

Chemistry 20 - Section 1152
Fundamentals of Chemistry
Fall 2009

Instructor: **Dr. Peter A. Doucette**
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Office Hours: M: 12:00-1:00, Tu & W: 1:00 -2:00, or by appointment

| | | | | |
|-------------------------------------|------------------|------|------------|----------|
| Meeting times and locations: | Lectures: | T Th | 9:30-11:35 | PHYS 108 |
| | Lab: | F | 9:30-12:40 | Chem 164 |

COURSE OUTLINE

1. Required Materials:

Textbook: Timberlake ; *Chemistry: An Introduction to General, Organic, & Biological Chemistry*, 10/E

Lab Manual: Henrickson; Lab Manual, 6/E

Scientific Calculator (logarithms and exponents, but no programmables)

Safety Goggles (Instructor Approved)

2. Course prerequisites:

Mathematics 40 or 41B with a minimum grade of C in prerequisite or qualification by testing (El Camino College Mathematics Placement Test) and assessment. Recommended preparation: eligibility for English 84.

3. Course description:

This course introduces fundamental theory and principles of chemistry applied to inorganic, organic, and biological chemistry. Atomic and molecular structure, chemical and physical changes, gases, solutions and colloids, nomenclature, equations and calculations will be emphasized.

4. Course Objectives:

General Skills - The student will become proficient in the ability to:

1. use scientific terminology
2. name and write chemical formulas for inorganic compounds: binary nonmetal compounds, salts and acids
3. write and classify chemical equations for elementary chemical reactions
4. perform stoichiometric calculations involving chemical reactions

Structure - The student will:

1. demonstrate a basic understanding of Bohr theory
2. predict and explain periodic trends of elements in terms of electronic configurations
3. describe and illustrate the structure and bonding for molecules by: constructing Lewis structures, labeling molecular geometries, determining polarity

States of Matter - The student will:

1. use the Kinetic Molecular Theory to explain the behavior of gases
2. perform calculations involving the gas laws
3. relate intermolecular forces to observed properties of solids, liquids and gases

Aqueous solutions - The student will:

1. explain solubility in terms of properties of both solute and solvent.
2. determine concentrations of solutions quantitatively and experimentally
3. give qualitative & quantitative descriptions of soln colligative properties as a function of solute type and solute conc
4. classify solutes as strong, weak or nonelectrolytes
5. write net ionic equations for chemical reactions

Acids and Bases - The student will:

1. compare and contrast Arrhenius and Bronsted-Lowry acid theories
2. write acid-base reactions
3. determine pH and understand how a buffer works

Oxidation-Reduction - The student will:

1. determine oxidation numbers
2. identify the element oxidized and the element reduced in redox reactions

Organic Chemistry - The student will:

1. use the common and IUPAC systems to name simple examples of various classes of organic compounds
2. draw structural formulas of simple examples of various classes of organic compounds
3. write equations, using structural formulas, for selected common reactions of organic compounds
4. draw structural formulas which illustrate a knowledge of structural isomerism and geometric isomerism

Biochemistry - The student will:

1. demonstrate an understanding of chirality by drawing Fischer projections of enantiomers containing one chiral C
2. draw open chain and ring structural formulas for the common monosaccharides
3. describe the linkage between monosaccharide units in terms of the bonding involved
4. state the functions of the common di- and polysaccharides
5. draw the general structural formula of a fatty acid and a triglyceride
6. draw the structural formulas of at least three saturated and one unsaturated fatty acid
7. explain the function of a fatty acid in a membrane in terms of the structure of the fatty acid
8. draw a general structure for a phospholipid
9. draw the ring system found in steroids
10. draw the general structural formula for a zwitterion and explain how this structure can function as a buffer
11. draw the structural formulas of at least three amino acids at physiological pH
12. explain the geometry of a peptide bond by using resonance structures
13. state the features which characterize the primary, secondary, and tertiary structure of a protein
14. define denaturation as it applies to a biological system

Laboratory - The student will:

1. learn fundamental chemistry techniques such as titration, use of pH meter
2. become proficient in the use of: balance, common laboratory glassware such as burets, pipets, and volumetric flasks
3. illustrate basic principles of gases, solutions, acids and bases, and ox and red agents through experimental set ups

5. Grading: Approximate total points

| | | |
|----------------------------|--------------------|------------|
| 3 Midterms | (200 points each) | 600 |
| Lab Reports | (150 points total) | 150 |
| Quizzes | (50 points total) | 50 |
| Final Exam | (200 points) | <u>200</u> |
| Total Possible (tentative) | | 1000 |

6. Grade Distribution:

Letter grades are given based on the percentage of total points.

| | |
|----------|-----------|
| A | 100 - 89% |
| B | 88 - 78% |
| C | 77 - 65% |
| D | 64 - 52% |
| F | 51 - 0% |

7. Quizzes and Exams:

Quizzes: When time permits, I will give quizzes to prepare you for the exams. Quizzes will be graded.

Exams: Exams will be given on scheduled days in room 108 (physics building). The format of the exams depends on the content of the material being tested, but is usually made up of multiple choice, true/false and short answer questions. There will be no make-up exams. If you miss an exam, you will receive a zero unless you give a documented reason for missing the exam.

8. Practice Problems/Assigned Problems:

Practice problems are given for each topic covered and we go over many of them in class. I do not collect and grade these, but you should complete and understand all questions, preferably before we go over them in class. I will also assign problems from the book that you should complete and understand.

