General Chemistry for Science Majors -2007-Summer
ChemA105- First Session / Chem A106- Second Session

Instructor-

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Texts:

   Raymond Chang; The Mc Graw Hill Companies, Inc., 2007

2. Problem-Solving Workbook With Solutions To Accompany
   Chang's Chemistry, Brandon J. Cruickshank and Raymond Chang;

Useful Websites for General Chemistry:

1. Website for required text - http://www.mhhe.com/chang

2. American Chemical Society site- http://www.acs.org/portal/Chemistry

   http://aol1.infoplease.com/ipa/A0001817.html

Calculators: Programmable calculators may not be used for quizzes or exams. You will need an inexpensive scientific calculator capable of taking logarithms and exponentials in addition to arithmetic operations.

Cell Phones: Cell phones will not be allowed in the classroom.

Co Requisites: General Chemistry Lab (CHEM A107), Eligibility to take MATH A257.

PLEASE NOTE: Eligibility to take MATH A257 is a pre-requisite to take CHEM A105. If you did not receive placement into MATH A257 (or "Math of the program") you cannot be enrolled in CHEM A105. (This does not mean that you must be currently enrolled in MATH A257.)

PREFACE TO GENERAL CHEMISTRY:
This course is designed to meet the needs of science majors. We will be studying the theoretical concepts and the practical aspects of various chemical processes. This course is expected to impart a rigorous, chemical background and should offer a strong foundation for upper level chemistry courses.

Students take Chemistry for many different reasons. Many approach with a certain amount of
trepidation and some even with terror. Much of this can be eliminated with the correct study skills. To do well it is important that you follow the following steps:

1. Take complete organized lecture notes. It is often helpful to recopy and organize your notes at the end of class.
2. Supplement lecture notes by re-reading the info covered in class and adding important bits to the class notes.
3. Be sure you understand the language of Chemistry. If you don't understand the term, you won't understand the concepts.
4. Go over and over your notes until you have really mastered the material.
5. Memorize factual information only with complete understanding.
6. Apply your knowledge to solving problems.
7. Do appropriate problems at the end of each chapter regularly.
8. Don't procrastinate - You can not learn everything in one night.
9. If you are having trouble - ask questions. If you do not ask I can not help you because I won't know there is a problem.
10. Work hard - that is the only way to succeed.

Drop/Add: The last day to drop this class is
Withdrawals: The last day to withdraw with a transcript "W" is

TENTATIVE GRADING SCALE:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100</td>
<td>A</td>
</tr>
<tr>
<td>87 - 89</td>
<td>B+</td>
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<tr>
<td>80 - 86</td>
<td>B</td>
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<tr>
<td>78 - 79</td>
<td>C+</td>
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<td>70 - 77</td>
<td>C</td>
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<tr>
<td>66 - 69</td>
<td>D+</td>
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<tr>
<td>60 - 65</td>
<td>D</td>
</tr>
<tr>
<td>less than 60</td>
<td>F</td>
</tr>
</tbody>
</table>

***Read and make sure you understand the section on academic honesty, Integrity of Scholarship and Grades, in the Loyola University Undergraduate Bulletin.***

EXAMS: There will be at 4 major exams each semester. All tests will be in class, and closed book. You should bring a scientific calculator and a few sharp pencils with erasers. As stated above, programmable calculators may not be used.

First Semester-Chem A105 - TENTATIVE EXAM DATES:

<table>
<thead>
<tr>
<th>Test</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test I</td>
<td>Thurs.- June 7</td>
</tr>
<tr>
<td>Test II</td>
<td>Thurs.- June 14</td>
</tr>
<tr>
<td>Test III</td>
<td>Thurs- June21</td>
</tr>
<tr>
<td>Final Exam (cumulative)</td>
<td>Thurs-June 28</td>
</tr>
</tbody>
</table>

Second Semester-Chem A106 - TENTATIVE EXAM DATES:

<table>
<thead>
<tr>
<th>Test</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test I</td>
<td>Thurs-July 12</td>
</tr>
<tr>
<td>Test II</td>
<td>Thurs-July 19</td>
</tr>
<tr>
<td>Test III</td>
<td>Thurs-July 26</td>
</tr>
</tbody>
</table>
Final Exam (cumulative) Thurs - August 2

Make-up exams will not be given except under very special circumstances (e.g. injury, sudden extreme illness, family emergency). You must contact your instructor as soon as possible, preferably before the scheduled exam to discuss possible arrangements. **Failure to give a satisfactory, timely explanation for missing a scheduled exam will result in a zero for that exam.** It is entirely up to the instructor as to whether a make-up exam will be given. Excuses involving illness will require a note from a physician.

