

Chemistry 4A Fall 2013: General information.

Instructors: **Professor K. Birgitta Whaley**, 219 Gilman Hall
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 office hours: Monday 4-5 pm, Wednesday 4-5 pm
 Prof. Whaley is the instructor for the first half of this class

Professor Ronald Cohen B45 Hildebrand Hall
 e-mail: rccohen@berkeley.edu
 office hours: Wednesday 1-2 pm, Friday 1-2 pm (or by appointment)
 Prof. Cohen is the instructor for the second half of this class.

Class meeting time/location: MWF 12-1pm, 1 Pimentel Hall

Discussion Section: Tu 7:30-9:00 pm, 120 Latimer Hall

Class web site: hosted at <http://bcourses.berkeley.edu>

Textbooks: We will make use of two textbooks during the semester.
 (1) *Principles of Modern Chemistry*,
 Oxtoby, Gillis and Campion, 7th edition, Cengage Learning 2012
 (required)
 (2) *Quantitative Chemical Analysis*,
 Harris, 8th edition, Freeman 2010
 (recommended)

Lab Manual: Prelab reading and lab instructions/write-ups will be located on Canvas

Assessment: 30% for three 1-hour mid-term exams (in class)
 30% for one 3-hour cumulative final exam.
 35% for laboratory (see Lab page on Canvas for details)
 5% for weekly homework (graded on a 0 to 2 scale)

TA Office Hours: TBA

General comments:

- (1) Weekly reading: There is weekly assigned reading, which is given in this hand-out. Do this reading on a steady basis **before** lectures (20-30 minutes/lecture) to help you get more out of the lectures (which don't duplicate the book!).
- (2) Weekly homework: There is a weekly set of assigned homework problems. These will generally be collected before lecture on the Monday of the following week. They will be graded on a scale of 0 to 2. Doing these problems is essential to doing well in this class! 5% of your grade will come from them directly, but your success on the exams will depend on doing the problems. Homework solutions will be posted on the web site.

- (3) Work expectations – plan to spend *at least* 2 hours reading/problem solving per hour lecture, and stick to it. Steady work is the pathway to good progress. Lack of sustained work is a pretty sure guarantee of trouble.
- (4) Grade expectations – we grade on an absolute scale, so everyone can do well!
- (5) Get help early when you need it: Chem 4A goes fast, and your first semester at Cal also goes by fast! So, if you need help, use the available resources as soon as possible – TA and faculty office hours, mid-term review sessions, learning center/undergraduate chemistry tutoring, etc. Delay is the usual cause of real problems. Our mid-terms come along about every 4 weeks...

Chemistry 4A Fall 2013: Honor Code

The student community at UC Berkeley has adopted the following Honor Code: *“As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others.”* The expectation is that you will adhere to this code.

Collaboration and Independence: Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. However, unless otherwise instructed, homework assignments are to be completed independently and materials submitted as homework should be the result of one’s own independent work.

Cheating: A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. Anyone caught cheating on a quiz or exam in this course will receive a failing grade in the course and will also be reported to the University Center for Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

Plagiarism: To copy text or ideas from another source without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. It is assumed that a list of any external references used will be provided by the student for any assignment in Chemistry 4A. For additional information on plagiarism and how to avoid it, see, for example:

<http://www.lib.berkeley.edu/instruct/guides/citations.html#Plagiarism>

Academic Integrity and Ethics: Cheating on exams and plagiarism are two common examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. Ethical behavior builds self-confidence and is crucial to building trust within relationships, whether personal or professional. There is no tolerance for dishonesty in the academic world, for it undermines what we are dedicated to doing – furthering knowledge for the benefit of humanity.

Your experience as a student at UC Berkeley will be fueled by a passion for learning and rewarding activities, but we also appreciate that being a student can be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam, or submitting a written assignment that has been copied from another source. And it could be as subtle as glancing at a fellow student’s exam when you are unsure of an answer to a question and are looking for some confirmation. By becoming a member of the academic community at Berkeley you have agreed to eschew such behavior for your own personal growth and the community as a whole.

Chemistry 4A Fall 2013: Course Outline

Readings are from the two textbooks Oxtoby et al, (O) and Harris (H), with chapters denoted as, e.g., O2 for Ch. 2 of Oxtoby.

1. A Reminder about Stoichiometry

8/30: Moles, molecular formulas and chemical equations.

Week 1 reading: O1, O2

2. Elementary ideas of chemical bonding

9/2: *Labor Day Holiday (no lecture)*

9/4: Electronegativity and ionic bonding

9/6: Covalent bonding and Lewis structures

Week 2 reading: O3

3. Quantum concepts – I

9/9: Molecular shape

9/11: Waves, electromagnetic radiation, blackbody radiation, Planck relation

9/13: Photoelectric effect, quantization in atoms, the Bohr atom and atomic spectra

Week 3 reading: O4.1-O4.3

4. Quantum concepts - II

9/16: Diffraction and the de Broglie relation

9/18: Schrodinger equation and quantum mechanics of a particle in a 1-d box

9/20: **Mid-term 1**

Week 4 reading: O4.4-O4.6

5. Atomic structure.

9/23: Particles confined in 2-d/3-d and the harmonic oscillator

9/25: Energy levels of 1-electron atoms

9/27: Energy levels of many-electron atoms, periodicity

Week 5 reading: O4.7 and 5

6. Chemical bonding in molecules – I

9/30: Intro. to molecular bonding – Born-Oppenheimer, H_2^+ , molecular orbitals

10/2: MO description of diatomic molecules

10/4: MO description of heteronuclear diatomic molecules

Week 6 reading: O6

7. Chemical bonding in molecules - II

10/7: Orbital Hybridization (VSEPR) and MO diagrams for polyatomic molecules

10/9: Review

10/11: **Mid-term 2**

Week 7 reading: O6

8. Introduction to Molecular Spectroscopy

10/14: Bonding in organic molecules and aromaticity
10/16: Electronic spectroscopy
10/18: Transition Metal Complexes and their spectroscopy
Week 8 reading: O7.1-O7.5, O20.1-20.2, 20.5, O8

9. Gases

10/21: Overview of segment 2 and Gas laws
10/23: Gas Laws & Kinetic theory of gases
10/25: Gases continued
Week 9 reading: O20.6, O9

10. Intermolecular forces and phase transitions

10/28: Intermolecular forces and phase diagrams of pure substances
10/30: Colligative properties, Raoult's and Henry's Laws
11/1: Molecular vibrational, rotational energy levels and spectroscopy
Week 10 reading: O9.6-O9.7, O10, O11.5-O11.7, O20.1-3

11. Thermodynamics 1: Heat and temperature

11/4: Earth's Climate
11/6: Thermodynamics
11/8: Heat capacities
Week 11 reading: O12

12. Review and Exam

11/11: *Veterans' Day Holiday (no lecture)*
11/13: Review
11/15: **Mid-term 3 (IN CLASS)**
Week 12 Reading: Review

13. Thermodynamics 2: Energy and Entropy

11/18: 1st law
11/20: Entropy
11/22: The 2nd law: part 1

Week 13: Reading: O13.1-7

14. Entropy continued

11/25: 2nd law part 2

11/27: Air Pollution in California
11/29: THANKSGIVING HOLIDAY
Week 14: O14-16

15. Equilibrium

M 12/2: Equilibrium
W 12/4: Acids and bases
F 12/6: Oceans & Review
Week 15 reading: O14-16

16. RRR Week

12/9 – 12/13: REVIEW WEEK

Final Exam: Cumulative

Monday, December 16 3-6 PM

Location to be Announced