Principles of Chemistry II Chem 1220 Spring 2008

Section 001, CRN#11573 MWF 8:30 – 9:20 am ESLC 130

Professor John L. Hubbard Office: Maeser Lab 361 Phone: 797-1641
Office Hours : MW 12-2 pm, or by appointment jlhub@cc.usu.edu

Text: "*Chemistry: The Central Science*" 9th or 10th Edition, Brown, Lemay, Bursten
Prerequisites: Math 1050 or equivalent; Chem 1210 or equivalent

Recitation: You must be registered for a recitation section (CRN# 11574-11584). 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. Because of the Monday holidays in the Spring term (Jan 21, Feb 18), the cycles of recitations are a little complicated. Thus, I provide the detailed schedule (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.**

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 (Locations Witdsoe 226, GEOL 308, MTWR pm)

Supplemental Instruction : Times and locations for meeting with the S.I. leader Brittany Woytko will be announced by the second week of class. Brittany will attend our class each day and is especially qualified to assist students. (brittwoytko@gmail.com)

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

1st Hour Exam (W, 2/6, 8:30 am, ESLC 130)	……...….100 pts
2nd Hour Exam (W, 3/5, 8:30 am, ESLC 130)	……..……...…100 pts
3rd Hour Exam (W, 4/9, 8:30 am, ESLC 130)	……..……....100 pts
Final Exam (Mon, 4/28, **7:30 am**, ESLC 130)	……....200 pts
Recitation quizzes (best 10 of 11 offered) ……	……..……..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, April 18, 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.

- ***Course Materials are on BlackBoard:***
  recommended problems/solutions, sample exams/exam keys, practice quizzes, etc

Your Exam results will be e-mailed privately to your "preferred e-mail account as designated in Banner. MidTerm Grade reports will be sent periodically by E-Mail

Detailed Schedule, Spring 2008

Day	Date	Lecture	Topic	Chapter	Comments
M	1/7	1	Reaction rates, Rates and stoichiometry	14	**First day of Lecture**
W	1/9	2	Concentration and rates- 1st order, 2nd order, ½ lives	14	<No Recitations Jan 8-12>
F	1/11	3	Temperature and rates	14	
M	1/14	4	Reaction Mechanisms, Catalysis		**Recitation Cycle 1: Begins Mon, Jan 13 (Ch14)**
W	1/16	5	Equilibrium concepts	14	
F	1/18	6	Equilibrium constants, Keq values- calculation	15	
M	1/21	-	**Martin Luther King Holiday**		**Recitation Cycle 2 Begins Tue, Jan 22 (Ch15)**
W	1/23	7	Applications, LeChatelier's Principle	15	
F	1/25	8	Bronsted Lowry, Autoionization of water	16	<Monday, Jan 30- Last day to add>
M	1/28	9	pH scale, strong acids, strong bases	16	**Recitation Cycle 3 Begins Tue, Jan 29 (Ch16)**
W	1/30	10	Weak acids, weak bases, Ka, Kb	16	
F	2/1	11	Acid/base properties of salts, Lewis acid/bases	16	
M	2/4	12	Review	14,15,16	
W	2/6	**EXAM 1**	**Chapters 14, 15, 16**	**EXAM 1**	****No recitations Thurs Feb 7 or Fri Feb 8**
F	2/8	13	Common Ions, Buffers	17	
M	2/11	14	Acid-Base titrations, solubility equilibria	17	**Recitation Cycle 4 Begins Tue, Feb 12 (Ch17)**
W	2/13	15	Complex ions, amphoterism,	17	
F	2/15	16	Precipitation of ions	17	
M	2/18	-	**PRESIDENTS DAY HOLIDAY**	-	
Tuesday	2/19	17	Earth's atmosphere, photochemistry, Ozone	18	****Note: we meet on Tuesday !!****
W	2/20	18	Earth's oceans, freshwater, "green" chemistry	18	**Recitation Cycle 5 Begins Thurs, Feb 21 (Ch18)**
F	2/22	19	Spontaneous processes	19	
M	2/25	20	Entropy and 2nd Law of thermodynamics	19	**Recitation Cycle 6 Begins Thurs, Feb 28 (Ch19)**
W	2/27	21	Entropy changes in reactions	19	
F	2/29	22	Gibb's Free energy, temperature relationships	19	**Leap Day!!!**
M	3/3	23	Review	17,18,19	****No recitations Thurs Mar 6 or Fri Mar 7****
W	3/5	**EXAM 2**	**Chapters 17, 18, 19**	**EXAM 2**	<Mar 7 Last day to Drop with a "W"/ or P/F change>
F	3/7	24	Oxidation/reduction reactions, balancing reactions	20	
M	3/10	-	**SPRING BREAK**	-	**SPRING BREAK**
W	3/12	-	**SPRING BREAK**	-	**SPRING BREAK**
F	3/14	-	**SPRING BREAK**	-	**SPRING BREAK**
M	3/17	25	EMF, Spontaneity of Redox reactions	20	**Recitation Cycle 7 Begins Mon, Mar 17 (Ch20)**
W	3/19	26	Concentration effects on EMF	20	
F	3/21	27	Chemical Batteries	20	
M	3/24	28	Corrosion, Electrolysis	20	**Recitation Cycle 8 Begins Mon, Mar 24 (Ch21)**
W	3/26	29	Radioactivity, patterns of nuclear stability	21	
F	3/28	30	Nuclear transmutations, rates of decay, detection	21	<Apr 1 Last day to drop with "W/F" >
M	3/31	31	Energy change in nuclear reactions, bombs, reactors	21	**Recitation Cycle 9 Begins Mon, Mar 31 (Ch22)**
W	4/2	32	Hydrogen, Noble gases, halogens, Oxygen group	22	
F	4/4	33	Nitrogen group, carbon group, Boron group	22	
M	4/7	34	Review	20,21,22	****No recitations For the week of Apr 7-11****
W	4/9	**EXAM 3**	**Chapters 20, 21, 22**	**EXAM 3**	
F	4/11	35	Purification of Al, Na, Fe, Cu	23	
M	4/14	36	Models of Metallic Bonding, metallic properties	23	**Recitation Cycle 10 Begins Mon, Apr 14 (Chap 23)**
W	4/16	37	Coordination complexes	24	
F	4/18	38	Color, Magnetism properties	24	Make-up Exam (by permission/appointment only)
M	4/21	39	Characteristics of organic molecules- functional groups	25	**Recitation Cycle 11 Begins Mon, Apr 21 (Chap 24)**
W	4/23	40	Carbonyls, introduction to peptide bonds, proteins	25	
F	4/25	41	Nucleic Acids, DNA	25	**Last Day of Lecture**
MON	4/28	**FINAL** 7:30 am	**Comprehensive Final Exam Chapters 14-25**	**FINAL 7:30 am**	**NOTICE - Early Time !!!**

