable term. Please feel free to come by or call my office or to call me at home. Help with course material, discussion of career opportunities in chemistry, or just "shooting the breeze" are all possible topics for discussion. Good luck!

## Chem 1110 Tentative Daily Topics

### Robertson

### Spring 2010

		Chap	Topic	Reading	Questions/problems
F	Jan. 15	1	Syllabus, Matter, Measurements	2-15	
M	18		MLK holiday		
F	22	1	Sig Figs, conversions, density	6-31	
M	25	2	The atom	40-50	
F	29	2	The periodic table, ionic bonding, writing formulas and naming compounds	51-70	
M	Feb. 1	2	Covalent bonding, writing formulas and naming compounds	51-70	
F	5	3	Introduction to the mole, molar mass, conversions and empirical formulas	78-91	
M	8	3	EXAM 1 Chemical reactions and balancing chemical equations	92-99	
F	12	3	Chemical equations, stoichiometry, theoretical yield	99-102	
M	15	3	Limiting reactants, theoretical and percent yield	103-109	

F	19	4	Aqueous solution properties and writing chemical changes in aqueous solution	120-128	
M	22	4	Concentrations of solutions and dilutions	147-151	
F	26	4	Acids and Bases, acid/base reactions and titrations	129-134, 153-156	
M	Mar. 1	4	Redox reactions and titrations	135-146, 156-159	
F	5	5	EXAM 2 Kinetic theory and gases	173-178	
M, F	8, 12		Spring Break		
M	15	5	Phases of matter, Gas laws	179-209	
F	19	5/6	Other gas properties and gaseous diffusion Energy changes in physical changes	230-232, 245-252, 258-260	
M	22	6	Energy changes in physical and chemical changes – the concept of enthalpy	241-244, 252-256	
F	26	7	Properties and the Quantum theory of light	276-287	
M	29	7	EXAM 3 Quantum mechanics of atomic structure		
F	Apr. 2		Good Friday Holiday	288-310	
M	5	8	Electron configurations		
F	9	8	Use of electron configurations, Periodic trends	323-343	
M	12	9	Periodic trends	323-343	
F	16	10	Predicting structure of covalent compounds, writing Lewis structures, formal charge	374-394	
M	19	10	Valence Shell Electron Pair Repulsion Theory (VSEPR)	409-419	
F	23	10	EXAM 4 VSEPR	420-423	
M	26	10	VSEPR applications, prediction of molecular dipoles		
Tues	May 4		FINAL EXAM		8:00 – 10:00

The above is a tentative, rough outline of topics covered on a daily basis. We may go more quickly or more slowly than listed above. Specific reading assignments and homework problems will be given in class. Assignments given in class always supersede those listed above.