

Principles of Chemistry II

Section 001, CRN#44437

MWF 1:30 – 2:20 pm

Chem 1220

Fall 2009

Widtsoe 007

Professor John L. Hubbard **Office: Maeser Lab 361**

Office Hours : MW 11:30-12:30 pm, or by appointment

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Text: “*Chemistry: The Central Science*” 11th or 10th or 9th Editions, Brown, Lemay, Bursten

Prerequisites: Math 1050 or equivalent; Chem 1210 or equivalent

Recitation: You must be registered for a recitation section. 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. I provide the detailed schedule on the next page. A total of 11 cycles are offered and 10 graded quizzes will be recorded.

One sixth (1/6) of your Chem 1220 grade is based on your best 10 of 11 recorded quizzes.

**Supplemental : To be announced
Instruction**

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

1 st Hour Exam (M, 9/21, 1:30 am, Widtsoe 007)	100 pts
2 nd Hour Exam (M, 10/19, 1:30 am, Widtsoe 007)	100 pts
3 rd Hour Exam (M, 11/16, 1:30 am, Widtsoe 007)	100 pts
Final Exam (Wednesday, 12/9, 11:30 am , Widtsoe 007)	200 pts
Recitation quizzes (best 10 of 11)	100 pts
Total	600 pts

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

A/A- **100-88%** **B-/B/B+** **77-87%** **C-/C/C+** **60-76%** **D/D+** **50-59%**

Anyone missing one of the scheduled exams for legitimate reasons (written documentation from physician, parent, guardian, lawyer, judge, etc.) will be eligible to take the Comprehensive Make-up Exam, offered on Friday, November 20, by appointment with Dr. Hubbard. Personal or family vacations are not excused absences. **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, organic and biological substances) 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. Hubbard 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.

BlackBoard Web System

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

Using a web browser from any location go to: **bb.usu.edu** . Then , Log on using your A-number. Your password is your Banner Password. You will need to set your “Preferred Email Address” in order to receive reports about grades.

• **Course Materials are on BlackBoard:**

recommended problems/solutions, sample exams/exam keys, practice quizzes, gradebook, etc

Your Exam results will be e-mailed privately to your “preferred e-mail account as designated in Banner.

Detailed Schedule, Fall 2009

Day	Date	Lecture	Topic	Chapter	Comments
M	8/24	1	Reaction rates, Rates and stoichiometry	14	First day of Lecture
W	8/26	2	Concentration and rates- 1 st order, 2 nd order, ½ lives	14	<No Recitations Aug 25, Aug 28)
F	8/30	3	Temperature and rates	14	
M	8/31	4	Reaction Mechanisms, Catalysis		Recitation Cycle 1: Begins Tues, Sept 1 (Ch14)
W	9/2	5	Equilibrium concepts	14	
F	9/4	6	Equilibrium constants, Keq values- calculation	15	
M	9/7	-	Labor Day Holiday		Recitation Cycle 2: Begins Tue, Sept 8 (Ch15)
W	9/9	7	Applications, LeChatelier's Principle	15	
F	9/11	8	Bronsted Lowry, Autoionization of water	16	
M	9/14	9	pH scale, strong acids, strong bases	16	Recitation Cycle 3: Begins Tue, Sept 15 (Ch16)
W	9/16	10	Weak acids, weak bases, Ka, Kb, Salts	16	
F	9/18	11	Review	14,15,16	
M	9/21	EXAM 1	Chapters 14, 15, 16	EXAM 1	**No recitation Tues Sept 22
W	9/23	12	Common Ions, Buffers	17	
F	9/25	13	Acid-Base titrations, solubility equilibria	17	Recitation Cycle 4: Begins Friday Sept 25 (Ch17)
M	9/28	14	Complex ions, amphoterism, precipitation	17	
W	9/30	15	Earth's atmosphere, photochemistry, Ozone	18	
F	10/2	16	Earth's oceans, freshwater, "green" chemistry	18	Recitation Cycle 5: Begins Friday Oct 2 (Ch18)
M	10/5	17	Spontaneous processes	19	
W	10/7	18	Entropy and 2 nd Law of thermodynamics	19	
F	10/9	19	Entropy changes in reactions	19	Recitation Cycle 6: Begins Friday Oct 9 (Ch19)
M	10/12	20	Gibb's Free energy	19	
W	10/14	21	Temperature effects	19	
Thursday!	10/15	22	Review Chap 17, 18, 19	-	Note: Class on Thursday, (No Fri Recitations on 10/15)
F	10/16		Fall Break Holiday		
M	10/19	Exam 2	Chapters 17, 18, 19	EXAM 2	
W	10/21	23	Oxidation/reduction reactions, balancing reactions	20	
F	10/23	24	EMF, Spontaneity of Redox reactions	20	Recitation Cycle 7: Begins Fri, Oct 23 (Ch20)
M	10/26	25	Concentration effects on EMF	20	
W	10/28	26	Chemical Batteries	20	
F	10/30	27	Corrosion, Electrolysis	20	Recitation Cycle 8: Begins Fri, Oct 30 (Ch21)
M	11/2	28	Radioactivity, patterns of nuclear stability	21	
W	11/4	29	Nuclear transmutations, rates of decay, detection	21	
F	11/6	30	Energy change in nuclear reactions, bombs, reactors	21	Recitation Cycle 9: Begins Fri, Nov 6 (Ch22)
M	11/9	31	Hydrogen, Noble gases, halogens, Oxygen group	22	
W	11/11	32	Nitrogen group, carbon group, Boron group	22	
F	11/13	33	Review Chap 20, 21, 22		**No Recitations Fri Nov 13
M	11/16	Exam 3	Exam 3 Chap 20, 21, 22	Exam 3	
W	11/18	34	Purification of Al, Na, Fe, Cu	23	
F	11/20	35	Models of Metallic Bonding, metallic properties	23	Recitation Cycle 10: Begins Friday, Nov 20 (Chap 23)
M	11/23	36	Coordination complexes	24	
W	11/25	35	Thanksgiving		
F	11/27	36	Thanksgiving		
M	11/30	37	Color, Magnetism properties	24	Recitation Cycle 11: Begins Tues, Dec 1 (Chap 24)
W	12/2	38	Characteristics of organic molecules- functional groups	25	
F	12/4	39	Introduction to peptide bonds, proteins, DNA	25	Last Day of Lecture
W	12/9	FINAL 11:30 am	Comprehensive Final Exam Chapters 14-25	FINAL 11:30 am	

