

Chemistry 1213-01

General Chemistry I

Fall 2004

Instructor: Dr. Wolfgang H. Kramer

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Office Hours: M 2-3 pm, T 8-9 am, W 2-3 pm, and by appointment
Lectures: MWF 8:00 – 8:50 am,
Location: OH 100

Textbook:

Chemistry, 8th 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 enhance 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 1211 (General Chemistry Laboratory), satisfies Core Curriculum 7 or 9. The following skills will be developed during the course of this class (<http://www.millsaps.edu/admiss/apply/articulationguide.pdf>):

Liberal Arts Abilities
Reasoning. Chemistry is a practical science utilizing logic and critical analysis in all aspects of problem-solving for homework, quizzes, tests, and class discussions.
Quantitative Thinking. 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.
Historical Consciousness. 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.
Communication. Students will enhance their writing and communications skills through writing clear and concise explanations for tests and quizzes, as well as a writing assignment
Value and Decision Making. 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.

Lectures and Attendance:

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

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.

Examinations, and Grading:

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

Exams: 60% (20% each test)
There will be three tests of equal percentage.

Final Exam: 20%
The final will be comprehensive over the course of the semester and will be a standardized ACS (American Chemical Society) Exam.

On-Line Computer Quizzes/In-Class Quizzes/Worksheets/Homework/Pop-Tests:
20%

On-line computer quizzes associated with some chapters are available to the student. The student is allowed to take the quizzes twice with the better of the two grades counting towards the student's grade. This assignment is to be worked by the individual student with no outside help either from another person, a textbook, or even notes. The Honor Code also applies to these quizzes.

Midterm examinations (3 x 20%)	:	60%
Quizzes/Homework etc.	:	20%
<u>Final Examination (1 x 20%)</u>	:	<u>20%</u>
Total:		100%

A	895 -1000	A	935 – 1000
		A-	895 – 934
		B+	855 – 894
B	795 – 894	B	825 – 854
		B-	795 – 824
		C+	755 – 794
C	695 – 794	C	725 – 754
		C-	695 – 724
		D+	655 – 694
D	595 – 694	D	595 – 654
F	0 – 594	F	0 – 594

Note that I reserve the right to change these points totals!

Writing Assignment:

A writing assignment will be assigned and included in the laboratory grade.

<u>Tentative Exam Schedule:</u>	Exam 1	October 1
	Exam 2	October 29
	Exam 3	November 22
	Final	December 10

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: For consideration of a possible grading error on an exam, you must return it to me within one week of the date I hand it back to you. Furthermore, you must include a clear written statement of why you feel you deserve more credit.

Note:

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

Honor Code:

This course operates under the guidelines defined by the Millsaps College Honor Code (http://www.millsaps.edu/academics/honor_code.shtml). Unless otherwise noted, all work turned in for a grade is pledged to be that of your own. The on-line computer quizzes are also pledges of individual work.

Study Groups:

I encourage you to work with others on problem, to discuss your work and to compare your answers. Try to learn from others and ask them to explain their reasoning to you. If they truly understand the material they should be able to explain it to others.

Changes:

Changes to this syllabus are not anticipated, but if necessary they will be announced in class and in addition I will send you an email with the change.

Important Dates:

Wednesday, August 25, 10am, **First class (You made it!!!)**

Friday, October 1, 8:00 am, **In-class examination**

Friday, October 29, 8:00 am, **In-class examination**

Monday, November 22, 8:00 am, **In-class examination**

Friday, December 10, 2 pm, Final examination

Chapter 1 Chemistry: The Study of Change (Lecture Material: Lab, Week of Aug. 30 – Sept. 3)

Note: Most of Chapter 1 will be covered in laboratory the first week of lab. You are responsible for this material in lecture and will be tested on it in lecture.

- Section 1.3 The Scientific Method
- Section 1.4 Classifications of Matter
- Section 1.5 The Three States of Matter
- Section 1.6 Physical and Chemical Properties of Matter
- Section 1.7 Measurement
- Section 1.8 Handling Numbers
- Section 1.9 Dimensional Analysis

Suggested Homework Problems: 12, 16, 17, 18, 21, 22, 24, 26, 29, 32, (35), 36, 54, (55), (56), (57), 59, (60), (64), (66), 69, 75, 79, (80)

The parentheses around the problems usually indicate that those problems are similar to other problems already assigned or that the problem will give you extra practice in addition to the other problems.

NECESSARY skills from Chapter 1: The ability to determine density, mass, or volume of a substance; the ability to convert a temperature from one scale to another scale (Fahrenheit to Celsius to Kelvin), and the ability to determine percent error. One should also know what a percentage means, what the seven base units of measure are along with their SI notation, and what are the prefixes used with SI units. All numbers and answers must be written in proper notation (scientific or other as specified) with the correct number of significant digits and with the correct units. Students should be able to convert substances from one set of units to the other using the factor-label method, and students should know basic conversion factors, such as 1 inch is equal to 2.54 centimeters.

Chapter 2 Atoms, Molecules, and Ions (Aug. 25-Sept. 1)

- Section 2.1 The Atomic Theory
- Section 2.2 The Structure of the Atom
- Section 2.3 Atomic Number, Mass Number, and Isotopes
- Section 2.4 The Periodic Table
- Section 2.5 Molecules and ions
- Section 2.6 Chemical Formulas
- Section 2.7 Naming Compounds

Suggested Homework Problems: 1, (5), 6, 10, 12, 16, 18, 26, 36, 40, (42), 44, (45), 46, 48, (52), (53), 56, 58, 63, (66), (65), 69, 77, 79

The parentheses around these problems (Chapter 2 only) indicate that these problems are writing problems to enhance one's ability to coherently discuss the theories and definitions of the concepts learned in this chapter.

