

# *Principles of Chemistry II*

*CHEM 1212K*

*Mon, Wed, & Fri (9:00 – 11:55 am), TLC 3108*

*Summer 2007*

## ***Purpose***

This is the second course in a two-semester sequence covering the fundamental principles and applications of chemistry for science majors. Topics to be covered include equilibria, thermodynamics, kinetics, and electrochemistry.

## ***Learning Outcomes***

Each student will acquire a basic understanding of equilibria, acids and bases, solubility, thermodynamics, kinetics, electrochemistry, and selected descriptive inorganic chemistry. Also, each student will learn to apply the scientific method in laboratory projects, collect and analyze scientific data and formulate appropriate conclusions from data analysis.

**Good algebra skills and a working knowledge of high school chemistry are assumed.**

**Instructor:** [Dr. Spencer Slattery](#)

**Office:** TLC-2135

**Office Hours:** M,T,W (1:30 – 3:30 p.m.)

**Phone:** 678-839-6550

**E-mail:** [sslatt@westga.edu](mailto:sslatt@westga.edu)

(use your *mywestga.edu* student e-mail account to contact me via e-mail)

## ***Textbook***

*Chemistry* - 4<sup>th</sup> edition, Silberberg, McGraw Hill Publishing Co.

## ***Exam Schedule (tentative list of chapters to be covered)***

<i>Class Meetings</i>	<i>Chapters</i>	<i>Exam</i>	<i>Quiz date</i>	<i>Exam Date</i>
June 4 – June 13	11, 12, 13	1	June 8 (Chapt. 11,12)	June 15 (Fri.)
June 18 – June 27	16, 17	2	June 22 (Chapt. 16)	June 29 (Fri.)
July 2 – July 11	18, 19	3	July 6 (Chapt. 18)	July 13 (Fri.)
July 16 – July 25	20, 21		July 20 (Chapt. 20)	-----
<b>Comprehensive Final Exam</b>	<b>1– 13, 16 - 21</b>	<b>ACS-Final</b>		<b>July 26 (Thurs) 10:00 am – noon</b>

### ***In-Class Assignments***

These assignments consist of all activities that take place during the course of each session. They include all computer and laboratory activities.

### ***Homework***

Each week the instructor will provide a list of suggested problems from your book for homework. The best way to make sure that you have thoroughly understood the material covered in class is to read the text and work through the appropriate problems, on a **REGULAR BASIS**. Keep track of the end of chapter problems that give you the most difficulty, and try similar problems for additional practice and review.

### ***Examinations***

There will be four examinations and a comprehensive final examination during the semester. You will be given 90 minutes to complete the exam (Final Exam will be given two hours) and no exams will be dropped. The exam dates will be given well in advance and will not be postponed. Please make every attempt to be present at these times since no makeup exam will be given. Please arrive on time, as no extra time will be given if you arrive late. Each examination will be closed book. You will be permitted to have a calculator and a pencil. I will provide the periodic chart. ***Cheating will not be tolerated. Any infraction will be taken before the disciplinary committee and carried out to the fullest extent.***

### ***ACS Final Examination***

The standardized examination from the American Chemical Society will serve as the final examination and it covers both semesters of freshman chemistry (Principles of Chemistry I and II). If there is a conflict with the final exam time, you must provide me with written authorization from the Dean of Arts & Sciences to move your final exam time. This note should be delivered to me at least two weeks prior to the scheduled final exam time.

### ***Semester Grades***

Your grade will be calculated based on the following formulae:

$$\text{Course \%} = 0.70 \times \text{Exam Average (100 points each)} + 0.20 \times \text{Laboratory Activities Average} + 0.10 \times \text{Workshop Average}$$

The exam average will be determined by the following formulae:

Exam Average = Sum of exams [test #1 + test #2 + test #3 + (quiz average) + (final exam)] divided by five. Notice that your average quiz grade represents an exam score.

All exams and lab activity grades will be based on your ability to DEMONSTRATE full understanding of the material. Some questions will be multiple choice (with credit given only for the correct answer), while some questions will be short answer (with full credit given only if you SHOW ALL YOUR WORK, not just for obtaining the correct answer).

Grade Scale:

**A (90.0 – 100%); B (80.0 – 89.9%); C (70.0 – 79.9%); D (60.0 – 69.9%); F (0 – 59.9%)**

## ***Workshop Chemistry***

In workshops, the large class is broken down into smaller groups. In addition to regularly scheduled lecture and laboratory sessions, you have be REQUIRED to attend a workshop that meets once a week outside of class to discuss chemistry problems and improve your understanding of the material. Workshops are something like study groups, with two prominent differences:

- Each week's workshop will go over a set of assigned questions. Please purchase the workbook available in the bookstore which contains material for each workshop.
- Each workshop will be led by a upper-level student leader who has had the course previously and who has been trained for undertaking this responsibility. The leader will act more as a facilitator than as a tutor. The purpose of workshops is to provide practice and build confidence in your own ability to do chemistry problem-solving.

Each workshop will be scheduled for a two-hour block of time. Why should you want to commit to two more hours spent on chemistry each week in addition to your time in lecture and lab?

- To be successful in chemistry, you should plan, on average, to spend AT LEAST six hours a week outside of class/lab meetings studying chemistry. The workshop can be two of them.
- Working with other students and with a leader can be more productive than doing all your studying alone. In the structured workshop setting other students can help you see something you missed and as you explain an idea to someone else it becomes more clear in your own mind.
- Workshops at other institutions have found that students participating average significantly better on chemistry tests than those not attending workshops.
- It can directly affect your grade. A 10% contribution to your overall course average is to come from workshops, and thus reduce how heavily your test scores will count.

