Principles of Chemistry II Chem 1220 Summer 2007

MTWRF 9:00 – 10:20 AM **Widt 007**

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Office Hours: MW 10:30-11:30 AM, R 2:00-3:00 PM or by appointment psilva@cc.usu.edu

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

Recitation: There are no recitation sections during summer session. Recitation hours have been added into normal lecture hours. We will have quizzes and go over problems during the normal lecture hours.

SI Sessions: There is no SI during the summer session.

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

1st Hour Exam (F, 6/22, 9:00 AM, Witd 007) .....100 pts
2nd Hour Exam (W, 7/11, 9:00 AM, Widt 007) .....100 pts
3rd Hour Exam (F, 7/27, 9:00 AM, Witd 007) .....100 pts
Final Exam (F, 8/3, 9:00 AM, Witd 007) .....200 pts
Quizzes (best 10 of 11) .....100 pts
Total ....600 pts

The three mid-term exams will be composed of 25 multiple choice questions worth 4 points each and you will have 50 minutes to complete them. If you miss a mid-term exam and have a valid excuse (*e.g.* sickness, family emergency) you must immediately inform Dr. Silva and you will be allowed to take a cumulative make-up exam on 7/30/2007 @ 10:30 AM which will substitute for the exam you missed. The final exam on 8/3/2007 will be cumulative and composed of 40 multiple choice questions worth 5 points each. You will have the full 80 minute period for the final exam. Quizzes will be administered at the **beginning** of a class session and make-up quizzes **will not be offered**.

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%**

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.

Blackboard Vista

The university is currently switching over from the WebCT system to the Blackboard Vista system. I will be utilizing the Vista management system for this summer session of Chem 1220. All registered students will have access to Vista using the following process:

Using a web browser from any location go to: **http://bb.usu.edu** You should be asked for username and password. This should be the same login you use for banner: Banner A# and banner pin#. If you cannot login to Bb Vista, you need to call the IT service desk (797-HELP) for assistance. The service desk can reset your Banner Pin and query to look at enrollment information. They can also help if for some reason you are not showing up in Bb Vista but are enrolled in Banner. **Note: If you have problems accessing Blackboard and the IT department is not helpful, let me know. If problems with Blackboard occur and persist, I will be using the chemistry department webserver as a backup location for storing lecture notes, etc. The website URL is http://www.chem.usu.edu/~psilva/Chem1220_Su2007.html**

Tentative Lecture Schedule, Summer 2007

Day	Date	Lecture	Topic	Chapter	Comments
M	6/11	1	Characteristic of organic molecules	25	**Introduction, Pre-assessment**
T	6/12	2	Carbonyls, introduction to peptide bonds, proteins	25	**Demo 1: Water-soluble, lipid soluble organics**
W	6/13	3	Reaction rates, Rates and stoichiometry	14	**Quiz 1: Chapter 25;**
R	6/14	4	Concentration and rates- 1st order, 2nd order, ½ lives	14	**Demo 2: Combustion vs rust**
F	6/15	5	Temperature, Reaction Mechanisms, Catalysis	14	
M	6/18	6	Equilibrium concepts	15	**Quiz 2: Chapter 14**
T	6/19	7	Equilibrium constants, Keq values- calculation	15	
W	6/20	8	Applications, LeChatelier's Principle	15	
R	6/21	9	Bronsted Lowry, Autoionization of water	16	**Quiz 3: Chapter 15**
F	6/22	**EXAM 1**	**Chapters 25, 14, 15**	**EXAM 1**	
M	6/25	10	pH scale, strong acids, strong bases	16	**Demo 3: pH meter**
T	6/26	11	Weak acids, weak bases, Ka, Kb	16	
W	6/27	12	Acid/base properties of salts, Lewis acid/bases	16	
R	6/28	13	Common ion effect, Buffers	17	**Quiz 4: Chapter 16**
F	6/29	14	Acid-Base titrations, solubility equilibria	17	
M	7/2	15	Complex ions, amphoterism, precipitation of ions	17	**Demo 4: Cobalt ions**
T	7/3	16	Earth's atmosphere, photochemistry, Ozone	18	**Quiz 5: Chapter 17**
W	7/4	-	**Independence Day Holiday**	-	-
R	7/5	17	Particles, climate change	18	**Demo 5: ammonium nitrate**
F	7/6	18	Earth's oceans, freshwater, "green" chemistry	18	
M	7/9	19	Spontaneous processes	19	**Quiz 6: Chapter 18**
T	7/10	20	Entropy and 2nd Law of thermodynamics	19	
W	7/11	**EXAM 2**	**Chapters 16, 17, 18**	**EXAM 2**	
R	7/12	21	Gibb's Free energy, temperature relationships	19	
F	7/13	22	Redox reactions, balancing reactions	20	**Quiz 7: Chapter 19**
M	7/16	23	Voltaic cells, EMF	20	**Demo 6: dissolving pennies**
T	7/17	24	Spontaneity of Redox reactions, Concentration effects	20	
W	7/18	25	Batteries, Corrosion, Electrolysis	20	**Demo 7: hydrolysis of salt water**
R	7/19	26	Radioactivity, patterns of nuclear stability	21	**Quiz 8: Chapter 20**
F	7/20	27	Nuclear transmutations, rates of decay, detection	21	
M	7/23	28	Energy change in nuclear reactions, bombs, reactors	21	
T	7/24	-	**Pioneer Day Holiday**	-	-
W	7/25	29	Periodic concepts, trends and reactivity, hydrogen	22	**Quiz 9: Chapter 21**
R	7/26	30	Noble gases, halogens, Oxygen group	22	
F	7/27	**EXAM 3**	**Chapters 19, 20, 21**	**EXAM 3**	
M	7/30	31	Nitrogen group, carbon group, Boron group	22	**Make-up exam day, 10:30-11:20**
T	7/31	32	Metals, pyrometallurgy, electrometallurgy	23	**Quiz 10: Chapter 22**
W	8/1	33	Metallic bonding, Semi-conductors, transition metals	23	**Demo 8: transition metals**
R	8/2	34	Coordination complexes, Ligands	24	**Quiz 11: Chapter 23**
F	8/3	**FINAL**	**Comprehensive Final Exam Chapters 14-25**	**FINAL**	

Chem 1220 Detailed Learning objectives:

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

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