**Attendance Policy:**

The summer session moves very quickly. It is essential that you attend class regularly if you hope to do well in this class. Students who are chronically late or absent will find that their grades will suffer. Role will be taken at the beginning of each class.
ChemA105- Topics to be covered- First Semester

1) Introduction
   Classifications in the Study of Matter. Properties of Substances. (Chapter 1)

2) Measurements In Chemistry
   Units of Measurements for length, weight, volume, pressure, temperature, joules, calories,
   density and specific gravity, significant figures, scientific notation, dimensional analysis, etc.
   (Chapter 1)

3) Structure of Matter
   Basic Laws, The Invisible Atom: Its Composition (Structure). Nucleus, Electrons, Protons,
   Bohr's Atomic Model. Energy Levels (Shells), Subshells, Orbitals and Quantum Numbers.
   Building up of Periodic Table. Hund's Rule. Ionization Potentials and Periodic Table.
   Electronegativity of the Elements (sec. 9.3). Periodicity. (Chapters 2, 3.1 -3.6, 7, 8)

4) Atoms, Molecules, Ions, Reactions - Bonding
   Compounds, Nomenclature (sec. 2.6, 2.7), What holds Atoms together, Covalent
   Bonds, Coordinate Covalent Bonds, Lewis Structures. Effects of Covalent Bond
   on Dipole Moment and Polarity of Molecules. Electrovalent (Ionic) Bond,
   Crystalline Lattice Energy, Molecular Geometry, Molecular Orbitals, Hybrid
   Orbitals. Effect of Bonding on Molecular Properties.
   (Chapters 9, 10; review Chapter 2)

5) Some Concepts in Stoichiometry
   Valence, Ions, Molecules, Gram Atom, Avogadro's number, Molecular weight, Mole.
   Molecular Architecture, Oxidation Number, The Use of Oxidation Numbers in Writing
   Formulas, Calculating Oxidation Numbers from Formulas. Types of Chemical Reactions,
   Important Features of Chemical Reactions, Balancing Equations, Use of Mole in Chemical
   Equations. (Chapter 3.7-3.10)

6) The Gaseous State
   Kinetic - Molecular Theory, Boyle's Law, Charles' Law, STP, Gay-Lussac's
   Law, Dalton's Partial Pressure Law, Ideal Gas Law. (Chapter 5)

7) The Liquid and Solid States
   Changes of State, Relationship between States, Intermolecular and Intramolecular
   Bonding, Metallic bonds, Effect of Bonding on Molecular Properties, Crystal
   Structure, Lattice energy, etc. (Chapters 11, 12)
ChemA106 -Topics to be covered-Second Semester

1) Liquids and Solutions:
   Expressing concentrations, percent solutions, molarity, molality, and molar solutions, normality and normal solutions (equivalent weights). Brownian movement, Tyndall effect, colligative properties, Raoult's Law, surface tension, diffusion, osmosis, osmotic pressure, isotonic, hypertonic and hypotonic solutions. Suspension, Colloids, dialysis, emulsions, protective colloids and gels.  (Chapter 12, Chapter 4)

2) Chemical Equilibrium:
   Law of Chemical Equilibrium  The equilibrium constant- $K_{eq}$, Le Chatelier's Principle, Effect of changing (1) concentration and (2) temperature upon equilibrium. Homogeneous and heterogeneous equilibria  (Chapter 14)

3) Ionization
   Electrolytes (review sec 4.1), extent of ionization; strong and weak electrolytes; acids and bases/ Bronsted-Lowry(review sec 4.3) / Lewis acids and bases, polyprotic acids, the strength of acids and bases; (the ionic equilibria of acids and bases). Salt effect and common ion effect on the degree of ionization. The ionization of water. The pH relationship to the concentration of $H^+$ ions. Factors affecting the strength of acids and bases. Buffer Solutions and their importance in our body. (Chapters 15, 16)

4) Salts

5) The Solubility Product -$K_{sp}$; Formation Constants- $K_f$
   The precipitation reactions. The dissolution of precipitates. Complex ions. (Chapters 16; review sec 4.2)

6) Thermochemistry

7) Chemical Thermodynamics
   Free energy, Entropy and Equilibrium . Temperature dependence of Thermodynamic properties. (Chapter 18)

8) Redox / Electrochemistry
**Oxygen**- Our most abundant element on earth. Acidic and basic oxides. Allotropes. Ozone.

