CHEMISTRY 10H—Honors General Chemistry II
Spring 2016 Course Syllabus

Instructor: Erik Menke, emenke@ucmerced.edu, office SE 358.
TA: Xianghai Sheng

Meeting Times and Location

Lecture: MWF 11:30-12:20 pm, room COB 261
Lab: T 3:30-6:20 pm, room SE1 110

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 9:00-10:30 am, Tuesdays and Thursdays, at the Lantern Café in the library.

Course description: Second semester of a two-semester general chemistry sequence. Addresses properties of gases, chemical thermodynamics, electrochemistry, chemical kinetics, quantum mechanics and spectroscopy, properties of solids and liquids, and nuclear chemistry. A laboratory section reinforces the concepts and quantitative skills introduced in lecture. *Prerequisite: CHEM 2 or 2H and MATH 12 or 22, which may be taken concurrently.*

Course learning outcomes: By the end of the semester students should be able to:

- Qualitatively describe the properties of solutions and calculate quantitative changes in physical properties due to the colligative properties of bulk matter.
- Solve quantitative problems involving chemical kinetics and the rates of chemical reactions, and relate their implications toward reaction mechanisms.
- Use the principles of chemical equilibrium to calculate solution composition and pH of acid/base and buffer solutions.
- Perform basic chemistry laboratory techniques using common laboratory equipment, record data and observations accurately, and describe the sources of error and uncertainty in experimental data.
- Conduct themselves ethically and responsibly in a scientific context.

Relationship to program learning outcomes and program requirements: The primary focus of CHEM 10H is on fundamental knowledge and skills. This course introduces major concepts and principles necessary for understanding chemistry, as well as builds on skills and knowledge introduced in CHEM 2. 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%
- Group/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, February 26th
- Exam 2: Friday, April 1st
- Exam 3: Friday, April 29th
- Final: Friday, May 15th

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 primary component will be based on the group and class discussion during the first half of the class.

Course policies: 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	Class number	Topic	Chapter
Jan. 20	Wed.	1	Entropy, disorder	9
Jan. 22	Fri.	2	Reaction entropies	9
Jan. 25	Mon.	3	Global changes in entropy	9
Jan. 27	Wed.	4	Gibbs energy	9
Jan. 29	Fri.	5	Temperature	9
Feb. 1	Mon.	6	Mathematica	9
Feb. 3	Wed.	7	Phase transitions	10
Feb. 5	Fri.	8	Solubility	10
Feb. 8	Mon.	9	Colligative properties	10
Feb. 10	Wed.	10	Mixtures	10
Feb. 12	Fri.	11	Equilibrium/reversibility	10
Feb. 15	Mon.	N/A	President's day	
Feb. 17	Wed.	12	Mathematica	10
Feb. 19	Fri.	13	Extent of reaction	11
Feb. 22	Mon.	14	Equilibrium constant	11
Feb. 24	Wed.	15	Equilibrium calculations	11
Feb. 26	Fri.	16	Exam 1 (Ch. 9, 10)	
Feb. 29	Mon.	17	LeChatlier's principle	11
Mar. 2	Wed.	18	Mathematica	11

Mar. 4	Fri.	19	Bronsted acids/bases, pH	12
Mar. 7	Mon.	20	Weak acids/bases	12
Mar. 9	Wed.	21	Polyprotic acids/bases, autoprotolysis	12
Mar. 11	Fri.	22	Mathematica	12
Mar. 14	Mon.	23	Buffers	13
Mar. 16	Wed.	24	Titrations	13
Mar. 18	Fri.	25	Precipitation	13
Mar. 21	Mon.	N/A	Spring break	
Mar. 23	Wed.	N/A	Spring break	
Mar. 25	Fri.	N/A	Cesar Chavez day	
Mar. 28	Mon.	26	Complex ion formation	13
Mar. 30	Wed.	27	Mathematica	13
Apr. 1	Fri.	28	Exam 2 (Ch. 11, 12, 13)	
Apr. 4	Mon.	29	Redox reactions	14
Apr. 6	Wed.	30	Galvanic cells	14
Apr. 8	Fri.	31	Nernst equation	14
Apr. 11	Mon.	32	Electrolytic cells	14
Apr. 13	Wed.	33	Mathematica	14
Apr. 15	Fri.	34	Reaction rates	15
Apr. 18	Mon.	35	Concentration vs. time	15
Apr. 20	Wed.	36	Mechanisms	15
Apr. 22	Fri.	37	Reaction models	15
Apr. 25	Mon.	38	Mathematica	15
Apr. 27	Wed.	39	d-block elements	17
Apr. 29	Fri.	40	Exam 3 (Ch. 14, 15)	
May 2	Mon.	41	Coordination compounds	17
May 4	Wed.	42	Crystal field theory	17
May 6	Fri.	43	Mathematica	17