Chapter 3 Mass Relationships in Chemical Reactions (Sept. 3 to Sept. 13)

- Section 3.1 Atomic Mass
- Section 3.2 Molar Mass of an Element and Avagadro's Number
- Section 3.3 Molecular Weight
- Section 3.4 The Mass Spectrometer
- Section 3.5 Percent Composition of Compounds
- Section 3.6 Determination of Empirical and Molecular formulas
- Section 3.7 Chemical Reactions and Chemical Equations
- Section 3.8 Stoichiometry
- Section 3.9 Limiting Reagents
- Section 3.10 Percent Yield

Suggested Homework Problems: 1, 2, (4), 6, (9), 10, 14, (15), 16, (17), 18, (19), 20, (23), 24, 26, 30, 40, (41), (49), 50, 53, (59), 60, (65), (66), 69, 73, 75, 77, 84, 85, 92, 91, 97, and 107

Chapter 4 Reactions in Aqueous Solutions (Sept. 15 to Sept. 29)

Section 4.1 General Properties
Section 4.2 Precipitation Reactions
Section 4.3 Acid-base Reactions
Section 4.4 Oxidation-Reduction Reactions
Section 4.5 Concentrations of Solutions
Section 4.7 Acid-Base Titrations
Suggested Homework Problems: (Ch. 4): (9), 10, (21), 22, 23, 24, (31), 32, (33), 34, (43), 44, (45), 46, 47, (48), (59), 60, (61), 62, (63), 64, 65, 66, 71, (77), 78, 87, 88, 99, 105

Chapter 5 Gases (Lab, Week of Sept. 29)

Note: Sections 5.1-5.5 will be covered in laboratory. You will be responsible for this material in lecture and will be tested on it in lecture. Sections 5.6-5.8 will be covered in lecture.

Section 5.1 Elements that exist as gases
Section 5.2 Gas Pressure
Section 5.3 The Gas Laws
Section 5.5 Gas Stoichiometry
Section 5.6 Dalton's Law of Partial Pressures
Section 5.7 Kinetic Molecular Theory of Gases
Section 5.8 Real Vs. Ideal Gases
Suggested Homework Problems: To be assigned later

Chapter 6 Thermochemistry (Oct. 4 to Oct. 15)

Section 6.1 Types of Energy
Section 6.2 Energy Changes
Section 6.3 Enthalpy
Section 6.4 Calorimetry
Section 6.5 Standard Enthalpies of Formation and Reaction
Section 6.6 Heat of Solution and Dilution
Section 6.7 Introduction to Thermodynamics
Suggested Homework Problems: 1, 22, 24, 29, 33, (34), (35), (36), 37, 39, 41, 45, 51, (53), 54, (61), 62, (63), 64, (75), 80, 95, 107

Chapter 7 Quantum Theory and the Electronic Structure of Atoms (Oct. 20 to Oct. 27)

Section 7.1 Classical Physics to Quantum Theory
Section 7.2 The Photoelectric Effect
Section 7.3 Bohr's Theory of the Hydrogen Atom
Section 7.4 The Dual Nature of the Electron
Section 7.5 Quantum Mechanics
Section 7.6 Quantum Numbers-Electron Addresses and Shapes
Section 7.7 Atomic Orbitals
Section 7.8 Electron Configuration
Suggested Homework Problems:
Concepts: 1-6 (#2 only the m/s part), 13, 14 (only photons), 21, 22, 35, 37, 45, 47, 48, 52, 72, 74, 97
Problems: 8, (11), (12), 16, (17), 20, 29, 30, 33, 34, 41, (42), 53, 55, 61, 63, 64, 79, 80, (83), 84, 86, 92, 93, 112, 124

Chapter 8 Periodic Relationships Among the Elements (Nov. 1 to Nov. 3)

Section 8.1 Development of the Periodic Table
Section 8.2 Classification of the Elements
Section 8.3 Periodic Variation in Physical Properties
Suggested Homework Problems:
Problems: 19, 20, (21), 22, 27, 28, 29, 32, (35), (36), 37, 38, (45), 46, 54, 59, (61), 60, 69, 70, 77**, 78, 82, 113.

Chapter 9 Chemical Bonding I: Basic Concepts (Nov. 5 to Nov. 12)

- Section 9.1 G. N. Lewis and Lewis Dot Symbols
- Section 9.2 The Ionic Bond
- Section 9.3 Lattice Energy
- Section 9.4 The Covalent Bond
- Section 9.5 Electronegativity
- Section 9.6 Writing Lewis Structures
- Section 9.7 Formal Charge and Lewis Structures
- Section 9.8 Resonance
- Section 9.9 Exceptions to the Octet Rule
- Section 9.10 Bond Dissociation Energy (BDE)

Suggested Homework Problems:

Definitions/concepts: 28, 29, 31, 33, 41, 42, 46, 60

Problems: 3, 4, 5, 17, 28, 29, 30, 31, (39), 40, 43, 47, 52, (55), 56, 58, 63, 69, 75, 83, 89, 92, 99, 105, 115

Chapter 10 Chemical Bonding II: Molecular Geometry and Hybridization of Atomic Orbitals (Nov. 15 to Nov. 29)

- Section 10.1 Molecular Geometry
- Section 10.2 Dipole moments
- Section 10.3 Valence Bond Theory
- Section 10.4 Hybridization of Atomic Orbitals
- Section 10.6 Molecular Orbital Theory

Concepts: 4, 15, 17, 25, 26, 45, 48

Problems: (7), 8, (11), 12, 19, 30, 33, 38, 44, 51, 57, 67