**Hydrogen**- The most abundant element in the universe, preparation and properties. The activity of electromotive series of the metals. The most important oxide of hydrogen - water. Purification of water. Heavy water and hydrogen peroxide

9) **Chemical Kinetics**
   - How reactions occur. The collision and transition state theories.

10) **Nuclear Chemistry**
<table>
<thead>
<tr>
<th>Date</th>
<th>Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 29</td>
<td>Introduction</td>
</tr>
<tr>
<td>30</td>
<td>Chapter 1 History</td>
</tr>
<tr>
<td>31</td>
<td>Chapters 2 Units /Atoms &amp; Matter</td>
</tr>
<tr>
<td>June 4</td>
<td>Chapters 2, 3 Atom &amp; Matter</td>
</tr>
<tr>
<td>5</td>
<td>Chapter 3 Electronic Structure &amp; Periodic Table</td>
</tr>
<tr>
<td>6</td>
<td>Chapters 7 Electronic Structure &amp; Periodic Table</td>
</tr>
<tr>
<td>7</td>
<td><strong>Test 1</strong> (Chapters 1,2,3, part of 7)</td>
</tr>
<tr>
<td>11-13</td>
<td>Chapters 8,9,10 Periodic Perspectives/Chem bonds /VSPER/ Valence bond theory//Molecular Orbital Theory</td>
</tr>
<tr>
<td>14</td>
<td><strong>Test 2</strong> (Chapters 7, 8, 9)</td>
</tr>
<tr>
<td>15</td>
<td>(last day to withdraw)</td>
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<tr>
<td>18</td>
<td>Chapters 10 Chem bonds /Valence bond theory/Molecular Orbital Theory</td>
</tr>
<tr>
<td>19</td>
<td>Chapter 3 Atoms/molecule/ions(3.7-3.10),Stoichiometry/ reactions</td>
</tr>
<tr>
<td>20</td>
<td>Chapter 5 Gases</td>
</tr>
<tr>
<td>21</td>
<td><strong>Test 3</strong> (Chapters 3.7-3.9, 10,5)</td>
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<tr>
<td>25</td>
<td>Chapter 5,11 Gases/Intermolecular forces-Liquids and solids</td>
</tr>
<tr>
<td>26</td>
<td>Chapters 11 Intermolecular forces-Liquids and solids</td>
</tr>
<tr>
<td>27</td>
<td>Chapters 11 Intermolecular forces-Liquids and solids</td>
</tr>
<tr>
<td>28</td>
<td><strong>FINAL EXAM (CUMULATIVE)</strong></td>
</tr>
</tbody>
</table>
K. T. Crago  2007 Tentative -Lecture Schedule- Chemistry A 106  2nd Summer Session

July
2  Intro/Properties of Phases of Matter (Review Chapter 11)
   Solutions (Chapter 12 & Chapter 4)
3  Solutions (Chapter 12 & Chapter 4)
5  Equilibrium (Chapter 14)

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9  Equilibrium/Ionization (Chapters 14, 15, 16)
10 Ionization, Acids, Bases, Salts & Solubilities (Chapter 16)
11 Acids, Bases, Salts & Solubilities (Chapters 16)
12  Test I - (Chapters 4, 11, 12, 14)

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16 Thermochemistry (Chapter 6)
17 Thermochemistry (Chapter 6), Thermodynamics (Chapter 18)
18 Thermodynamics (Chapter 18)
19  Test II - Ionization, Acids, Bases (Chapters 14, 15, 16)

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23 Redox, Electro Chemistry (Chapter 19)
24 Redox, Electro Chemistry (Chapter 19)
25 Kinetics (Chapter 13)
26  Test III - (Chapters 6, 18)

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30 Kinetics (Chapter 13)
31 Nuclear Chemistry (Chapter 23)

Aug
1  Nuclear Chemistry (Chapter 23)
2  FINAL EXAM (CUMULATIVE)