CHEMISTRY 2H—Honors General Chemistry I
Fall 2016 Course Syllabus

Instructor: Erik Menke, emenke@ucmerced.edu, office SE 358.
TA: Stephen Dale, sdale@ucmerced.edu

Meeting Times and Location
    Lecture: MWF 12:30-1:20 pm, room COB 272
    Lab: T 2:30-5:20 pm, room SE1 108
    Discussion: R 2:30-3:20 pm, room COB2 265

Office hours: Drop by my office any time if you have questions or concerns. If I don't have time to talk, we can schedule a time. In addition, I will be available from 10:30-12:20, Monday, Wednesday, and Friday, at the Lantern Café in the library. The TA, Stephen Dale, will have his office hours from 10:30-12:20 on Tuesdays in the Lantern Café.

Course description: CHEM 2H is comprised of lecture and laboratory components. In the lecture component, you will be introduced to basic concepts of modern chemistry. Topics considered include atomic and molecular structure, chemical bonding, stoichiometric calculations, types of chemical reactions, properties of gases, and chemical equilibrium. The laboratory component introduces general laboratory procedures and techniques, as well as acceptable data collection, analysis, and reporting practices.

Course learning outcomes: By the end of the semester students should be able to:
  (1) Derive names and formulas of compounds using the IUPAC system of inorganic nomenclature for binary compounds and oxyacids;
  (2) Determine molecular formulas from data, balance chemical equations, predict formation of precipitates, and use stoichiometric relationships to calculate amount reactant/product with applications to limiting reagent and percent yield concepts;
  (3) Analyze the energy associated with chemical reactions, perform simple chemical thermodynamic calculations, and be able to apply these concepts to the first law of thermodynamics, stoichiometric relationships, calorimetry and Hess's law;
  (4) Explain the basic concepts of quantum theory and the basic theories of chemical bonding, and be able to make predictions about atomic and molecular properties;
  (5) Determine whether a reaction is at equilibrium, calculate equilibrium constants and equilibrium concentrations, and apply the principles of equilibrium and reaction kinetics to gas phase systems; and
  (6) Perform basic chemistry laboratory techniques, use common laboratory instruments, record data and observations accurately, and describe sources of error and uncertainty in experimental data.

Relationship to program learning outcomes and program requirements: The primary focus of CHEM 2H is on fundamental knowledge and skills. In addition, although to a lesser extent, this course explores scientific methodology, i.e. how a scientist integrates fundamental knowledge and skills into scientific inquire, improves scientific communication skills via written lab reports, and helps you gain an appreciation for scientific ethics and the role of chemistry in society by showing you how to handle data in the laboratory and providing real world examples of the importance of chemistry.

Course structure: This class has a format that is different then most. Each class has been broken down into four sections. For the first five minutes of the class, you will individually work on a problem set that I will give you at the start of class. After those five minutes, you will form groups and spend ten minutes discussing your solutions to the problem, as well as to identify any confusion or misunderstanding. The next ten minutes will be a class discussion of the problems. The final twenty-five minutes of class will be a lecture by me introducing a new topic.

Required materials:
Text: "Chemical Principles: The Quest For Insight" 6th edition, by Peter Atkins, Loretta Jones, and Leroy Laverman. ISBN 1-4641-2465-5.

Other Materials:
- A carbonless copy laboratory notebook.
- A calculator
- Safety goggles.
- A lab coat.
- A USB drive (for saving data from instruments).

Grading system: Your grade in this class will be based on five sources, according to the following percentages:
- 3 in-class exams = 25%
- 1 final exam = 25%
- Lab reports (best 10 of 11) = 30%
- Mathematica project = 10%
- Discussion/class participation = 10%

The grading will follow a standard 10 point scale (100 - 90 = A, 89 - 80 = B, 79 - 70 = C...), with any +/- to be left for the instructor's discretion.

Exams: There will be three in-class exams and a comprehensive final. There will be no make-up's allowed for missed exams. If you miss an exam and have a legitimate excuse (i.e. doctor's note or equivalent) the other exams will be renormalized to make up the point difference.

Exam schedule:
- Exam 1:   Friday, September 23rd
- Exam 2:   Friday, October 21st
- Exam 3:   Monday, December 5th
- Final: Monday, December 12th

Labs: The lab sections will be used to complete the 11 assigned experiments. Some will be done individually while others will be done in pairs. The lab descriptions, procedures, and write-ups can be found on the CatCourses website. You are responsible for bringing a copy of the lab handout for each experiment to the lab. The lab write-up is due at the beginning of the next lab period. There will be no make-up labs, and lab write-ups will not be accepted late. The first 30 minutes of each lab will be treated as a discussion section during which time the lab instructor will provide background for the experiment as well as answer questions regarding the lecture. Please come to each lab section prepared to work (i.e. having read and understood the experiment) having passed the online prelab quiz, and you will be expected to

follow the safety rules at all times.

Mathematica project: There will be a group project due during finals week using Mathematica to model a concept from this course. Details to follow.

Participation: As there is a large portion of this class that involves discussion, your participation will be graded. The grade will be based on the discussion during the first half of the class as well as your active participation during the discussion section. Active participation involves asking and answering questions, as well as working with your group.

