

**Chemistry 1223 (01): General Inorganic Chemistry II**  
**(Core 7 or 9)**  
**Spring 2005**  
**MWF 8:00-8:50, Olin Hall 100**

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**Text:** **Chemistry**, 8<sup>th</sup> edition by Raymond Chang  
The **Student Solutions Manual** and **Student Study Guide** accompanying this text are very useful.

**Requirements:** A non-graphing, scientific calculator (TI-30X) is required (and supplied) for both in-class exercises and exams. If more familiarity with the calculator is desired, you may purchase one for approximately \$10 to 12 from either the bookstore or a local discount store. Each student must familiarize himself/herself with available computer facilities in order to access the World Wide Web as well as personal email accounts. Each student must check email periodically in order to receive class announcements, assignments, and test/quiz aids.

**Objectives:** This course provides students with an understanding of basic chemical principles applicable to real-world problems and situations, encourages students to think independently about scientific concepts related to real-world issues, and enhances the students' thinking and problem-solving skills. This course also encourages thinking and applying chemical and scientific principles towards "the big-picture" problem-solving (the application of individual concepts in solving a multi-component problem).

This course, plus Chemistry 1221 (General Chemistry Laboratory), satisfies Core Curriculum 7 or 9. The following skills will be developed during the course of this class:

<b>Liberal Arts Abilities</b> ( <a href="http://www.millsaps.edu/admiss/apply/articulationguide.pdf">http://www.millsaps.edu/admiss/apply/articulationguide.pdf</a> ):
<b>Reasoning.</b> Chemistry is a practical science utilizing logic and critical analysis in all aspects of problem-solving for homework, quizzes, tests, and class discussions.
<b>Quantitative Thinking.</b> Real-world problems involving numerical data in various formats (written, graphical, and tabular) will be used to illustrate the relationships among scientific, particularly chemical, variables. Students will enhance their comprehension skills in interpreting and applying these data as a necessary student development during this course.
<b>Historical Consciousness.</b> The study of science and scientific principles builds upon theories, laws, and principles garnered and developed from past and present study. Responsible learning of science and scientific principles includes the incorporation of these past and present principles in application to present and future problems.
<b>Communication.</b> Students will enhance their writing and communications skills through writing clear and concise explanations for tests and quizzes, as well as a writing assignment
<b>Value and Decision Making.</b> Current events in the scientific community will be incorporated into classroom discussions. These current events include varied decisions and views and will allow students to enhance their decision-making skills and allow students to discuss and form opinions.

**Attendance:** Attendance is mandatory for this class. *If more than six lectures are missed, the student's grade will automatically drop a letter grade (e.g. from a B to a C).*

**Note:** Students with disabilities are encouraged to contact the professor to discuss their individual needs for accommodations.

**Tutorial Center:** The Student Affiliates of the American Chemical Society (SAACS) run a FREE tutorial center for students taking General and Organic Chemistry classes. Students are encouraged to utilize this facility. The Center is located in Olin 119. Available tutorial times will be posted outside Olin 119.

**Grading:** The student's grade will be compiled from the following areas:

**CATEGORY PERCENTAGE OF FINAL GRADE/IMPORTANT POINTS**

**Exams:** 66% (22% each test)  
There will be three tests of equal percentage.

**Final Exam:** 22%  
The final will be comprehensive over the course of *both* the fall and spring semesters and will be a standardized ACS (American Chemical Society) Exam.

**In-Class Quizzes/Worksheets/Homework/Pop-Tests:**  
12%  
Homework will be assigned periodically to be turned in for a grade. Quizzes, worksheets, and pop-tests will be given periodically in class.

**Writing Assignment:**  
A writing assignment will be assigned and included in the laboratory grade.

Grades will be assigned according to the following scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	F
94-100	90-93	86-89	83-85	80-82	76-79	73-75	70-72	66-69	60-65	< 60

**Tentative Exam Schedule:** ***Exam 1---Friday, February 4***  
***Exam 2---Wednesday, March 9***  
***Exam 3---Friday, April 15***

**Final:** The time designated for CHEM 1223(01) (MWF classes at 8:00) to take the final exam is Friday, April 29, at 2:00 P.M. Any requests for a different exam time must be submitted in writing to the Dean.