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

Suggested Strategy for a Successful Chem 1220 Semester

Everyone has different needs for achieving their academic goals. With very large classes like Chemistry 1210 and 1220, it is very important for you to understand how the class is presented- especially with regard to how information is presented and to how support services are made available.

My first suggestion is to obtain a copy of the text – 9th, 10th, or 11th editions will do fine. We have used this text for many years, and despite a few problems, it is still one of the best first-year chemistry texts available. It is a good value and useful for a complete year of chemistry. If you are a pre-med or science major with intentions of a science, medical, or technical career, I strongly suggest keeping the book for future study (like for MCAT, DAT, PCAT, GRE, etc).

I have worked extensively with the book and the changes between editions are minor. I organize the course around the book, but I will not read the book to you in class or just use PowerPoint slides to reproduce it in my lectures. Before class I suggest that you look at my detailed syllabus and see what sections will be covered each day. Before class, you need to browse those sections of the chapter and make some preliminary notes of your own – highlighting key words and concepts that will be covered, noting questions you may have. I plan to have my lecture notes available before class as Acrobat files (posted on the BlackBoard Web site).

When you come to class, have your pre-class notes organized in a notebook. My lectures and examples are organized around the material in the chapters- but you need to learn to jot down notes in your notebook as the lecture proceeds. Try to pay attention and LISTEN-

After class you complete the circle by taking your pre-class notes, and your in-class notes and see if things make sense. After you have done this, you need to look at the “Recommended Problems” for the chapter and begin to work problems. You may want to use a separate spiral notebook to do this so you can keep track of the problems you have worked out and be able to refer to them again for review.

Recitations each week are designed to help you review material. It is best to go to Recitation with a prepared mind- and be prepared to ask questions about specific things you do not understand. It is not useful to go to Recitation without preparation. One-sixth of your grade comes from the quiz at the end of recitation- so it is important to go and get as many of these points as possible.

Finally, the majority of the credit for the course rests on the 3 midterm exams (50%) and the Final exam (33%). The best way to prepare for exams is to ***practice taking exams under realistic conditions***. “Going over” old exam keys is not very productive. Be careful about taking practice exams literally. The practice exams I offer are actually real exams from previous years. However, the exams you will see will not necessarily reflect the same exact questions. The questions will require the same preparation but you will need to read and consider the questions carefully since slight changes in conditions, numbers, etc can radically change the outcome.

Remember, I will be available through the Discussion Board on the Website (“Questions Asked/ Questions Answered”). I usually start my day by looking at the web and I check it regularly during the day and in the evening after I go home. So please don’t hesitate to ask questions. By addressing questions in this way, everyone can benefit from our discussions. You may also write to me privately by email.