9. Lectures:

Course material will be presented primarily on an overhead projector and the white board. The overheads will be available at the following website: www.chem.ucla.edu/~pdoucett/chem20 (temporarily, until I switch to an ELCO server). You can print the notes out and bring them to class allowing you to think and participate (not sleep!) during lectures rather than trying to write down everything I cover. Additional notes can then be made in the margins of the printed overheads. **To print documents, first save them on your hard drive - do not print from the web!**

10. Study Strategies:

- Working problems is an essential part of the course and you should make this one of your primary goals. You should do all of the problems I assign and **you should avoid looking at the answer key until you have figured out the problem on your own.** There are a lot of problems out there and the more you do, the better you will get.
- It is very important not to fall behind and you should study and do the assigned problems while the lecture material is fresh in your mind. Students that fall behind often have to drop the course, so don't be one of them!
- Finally, **COME TO EVERY CLASS PREPARED AND ON TIME!**

11. Laboratory:

You should read and fully understand all labs **BEFORE** coming into the lab. If you wait until right before the lab class to read the lab, you will not understand the lab and it will be obvious to me that you did not prepare. Preliminary exercises are due before you begin the lab even if I don't remind you. There are no make-up labs. Points will be deducted for messy, unsafe, incomplete or late work. You must **ALWAYS** wear instructor-approved goggles when in the laboratory even if you are doing calculations after you have finished a lab. You will be asked to leave lab for repeated infractions of this rule.

Dropping:

It is your responsibility to drop the course to avoid an "F". To drop, you must check out of your lab drawer.

Drop dates:

Friday, September 11: Last day to drop with a full refund

Friday, September 25: Last day to drop without notation on permanent record

Friday, November 20: Last day to drop with a "W"

CHEMISTRY PROGRAM LEVEL STUDENT LEARNING OUTCOME:

Students will practice safe laboratory procedures by putting their goggles on at the beginning of a chemistry lab experiment involving burners or chemicals, and by keeping their goggles in place during the entire course of the experiment. Students will not remove their goggles until the students are leaving or until the instructor has said that it is safe to do so (whichever comes first).

CHEM 20 COURSE LEVEL STUDENT LEARNING OUTCOME:

On a written exercise, given the names of chemical compounds, students will be able to write the correct reactant formulas, states of matter (when required), identify reaction type, predict the formulas of products, and balance the chemical equation.

| Week | Date | Day | Lecture/Lab |
|------|--------|-----|---------------------------------------------------------------------------------|
| 1 | 9/1/09 | T | Course Introduction, Chapter 1 – <i>Measurements</i> |
| | | Th | Ch. 1 – cont'd |
| | | F | Chapter 2 – <i>Matter</i> – cont'd Locker Check-In, Safety video |
| 2 | 9/8 | T | Ch. 2 – cont'd, elements you should know |
| | | Th | Chapter 3 – <i>Elements and Atomic Structure</i> |
| | | F | Handout: <i>Burners (L1)</i> . |
| 3 | 9/15 | T | Ch. 3 – cont'd |
| | | Th | Chapter 4 – <i>Nomenclature and Bonding</i> , ions you should know |
| | | F | Experiment 1 – <i>Measurement and Density (L2)</i> |
| 4 | 9/22 | T | Ch. 4 – cont'd |
| | | Th | Midterm 1 |
| | | F | Ch. 4 – cont'd |
| 5 | 9/29 | T | Ch. 4 – cont'd |
| | | Th | <i>Nomenclature Exercise Handout (L4)</i> |
| | | F | Experiment 2 – <i>Graphing (L3)</i> |
| 6 | 10/6 | T | Ch. 4 – cont'd |
| | | Th | Experiment 11 - <i>Structure of Covalent Molecules and Polyatomic Ions (L5)</i> |
| | | F | Experiment 6 - <i>Simple Chemical Reactions (L6)</i> |
| 7 | 10/13 | T | Chapter 5 – <i>Chemical Calculations</i> |
| | | Th | Ch. 5 – cont'd |
| | | F | Experiment 7 - <i>Hydrates (L7)</i> |
| 8 | 10/20 | T | Chapter 6 – <i>Gases</i> |
| | | Th | Midterm 2 |
| | | F | Experiment 15 – <i>Combined Gas Laws (L8)</i> |
| 9 | 10/27 | T | Chapter 7 – <i>Solutions</i> |
| | | Th | Chapter 8 – <i>Acids and Bases</i> |
| | | F | Experiment 17 and Handout – <i>Acid/Base Indicators (L9)</i> |
| 10 | 11/3 | T | Ch. 8 – cont'd, Chapter 10 – <i>Alkanes</i> |
| | | Th | Ch. 10 – cont'd |
| | | F | Experiment 16 and Handout – <i>Acid-Base Titrations (L10)</i> |
| 11 | 11/10 | T | Chapter 11 – <i>Alkenes and Alkynes</i> |
| | | Th | Experiment 18 – <i>Structure of Hydrocarbons (L11)</i> Ch. 9 – cont'd |
| | | F | Veterans Day Holiday – No Class |
| 12 | 11/17 | T | Chapter 12 – <i>Organic Compounds With Oxygen</i> |
| | | Th | Ch. 12 – cont'd |
| | | F | Experiment 19 – <i>Properties of Hydrocarbons (L12)</i> |
| 13 | 11/24 | T | Midterm 3 |

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| 14 | 12/1 | T | Chapter 13 – <i>Esters, Acids, and Amines</i> |
| | | Th | Chapter 14 - <i>Carbohydrates</i> |
| | | F | Organic Functional Groups Handout (L13) |
| 15 | 12/8 | T | Ch. 14 – cont'd |
| | | Th | Chapter 15 - <i>Lipids</i> |
| | | F | Organic Functional Groups Handout (L14) , Locker checkout |
| 16 | 12/15 | T | Chapter 16 - <i>Proteins</i> |
| | | Th | Final Exam |
| | | F | Experiment 25 - Detection of Fats, Proteins, and Carbohydrates in Food (L15) , Locker checkout |