**Makeup Policy:** All assignments must be turned in **by or before** the due date. There are NO EXCEPTIONS. Makeup exams will NOT be given except in the case of extenuating circumstances.

**Grading Errors:** If the student thinks that the instructor has made an error in his/her grade, please submit in writing (email is sufficient) the reason(s) why the student thinks he/she deserves more credit along with the assignment. This request must be turned in within one week of the assignment having been returned to the student.

**Honor Code:** This course operates under the guidelines defined by the Millsaps College Honor Code (see Major Facts, ps. 28-32, [http://www.millsaps.edu/student\\_life/majorfacts.pdf](http://www.millsaps.edu/student_life/majorfacts.pdf)). Unless otherwise noted, all work turned in for a grade is pledged to be that of your own. The following actions are considered Honor Code violations if they occur during a CHEM 1223 *exam*: Cell phones are not permitted even to check the time. The student may not leave the room without the professor's consent except in the case of an emergency. After taking an exam, discussion of an exam with other individuals who have not taken the exam is a violation.

**Changes:** Changes to this syllabus are not anticipated. If there are any changes to the course material due to time constraints, they will be announced in class.

**Course Outline (Tentative Timeline)**

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Note on "Suggested Homework Problems:" Problems in ( ) indicate the problem number for the 7<sup>th</sup> edition of Chang if it differs from the 8<sup>th</sup> edition of Chang.

**Chapter 10 Chemical Bonding II: Molecular Geometry and Hybridization of Atomic Orbitals**  
(January 10-14)

Sections 10.1-10.4 Review on your own.

Section 10.5 Hybridization in Molecules Containing Double and Triple Bonds

Section 10.6 Molecular Orbital Theory

Section 10.7 Molecular Orbital Configurations

Section 10.8 Delocalized Orbitals

Suggested Homework Problems: 25 (23), 27 (25), 44 (42), 45 (43) (25 (23) and 27 (25) will help with this question), 48 (46), 51 (49), 52 (50), 57 (55), 67 (65)

**Chapter 11 Intermolecular Forces and Liquids and Solids** (January 19-28)

Section 11.1 The Kinetic Molecular Theory of Liquids and Solids

Section 11.2 Intermolecular Forces

Section 11.3 Properties of Liquids

Section 11.4 Crystal Structure

Section 11.5 X-Ray Diffraction by Crystals

Section 11.6 Types of Crystals

Section 11.7 Amorphous Solids

Section 11.8 Phase Changes

Section 11.9 Phase Diagrams

Suggested Homework Problems: 2, 3, 7, 10, 12, 16, 18, 19, 23, 30, 31, 39, 51 (50), 52 (51), 55, 86, 88, 93, 94, 107

**Chapter 12 Physical Properties of Solutions** (Laboratory, Weeks of Jan. 10-13 and 18-21)  
(The material in Chapter 12 will be covered as part of laboratory, but you are responsible for the following material in lecture.)

Section 12.1 Types of Solutions

Section 12.2 A Molecular View of the Solution Process

Section 12.3 Concentration Units

Section 12.4 The Effect of Temperature on Solubility

Section 12.5 The Effect of Pressure on the Solubility of Gases

Section 12.6 Colligative Properties of Nonelectrolyte Solutions

Section 12.7 Colligative Properties of Electrolyte Solutions

Section 12.8 Colloids

Suggested Homework Problems: 1, 3, 4, 6, 7, 12, 16a, 18, 22, 24c, 25, 28, 37, 49, 56, 61, 62, 66, 76, 78, 87, 92