Recitation "cycles"	**Coverage**	**Comments**
Week 1 (Mon 1/14- Fri 1/18)	Chapter 14	Mon-Fri Cycle
Week 2 (Tues 1/22- Mon 1/28)	Chapter 15	*Cycle Begins on Tuesday, ends on the following Monday*
Week 3 (Tues 1/29 - Mon 2/4)	Chapter 16	Tues-Mon Cycle
No recitations Tues 2/5, Thurs 2/7, Fri 2/8, or Mon 2/11		**(Exam 1 on Wed 2/6) Chapters 14, 15, 16**
Week 4 (Tues 2/12- Tues 2/19)	Chapter 17	**Note: Tues 2/19 is a Monday Schedule**
Week 5 (Thur 2/21- Tue 2/26)	Chapter 18	Cycle Now Begins on Thurs, ends the following Tues
Week 6 (Thur 2/28- Tue 3/4)	Chapter 19	Thurs-Tues Cycle
No recitations Thurs 3/6 or Fri 3/7		**(Exam 2 on Wed 3/5) Chapters 17, 18, 19**
<<<Spring Break 3/10 - 3/14>>>		
Week 7 (Mon 3/17- Fri 3/21)	Chapter 20	Cycle Now Begins on Monday, ends on Friday
Week 8 (Mon 3/24- Fri 3/28)	Chapter 21	Mon-Fri Cycle
Week 9 (Mon 3/31- Fri 4/4)	Chapter 22	Mon-Fri Cycle
No recitations Mon 4/7, Tues 4/8, Thurs 4/10, Fri 4/11		**(Exam 3 on Wed 4/9) Chapters 20, 21, 22**
Week 10 (Mon 4/14- Fri 4/18)	Chapter 23	Mon-Fri Cycle
Week 11 (Mon 4/21- Fri 4/25)	Chapter 24,25	Mon-Fri Cycle
(Final Exam on Mon Apr 28)	**Chapters 14-25**	**7:30 am ESLC 130- Note the Early Time-**

Chem 1220 Detailed Learning objectives:

Describe reaction rates in terms of zero, 1^{st}, 2^{nd}, 3^{rd} order processes
Describe reaction rates as a function of temperature
Predict reaction half-lives given initial conditions
Differentiate between the plots of 1^{st} order and 2^{nd} 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 2^{nd} 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 1^{st} 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