CHEM 14A-1: FALL 2005 **Instructor: Dr. Laurence Lavelle**

CHEMISTRY

COURSE ORGANIZATION & SYLLABUS

DESCRIPTION: This course provides a strong chemistry foundation. We review chemical principles and nomenclature. We then go on to atomic structure based on quantum mechanics, and study atomic properties, trends in the periodic table, and chemical bonding in molecules. The course concludes with gaseous and aqueous equilibria, and properties of inorganic and organic acids, bases, buffers and titrations.

LECTURES: M, W, F 11 – 11:50am in CS50.

Review sessions: 5 – 6pm, Monday, Nov. 14 in CS 50; and 4 – 5pm, Friday, Dec. 9 in CS 50

INSTRUCTOR: Dr. Laurence Lavelle, 3048A Young Hall.

OFFICE HOURS: M, W, F 3 – 4pm. Brief questions will also be answered after each lecture. Course related information will be available, and your questions can be posted, at any time to the Virtual Office Hours (**VOH**) under the Chemistry & Biochemistry Department Home Page (http://voh.chem.ucla.edu). All technical problems with VOH must be sent to: voh@chem.ucla.edu

TA's (Teaching Assistants): Paul Wilkinson paulw@chem.ucla.edu, John-Carl Olsen jcolsen@chem.ucla.edu, Thomas Quickel quickel@ucla.edu, Ruby Dewi <rubyed@ucla.edu>.
TA's will arrange their own office hours and these will be posted on VOH.
You may go to any TA office hour.

REQUIRED TEXT: Chemical Principles: The Quest for Insight, 3rd Edition, by Peter Atkins & Loretta Jones. This text, Student's Solutions Manual, and model building kit can be purchased as a package at the ASUCLA bookstore. Careful consideration went into choosing this text, you will find it good to read. Note: Several other chemistry textbooks have been placed on reserve in College Library, if you desire further supplementary material.

READING & HOMEWORK: Read the assigned chapters. Working through problems will facilitate your learning the course material and developing your problem solving skills. Homework problems are given with the lecture schedule on the back of this page. Homework is not turned in or graded. *It is your responsibility to do (at least) the assigned homework in order to master the material covered.* **You should plan for at least 8 hours of independent study per week**, and the more problems you do, the more you will learn.

QUIZZES & EXAMINATIONS: Four 30 minute quizzes, directly related to class notes and homework problems will be given in discussion sections. See **VOH** for quiz and exam schedule.

There is one mandatory 2hr midterm exam **5-7pm, Tuesday, November 15**, and one mandatory 3hr final exam **8-11am, Wednesday, December 14**.

Special Bonus: Each exam will include one question that will be taken from your Student's Solutions Manual. So it is very much in your interest to work through these questions.

All exams must be written in **pen**. **No make-up exams** will be given. **No one** will be permitted to take the final exam either earlier or later than the scheduled time, and no one can receive a passing grade for the course without taking the final exam. There are no regrades. *Only non-programmable, non-graphing calculators will be allowed during exams. Pagers and cellular phones are not allowed in the classroom during lectures or exams. Students possessing such items during exams or who commit other forms of academic dishonesty will receive a zero on the exam and will be referred to the Dean of Students.*

COMPUTER SELF-STUDY: There is **extensive** online course material available for you to use (see Mastering Chemistry).

GRADING:		
	Four Quizzes (4 x 30 mins)	120 pts
	One 2hr Midterm (120 mins)	120 pts
	One 3hr Final (180 mins)	180 pts
	Total	420 pts

Each quiz, midterm and final has a total score but is not assigned a grade.
Only at the end of the quarter when the class average score (out of 420 points) is known are individual and final grades assigned and they are based/curved on the class average.
However you need 50% or higher (210 points or higher) to pass this course with a C- or higher.