## **Workshop Grades**

You are not judged on actual right answers, but the effort you put. The workshop portion of your grade will be based on:

- Attendance. Don't arrive late; don't leave early.
- Participation in group efforts to solve problems.
- Preparation. Practice problems should have been solved, or at least attempted, before the relevant workshop.
- Attitude.

## Assigned Homework Problems

*Suggested Problems/Exercises at the end of each Chapter*

### Chapter 12 (Intermolecular Forces: Liquids, Solids, and Phase Changes)

1. Overview of Physical States & Phase Changes (1, 2, 4, 5, 7)
2. Quantitative Aspects of Phase Changes (11, 13, 14, 18, 19, 20, 21, 23, 25, 28)
3. Types of Intermolecular Forces (30, 32, 33, 34, 37, 38, 39, 41, 42, 43, 45, 47, 49, 51, 52)
4. Properties of the Liquid State (57, 60, 61, 63, 67)
5. Uniqueness of Water (68, 69, 72)
6. The Solid State: Structure, Properties, and Bonding (75, 81, 82, 86, 88, 94, 95, 96)

### Chapter 13 (Properties of Mixtures: Solutions and Colloids)

1. Types of Solutions: Intermolecular Forces and Solubility (2, 4, 7, 9, 11, 13, 16)
2. Intermolecular forces and Biological Macromolecules (omit)
3. Why Substances Dissolve (The Solution Process (24, 25, 28, 29, 30, 31, 32, 34, 38))
4. Solubility as an Equilibrium Process (44, 46, 49)
5. Quantitative Ways of Expressing Concentration (52, 56, 58, 60, 62, 64, 66, 68, 70, 74)
6. Colligative Properties of Solutions (79, 80, 85, 88, 90, 92, 93, 94, 98, 100)
7. Structure and Properties of Colloids (class room questions will be provided)

### Chapter 16 (Kinetics: Rates & Mechanisms of Chemical Reactions)

1. Factors that influence Rxn Rate (2, 3, 5)
2. Expressing the Rxn Rate (7, 8, 10, 11, 12, 14, 16, 18, 22)
3. The Rate Law (23, 25, 26, 28, 30, 32, 34, 35, 38)
4. Integrated Rate Laws (39, 41, 43, 44, 45)
5. Effect of Temperature on Rxn Rate (49, 50)
6. Explaining the Effects of Concentration & Temperature (53, 56, 60, 62, 64)
7. Rxn Mechanisms (65, 72, 73, 75)
8. Catalysis (class room questions will be provided)

### Chapter 17 (Equilibrium: The Extent of Chemical Rxns)

1. Equilibrium State and Equilibrium Constant (3, 4, 5, 6)
2. Rxn Quotient the Equilibrium Constant (7, 8, 11, 12, 14, 16, 18, 20, 23)
3. Expressing Equilibria with Pressure Terms (25, 26, 27, 29)
4. Rxn Direction: Comparing Q and K (33, 35, 37)
5. How to Solve Equilibrium Problems (38, 41, 45, 47, 49, 51, 55)
6. Le Chatelier's Principle (62, 63, 65, 67, 69, 71, 73, 76)

## Chapter 18 (Acid Base Equilibria)

1. Acids and Bases in Water (2, 4, 5, 7, 9, 11, 13, 15, 17)
2. Auto-ionization of Water and the pH Scale (19, 21, 22, 23, 27, 29, 36)
3. Proton Transfer and Bronsted-Lowry A/B Definition (37, 40, 41, 43, 45, 49, 51, 55, 57)
4. Solving Problems Involving Weak Acid Equilibria (59, 63, 65, 67, 69, 73, 75)
5. Weak Bases and Their Relation to Weak Acids (86, 90, 92, 94, 96, 100)
6. Molecular Properties and Acid Strength (104, 107, 108, 110, 114)
7. Acid-Base Properties of Salt Solutions (117, 119, 121, 127)
8. Generalizing the Bronsted-Lowry Concept: The Leveling Effect (129, 131)
9. Electron-Pair Donation & the Lewis Acid-Base Definition (137, 139, 141, 143)

## Chapter 19 (Ionic Equilibria in Aqueous Systems)

1. Equilibria of Acid-Base Buffer Systems (7, 9, 11, 13, 15, 19, 23, 27, 29, 33)
2. Acid-Base Titration Curves (42, 54, 58, 60)
3. Equilibria of Slightly Soluble Ionic Compounds (63, 66, 70, 72, 74, 80, 82, 84)
4. Equilibria Involving Complex Ions (Omit)
5. Ionic Equilibria in Chemical Analysis (Omit)

## Chapter 20 (Thermodynamics: Entropy, Free Energy, & direction of Chemical Rxns)

1. The Second Law of Thermodynamics (2, 5, 6, 7, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26)
2. Calculating the Change in Entropy of a Rxn (32, 33, 39, 41)
3. Entropy, Free Energy, and Work (46, 48, 50, 52, 54, 56, 58, 60, 62)
4. Free Energy, Equilibrium, and Work (64, 67, 68, 70, 72, 74, 76, 78)

## Chapter 21 (Electrochemistry: Chemical Change & Electrical Work)

1. Redox Reactions & Electrochemical Cells (1, 3, 8, 10, 12, 14, 16, 18, 21)
2. Voltaic Cells: Using Spontaneous Rxns to Generate Electrical Energy (22, 26, 27, 29, 31, 33)
3. Cell Potential: Output of a Voltaic Cell (36, 37, 38, 40, 42, 44, 46)
4. Free Energy & Electrical Work (53, 56, 58, 60, 62, 64, 66, 68, 70, 72)
5. Electrochemical Processes in Batteries (74, 76)
6. Corrosion (Omit)
7. Electrolytic Cells (Omit)