

Principles of Chemistry II

Section 001, Call#41005

Chem 1220

MWF 1:30 – 2:20 PM

Fall 2005

Widt 007

Professor Philip J. Silva Office: Witdsoe Hall 024
Office Hours: MW 2:30-3:30 PM, T 1:00-2:00 PM or by appointment

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Text: "Chemistry: The Central Science" 9th Edition, Brown, Lemay, Bursten, Burdge
Prerequisites: Math 1050 or equivalent; Chem 1210 or equivalent

Recitation: You **must** be registered for a recitation section (Call# 41006-41010).
Call# 41006 F 10:30-11:20 AM BNR 278
Call# 41007 F 8:30-9:20 AM Bus 318
Call# 41008 F 9:30-10:20 AM OM 207
Call# 41009 T 12:30-1:20 PM Vet 213
Call# 41010 F 8:30-9:20 AM AgSci 338
You will meet in recitation once each week to review material from the lectures. The "cycles" of recitation are designed to prepare everyone for the midterm exams. Since midterm exams are offered on Wednesdays, no recitation sections meet on Wednesdays.
A total of 12 cycles are offered and 11 graded quizzes will be recorded (for the first 11 weeks). **One sixth (1/6) of your Chem 1220 grade is based on your best 10 of 11 recorded quizzes.**

Resource Room: Times and locations of the "Resource Room" will be announced during the first week of the term. These sessions are available on a walk-in basis to all general chemistry students.

SI Sessions: The SI for this course is Brittany Webb (brittanywebb@cc.usu.edu). She has scheduled the following times and locations for SI sessions:

Mondays at 7:30 in Animal Science (ANSC) 115
Tuesdays at 6:30 in Engineering (ENGR) 103 (this is the new engineering building)
Thursdays at 5:30 in ENGR 103

Grading: A total of 600 points is possible in Chem 1220. Points are distributed as follows:

1 st Hour Exam (W, 9/28, 1:30 PM, Witd 007)100 pts
2 nd Hour Exam (W, 11/2, 1:30 PM, Witd 007)100 pts
3 rd Hour Exam (W, 11/30, 1:30 PM, Witd 007)100 pts
Final Exam (M, 12/9, 11:30 AM, Witd 007)200 pts
Recitation quizzes (best 10 of 11 offered)100 pts
Total600 pts

Tentative Letter grade brackets (brackets could be lowered- **will Not** be raised):

A/A- 100-89% **B-/B/B+** 76-88% **C-/C/C+** 64-75% **D/D+** 50-62%

Anyone missing one of the scheduled exams for legitimate reasons (written documentation from physician, lawyer, judge, etc. required) will be eligible to take the Comprehensive Make-up Exam, offered on Friday, December 2, by appointment with Dr. Silva. Make-up recitation quizzes will not be offered.

Course Objectives/ Goals (also see Detailed Learning Objectives List):

Chemistry 1220 is designed to prepare students to understand and solve a large variety of quantitative situations important for chemical kinetics, equilibria, and thermodynamics. Within this context, problems related to acid/base reactions, pH, electrochemistry, and nuclear reactivity are addressed. Issues related to the Earth's environment are integrated into the coverage. Finally, a broad range of descriptive topics (the chemistry of metals, nonmetals, organics, and biochemicals) is presented to complete the course.

Course Provisions:

The *Americans with Disabilities Act* mandates that reasonable accommodation will be made for students with disabilities in order to assure equal participation in Chem 1220. Students requesting such accommodation must meet with Dr. Silva during the first week of classes and must coordinate such accommodations with the Disabilities Resource Center.

The administration of Chem 1220 will adhere strictly to the academic regulations stipulated in the most recent Schedule of Classes and the USU General Catalog. Withdrawal from the course will follow official USU procedures.

WebCT

I will be utilizing the WebCT management system for this section of Chem 1220. All registered students will have access to WebCT using the following process:

Using a web browser from any location go to: webct.usu.edu Log on using your Banner identity and your Banner pin# for your password. **Note: All WebCT usernames and passwords have been switched over to Banner IDs and pins as of August 21st,**

Week 8 (Tues 11/8- Mon 11/14) Chapter 21
Week 9 (Tues 11/15- Mon 11/21) Chapter 22
Week 10 (Tues 11/22- Mon 11/28) Chapter 23
(Exam 3 on Wed 11/30) Chapters 20, 21, 22

Week 11 (Tues 11/29- Mon 12/5) Chapter 24
Week 12 (Tues 12/6- Fri 12/9) Chapter 25 No quiz
(Final Exam on Mon, 12/12) Chapters 14-25

Chem 1220 Detailed Learning objectives:

Describe reaction rates in terms of zero, 1st, 2nd, 3rd order processes
Describe reaction rates as a function of temperature
Predict reaction half-lives given initial conditions
Differentiate between the plots of 1st order and 2nd order reactions
Describe the action of catalysis on a chemical reaction
Describe reactions in terms of elementary steps and rate-determining steps

Write equilibrium constant expressions
Perform calculations of concentrations, pressures using K_{eq} information
Predict the direction of a reaction using the reaction quotient
Explain Le Chatelier's Principle

Cite essential definitions of acids and bases
Utilize the autoionization of water to define pH and pOH, K_w , pK_w
Employ K_a , K_b values to calculate pH, pOH of solutions of weak acids, weak bases, and salts
Describe chemical factors that contribute to the strength of acids and bases
Apply concepts of the Common Ion effect to design and construct acid/base buffer systems
Calculate acid/base titration curves and predict end-point conditions
Describe and apply K_{sp} values to determine solubility of inorganic solids
Describe the precipitation and separation of ions utilizing K_{sp} information

Describe the chemical composition of the Earth's crust, atmosphere, and surface waters
Describe chemical reactions in the atmosphere caused by solar radiation
Describe chemical reactions related to acid rain

Describe and apply concepts of chemical spontaneity and the 2nd Law of Thermodynamics
Describe and apply the concepts of entropy to chemical reactions
Use Gibb's Free Energy to predict chemical equilibrium

Balance chemical reactions that involve changes in oxidation states
Express oxidation/reduction in terms of half reactions
Describe voltaic cells and calculate potentials using standard reduction potentials
Predict the spontaneity of oxidation/reduction reactions
Employ the Nernst Equation to calculate cell potentials and chemical concentrations
Describe the essential reactions related to common battery systems and fuel cells in use today
Describe the chemical reactions of corrosion

Describe and differentiate between fundamental types of radioactivity and radioactive processes
Predict nuclear stability based on proton/neutron ratios
Apply 1st order kinetics for radioactive decay
Compare the energetic and mass aspects of nuclear fission and nuclear fusion

Describe the fundamental aspects of the reactivity of non-metal elements
Identify the major chemical processes for purifying iron, steel, aluminum, copper, and sodium

Describe the structure and bonding in simple coordination complexes of transition metals like Fe, Cu
Predict simple electronic configurations for transition metal ions using the periodic table
Predict magnetism using simple models of Crystal Field Theory
Discuss how the color of transition metal complexes is related to d-orbital splitting

Identify and draw the structure of hydrocarbon alkanes, alkenes, alkynes, and aromatics
Identify and draw the organic functional groups ethers, aldehydes, ketones, acids, esters, and amides

Identify the chemical structure of amino acids and polypeptides
Identify the chemical structure of carbohydrate sugars and fats
Identify the chemical structure of nucleic acids and DNA, RNA