

## CHEMISTRY 14A

### 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 and coordination compounds. The course concludes with gaseous and aqueous equilibria, and properties of inorganic and organic acids, bases, buffers and titrations.

**LECTURES:** See on-line schedule. Students can attend only the lecture they are enrolled in.

**INSTRUCTOR:** Dr. Laurence Lavelle, 3048A Young Hall, Chemistry & Biochemistry, UCLA

**OFFICE HOURS:** W & F 4 – 5pm. Questions will also be answered after each lecture. Course related information will be available, and your questions can be posted, at any time to Virtual Office Hours (VOH) at <http://voh.chem.ucla.edu>. All technical problems with VOH must be sent to: [voh@chem.ucla.edu](mailto:voh@chem.ucla.edu)

**TAs (Teaching Assistants):** To be announced. You may attend only the discussion section you are enrolled in. TA's will arrange their own office hours and these will be posted on VOH. You may go to any and all TA office hours.

<b>Chem 14A is unique:</b>	In class lectures (Yes)	Podcast lectures (Yes)
Webcast lectures (Yes)	Discussion sections (Yes)	Online materials (Yes)
And ...		

**Including Dr. Lavelle's office hours and all TAs - a total of 27 office hours every week!**  
**In addition to Virtual Office Hours 24/7 for 12 weeks of the 10 week quarter!**  
**In addition to over 30 hours of midterm and final exam review sessions!**

**TEXTBOOK:** Chemical Principles The Quest for Insight, 5<sup>th</sup> Ed., by Peter Atkins & Loretta Jones. The textbook, solutions manual, study guide, and model building kit are available as one bundled package at the UCLA bookstore. The same textbook bundle will be used in Chem 14B and the model building kit will be used in Chem 14A/B/C/D. If you desire further supplementary material several other chemistry textbooks have been placed on reserve in College Library.

**COURSE READER:** The Chem 14A course reader and workbook includes all course related material, all lecture notes with additional background material, past exams with solutions, review of high school material, and additional quizzes to work through. The text and equations are typeset to allow the student sufficient space to write additional class notes. With this course reader the student should not need any additional notepaper for taking class notes. It is available only at Course Reader Material, 1081 Broxton Ave, Westwood (two blocks south of campus).

**READING & HOMEWORK:** Read the assigned chapters. Working through problems will facilitate your learning the course material and will also develop your problem solving skills. 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.* **Do at least 8 hours of independent study per week**, and the more problems you do, the more you will learn.

**QUIZZES & EXAMINATIONS:** Three 40min quizzes in discussion section. One 2hr midterm exam. One 3hr final exam. All material is directly related to class notes and the readings and homework problems in the textbook, course reader, and workbook. The best preparation for all of these is to be able to independently work through the assigned homework problems. See **VOH** for quiz and exam schedule. The Preparatory Self-Quizzes in your Workbook will also be helpful. The Preparatory Self-Quizzes must be handed in to your TA. All uncollected work is kept by your TA until the end of the quarter, after the final exam it is recycled.

*To 'encourage' students to do the assigned homework problems both the midterm and final will include one homework question.*

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 are allowed.** 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:** The online Audio-Visual Focus-Topics are highly recommended.

<b>GRADING:</b>	Quizzes (3 x 40 mins)	120 pts
	One 2hr Midterm (110 mins)	110 pts
	One 3hr Final (170 mins)	170 pts
	Total	400 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 400 points) is known are individual and final grades assigned and they are based/curved on the class average. However you need 50% or higher (200 points or higher) to pass this course with a C- or higher.

## SYLLABUS

### **Review of Chemical & Physical Principles**

(SI units; significant figures; solutions; determining molecular formulas; balancing chemical reactions; limiting reactant calculations)

Reading all the Fundamentals sections in your textbook is highly recommended. The following are essential: Fundamentals E, F, G, H, L1-2, M

Appendix 1B, 1C, 1D

Problems: E 1, 3, 5, 7, 13, 17, 19, 23, 25; F 1, 3, 5, 7, 9, 11, 15, 19, 21; G 5, 7, 11, 13, 15, 17, 21, 25, 27; H 1, 3, 5, 7, 11, 13, 15, 17, 19; L 1, 3, 5, 7, 29, 33; M 1, 3, 7, 11, 13, 17, 19

### **The Quantum World**

(properties of light & electrons; Einstein equation; photoelectric effect; Bohr frequency condition; DeBroglie equation; Heisenberg's indeterminacy equation; wave functions and 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: 3, 5, 7, 9, 17, 19, 21, 23, 25, 27, 29, 47, 49, 51, 53, 55, 57, 59, 61, 63, 69, 71, 73, 75(omit part d), 81, 83, 85, 87, 89, 91, 93, 95, 99, 101, 103, 105, 109, 111, 123, 129

**Chemical Bonds**

(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 2.4)

Problems: 3, 5, 9, 11, 13, 15, 19(omit part c), 21, 25, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 95, 97, 99, 101, 103, 111, 115, 117, 119, 121

**Molecular Shape and Structure**

(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

Problems: 1, 3, 5, 7, 9, 11, 13, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 51, 53, 55, 57, 59, 61, 63, 65, 67, 71, 73, 75, 77, 79, 81, 85, 93, 95, 99, 111(a-d)

**Coordination Compounds and their Biological Importance**

(naming, shape and structures of coordination compounds; biological examples)

Ch 16.5, 16.6, Box 16.1, Toolbox 16.1

Problems: 27, 29, 31, 33, 35

**Chemical Equilibrium**

(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 10 (Omit 10.3, and pages 411-412)

Problems: 1, 5, 7, 9, 11, 13, 27, 29, 31, 33, 37, 39, 41, 43, 47, 49, 51, 53, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 85, 87, 93, 95, 97, 123

**Acids and Bases**

(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, 5, 7, 9, 11, 13, 15

Ch 11.1 - 11.14 and Box 11.1

Problems: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 71, 73, 75, 77, 79, 109, 115, 117, 121, 133, 135

**Aqueous Equilibria**

(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 12.1 - 12.7

Problems: 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 85, 87, 97, 103

**Study hard and enjoy your time at UCLA.**