Review of Chemical & Physical Principles
(~3 lectures)
(SI units; significant figures; solutions; determining molecular formulas; balancing chemical reactions; limiting reactant calculations)
Fundamentals E, F, G, H, L1-2, M
Appendix 1B, 1C, 1D
Problems: E 11, 13, 15, 19; F 1, 5, 7, 9, 11; G 5, 7, 11, 15, 17; H 3, 7, 11, 13; L 3, 5, 7; M 3, 7, 9, 11

Atoms: The Quantum World
(~7 lectures)
(properties of light & electrons; Einstein equation; blackbody radiation; photoelectric effect; Bohr frequency condition; DeBroglie equation; Heisenberg's indeterminacy equation; wave function & Schrodinger's equation; particle in a box; s-, p-, and d-orbitals; quantum numbers; H-atom; many-electron atom; electron configurations; trends in the periodic table)
Ch 1 (Omit Table 1.2)
Problems: 1, 3, 5, 7, 9, 11, 13, 15, 17, 23, 27, 29, 41, 43, 45, 47, 49, 51, 53, 59, 61, 63, 67, 69, 73, 83, 85, 91, 93, 95, 97, 101

Chemical Bonds
(~4 lectures)
(ionic & covalent bonds; Lewis structures; resonance structures; formal charge; Lewis acids & bases; coordinate covalent bonds; octet rule exceptions; ionic vs covalent bonds; electronegativity; periodic trends; dipole moments; bond lengths & energies)
Ch 2 (Omit 2.2)
Problems: 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 33, 35, 37, 41, 43, 45, 49, 51, 53, 57, 63, 65, 67, 69, 77, 79, 83, 89, 91, 95

Molecular Shape and Structure
(~5 lectures)
(determining molecular shape & polarity using VSEPR; sigma & pi bonds and their role in structure and shape; hybridization (sp, sp^2 sp^3, dsp^3, d^2sp^3); molecular orbital theory (diagrams and HOMO → LUMO transitions); diamagnetism & paramagnetism)
Ch 3.1 - 3.12
Problems: 1, 3, 7, 9, 11, 15, 17, 19, 21, 23, 27, 29, 33, 35, 37, 45, 47, 49, 51, 53, 55, 61, 67, 69, 79, 89

Chemical Equilibrium
(~3 lectures)
(calculating equilibrium constants & equilibrium concentrations for gaseous & liquid phase reactions (quadratic equation); non-equilibrium conditions & calculating the reaction quotient & applying Le Chatelier's principle to changing chemical & physical conditions)
Ch 4.1 - 4.11 (Background reading if needed.)
Ch 9 (Omit 9.3, 9.12, 9.13)
Problems: 1, 5, 7, 9, 11, 27, 29, 31, 33, 35, 37, 43, 45, 47, 49, 51, 55, 57, 59, 61, 63, 71, 73, 75, 77, 79, 81, 83

Acids and Bases
(~5 lectures)
(properties & structures of inorganic & organic acids/bases; amphoteric compounds; Bronsted & Lewis acids/bases; conjugate acids/bases; acidity/basicity constants and the conjugate seesaw; calculating pH and pOH of aqueous solutions containing strong or weak acids/bases; polyprotic acids/bases; identify acidic/basic salts; calculating the pH of salt solutions and the pH of a weak acid and its salt (buffer); air pollution and acid rain)
Fundamentals J
Problems: 1, 3, 5, 7
Ch 10.1 - 10.14 and Box 10.1
Problems: 1, 3, 5, 7, 9, 13, 15, 17, 19, 21, 25, 27, 29, 31, 33, 35, 37, 41, 43, 45, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 101

Aqueous Equilibria
(~3 lectures)
(making buffers & calculating buffer pH using Henderson-Hasselbalch equation; biological importance of buffer solutions; titrations (strong or weak acid with strong base, strong or weak base with strong acid) and calculating the pH at any point in a titration; indicators; physiological buffers and staying alive)
Ch 11.1 - 11.7
Problems: 1, 3, 5, 7, 9, 13, 15, 17, 19, 21, 23, 25, 29, 31, 33, 35, 37, 77, 89, 109

30 lectures total

Study hard and enjoy your time at UCLA.