**Chapter 13 Chemical Kinetics** (February 2-14)

Section 13.1 The Rate of a Reaction

Section 13.2 The Rate Law

Section 13.3 Relation between Reactant Concentration and Time

Section 13.4 Activation Energy and Temperature Dependence of Rate Constants

Section 13.5 Reaction Mechanisms

Section 13.6 Catalysis

Suggested Homework Problems: 2, 6, 8, 11, 12, 18, 20, 22, 28, 30, 35, 38, 40, 52 (50), 54 (52), 76 (74), 80 (78), 88 (86)

**Chapter 14**    **Chemical Equilibrium** (*February 18-28*)

Section 14.1    Concept of Equilibrium and the Equilibrium Constant  
 Section 14.2    Writing Equilibrium Constant Expressions  
 Section 14.3    The Relationship between Kinetics and Chemical Equilibrium  
 Section 14.4    What does the Equilibrium Constant Tell Us? (K and Q)  
 Section 14.5    Factors that Affect Equilibrium  
 Suggested Homework Problems: 8 (b, e, f), 15 (13), 18 (16), 20 (18), 22 (20), 26 (24), 30 (28), 32 (30), 36 (34), 40 (38), 44 (42), 48 (46), 51 (49), 52 (50), 56 (54), 68 (66), 78 (76)

**Chapter 15**    **Acids and Bases** (*March 4-28, Spring Break occurs during this time.*)

Section 15.1    Bronsted Acids and Bases  
 Section 15.2    The Acid-Base Properties of Water  
 Section 15.3    pH—A Measure of Acidity  
 Section 15.4    Strengths of Acids and Bases  
 Section 15.5    Weak Acids and Acid Ionization Constants  
 Section 15.6    Weak Bases and Base Ionization Constants  
 Section 15.7    The Relationship Between the Ionization Constants of Acids and Their Conjugate Bases  
 Section 15.8    Diprotic and Polyprotic Acids  
 Section 15.9    Molecular Structure and the Strength of Acids  
 Section 15.10    Acid-Base Properties of Salts  
 Section 15.11    Acid-Base Properties of Oxides and Hydroxides  
 Section 15.12    Lewis Acids and Bases  
 Suggested Homework Problems: 5, 6, 9, 16, 20, 34, 38, 40, 42, 50, 52, 62, 66, 72, 76, 80 (78), 81, 90, 94, 106

**Chapter 16**    **Acid-Base Equilibria and Solubility Equilibria** (*April 1-11*)

Section 16.2    The Common Ion Effect  
 Section 16.3    Buffer Solutions  
 Section 16.4    Acid-Base Titrations  
 Section 16.5    Acid-Base Indicators  
 Section 16.6    Solubility Equilibria  
 Section 16.8    The Common Ion Effect and Solubility  
 Section 16.9    pH and Solubility  
 Section 16.11    Application of the Solubility Product Principle to Qualitative Analysis  
 Suggested Homework Problems: To be assigned at a later date

**Chapter 18**    **Entropy, Free Energy, and Equilibrium** (*April 13-22*)

*Chapter 6: Review on your own* the First Law of Thermodynamics and other material associated with enthalpy

Section 18.1    The Three Laws of Thermodynamics  
 Section 18.2\*    Spontaneous Processes  
 Section 18.3    Entropy  
 Section 18.4    The Second Law of Thermodynamics  
 Section 18.5    Gibbs Free Energy  
 Section 18.6    Free Energy and Chemical Equilibrium  
 \*For users of Chang, 7<sup>th</sup> Ed., please note that the 8<sup>th</sup> ed. split the 7<sup>th</sup> ed's section 2 into two sections. Thus, your section numbers will differ from the 8<sup>th</sup> ed.  
 Suggested Homework Problems: To be assigned at a later date

**Chapter 19**    **Electrochemistry** (*April 22*)

Section 19.1    Redox Reactions  
 Section 19.2    Electrochemical Cells  
 Section 19.3    Standard Reduction Potentials  
 Section 19.6    Batteries  
 Suggested Homework Problems: To be assigned at a later date