Course policies: The number one rule for this course is to respect the time of everybody in this class, including the instructor. This includes not using cell phones in class, not talking out of turn, not taunting, teasing or belittling others, and using proper grammar and spelling when preparing material other people read (i.e. emails, papers, labs, message posts, etc.). In addition, while you are in the lab, I expect you to act in a professional and responsible manner. This means that you should show up to each lab period on time and prepared to work, dressed in the appropriate attire. You should be focused on what is happening in the lab. This means that you should not be surfing the internet, texting your friends, or having conversations on the phone. While there will be downtime during some of the experiments, you should use that time to your advantage, i.e. asking questions, working on your lab reports, interpreting results, etc.

Academic integrity: This is a topic that I take very seriously. While I understand that shortcuts are attractive, they very rarely end up helping in the long run. Dishonest practices, like cheating and plagiarism, typically prevent you from understanding the material, which is ultimately why you are here in school. A full description of the University policy, as well as the judicial process and potential penalties, can be found on the student life website (studentlife.ucmerced.edu/what-we-do/student-judicial-affairs/academicy-honesty-policy). Students should be familiar with the University policy as anyone caught violating it will be dealt with harshly.

Disability services: A disability should not impede learning. To this end, UC Merced provides a number of options to help students with disabilities succeed in their academic career. If you have a disability, I encourage you to contact the University Disability Services Office to find out how they can help. You can find more information on their website (disability.ucmerced.edu), e-mailing them at disabilityservices@ucmerced.edu, or calling them at 209.228.6996.

Schedule (subject to revision):

Date	Day	Week	Topic	Chapter	Lab	Discussion
Aug. 24	Wed	1	Course introduction/overview		No	No
Aug. 26	Fri	1	Investigating atoms	Chapter 1		
Aug. 29	Mon	2	Quantum theory	Chapter 1	Lab intro	Yes
Aug. 31	Wed	2	The hydrogen atom	Chapter 2		
Sept. 2	Fri	2	Mathematica			
Sept. 5	Mon	3	Labor day		No	No
Sept. 7	Wed	3	Many-electron atoms	Chapter 2		
Sept. 9	Fri	3	Periodicity	Chapter 2		
Sept. 12	Mon	4	Ionic bonds	Chapter 3	Lab 1	Yes
Sept. 14	Wed	4	Covalent bonds	Chapter 3		
Sept. 16	Fri	4	Mathematica			

Sept. 19	Mon	5	Octet rule exceptions	Chapter 3	Lab 2	Yes
Sept. 21	Wed	5	Ionic vs. covalent bonds	Chapter 3		
Sept. 23	Fri	5	EXAM 1			
Sept. 26	Mon	6	Strengths/lengths of covalent bonds	Chapter 3	Lab 3	Yes
Sept. 28	Wed	6	VSEPR	Chapter 4		
Sept. 30	Fri	6	Mathematica			
Oct. 3	Mon	7	Valence-bond theory	Chapter 4	Lab 4	Yes
Oct. 5	Wed	7	MO theory	Chapter 4		
Oct. 7	Fri	7	Mathematica			
Oct. 10	Mon	8	MO theory 2	Chapter 4	Lab 5	Yes
Oct. 12	Wed	8	Nature of gases	Chapter 5		
Oct. 14	Fri	8	Mathematica			
Oct. 17	Mon	9	Gas laws	Chapter 5	Lab 6	Yes
Oct. 19	Wed	9	Molecular motion	Chapter 5		
Oct. 21	Fri	9	EXAM 2			
Oct. 24	Mon	10	Real gases	Chapter 5	Lab 7	Yes
Oct. 26	Wed	10	Intermolecular forces 1	Chapter 6		
Oct. 28	Fri	10	Mathematica			
Oct. 31	Mon	11	Intermolecular forces 2	Chapter 6	Lab 8	Yes
Nov. 2	Wed	11	Liquid structure	Chapter 6		
Nov. 4	Fri	11	Mathematica			
Nov. 7	Mon	12	Solid structure 1	Chapter 6	No	No
Nov. 9	Wed	12	Solid structure 2	Chapter 6		
Nov. 11	Fri	12	Veteran's Day			
Nov. 14	Mon	13	Systems, state, & energy 1	Chapter 8	Lab 9	Yes
Nov. 16	Wed	13	Systems, state, & energy 2	Chapter 8		
Nov. 18	Fri	13	Mathematica			
Nov. 21	Mon	14	Enthalpy 1	Chapter 8	No	No
Nov. 23	Wed	14	Enthalpy 2	Chapter 8		
Nov. 25	Fri	14	Thanksgiving			
Nov. 28	Mon	15	Enthalpy of chemical change 1	Chapter 8	Lab 10	Yes
Nov. 30	Wed	15	Enthalpy of chemical change 2	Chapter 8		
Dec. 2	Fri	15	Mathematica			
Dec. 5	Mon	16	EXAM 3		Lab 11	Yes
Dec. 7	Wed	16	Review			
Dec. 9	Fri	16	Buffer			