CHEMISTRY 1220 — UTAH STATE UNIVERSITY EASTERN
PRINCIPLES OF CHEMISTRY II — PRICE, UT
4 CREDIT HOURS — SPRING 2022

MWRF 10:30 – 11:20 am
RV 239

Instructor: Dr. John Weber
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Office Hours: M - F 9:30-10:30 am
(or by appointment)
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1. Course content: This course is a continuation of Principles of Chemistry I and is designed for pre-medical/dental, pre-engineering, chemistry, and science students. Concepts include chemical kinetics and equilibrium, acid and base equilibria, aqueous equilibria, thermodynamics, electrochemistry, reactions involving hydrogen, oxygen and the main-group elements, coordination chemistry, metals and solid-state materials, nuclear chemistry, organic chemistry and biochemistry.

2. Pre-requisite: Successful completion of CHEM 1210.

3. Required Textbook and Supplies: Textbook: "Chemistry" -- 5th Edition, McMurry & Fay, Publisher: Pearson Prentice Hall, ISBN 978-0-13-199323-5; scientific calculator and a Periodic Table (Bookstore). You *should* bring your periodic table and calculator to class. You *must* bring your calculator to exams. The solutions manual for textbook problems is available in the library.

4. Course Objectives and Assessment: At the successful completion of this course students should understand the concepts listed under 'course concepts' as well as be able to think critically about and solve problems related to the concepts. Students will be assessed on chemistry proficiency by completing written exams, quizzes, and essay assignments. iClicker quizzes and recitation assignments will also be employed.

5. Learning outcomes

- 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 and 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 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
- Describe the chemical reactions of corrosion
- Describe how reactions in a nuclear power plant are initiated and controlled
- Apply 1st order kinetics for radioactive decay
- 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

5. Classroom Accommodation for Students With Different Abilities:

   USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

6. Policies and Procedures:

   a. Attendance Policy: Attendance will not be taken nor graded, but it is highly recommended that you attend class.

   b. Hours of lecture each week: 50 minutes on MWF from 10:30-11:20 am. Lab meets on Monday (RV 230) for 3 hours from 3:00 – 5:50 PM.

c. Recitation section: All students are required to attend Thursday recitation from 10:30-11:20am. Problem solving strategies and homework questions will be discussed and weekly assignments will be completed.

d. Textbook assignments: Reading and problem assignments will be given in class. Answers to selected problems may be found in the appendix of the textbook. The solutions manual is available in the library. Textbook questions will help solidify an understanding of concepts that will appear on the exams.

e. Academic integrity is expected in all your work. The University standard for academic integrity may be found at http://www.usu.edu/policies/PDF/Acad-Integrity.pdf

f. Canvas will be used to manage this course. Log on to Canvas using your A# and password from https://usu.instructure.com/. If you are enrolled in this course, you should have access to "Sp22-CHEM1220-PH1". Lecture notes, the syllabus, grades, homework assignments, and resource materials will be available through Canvas.

7. Laboratory (CHEM 1225): The laboratory section is a separate course. You will receive separate grades for CHEM 1220 and CHEM 1225. CHEM 1225 meets on Mondays from 3:00 – 5:50 pm in Reeves 230 starting Jan. 25th.

8. Grading Procedures:

Grades will be based on your performance on five regular exams, a final exam, regular quizzes, and homework/recitation assignments. Quizzes will be unannounced and will focus on current lecture topics. The average of your quiz scores will count equivalent to one regular exam. Exams will focus on the most recent topics but all exams including the final may be considered to be 'cumulative'. The score of the final exam may be used to replace the lowest score on a regular exam. The final exam may not replace the quiz score. A total of 800 points are possible to be earned during the course: 500 points from exams, 100 points from the final, 100 points from quizzes and 100 points from homework and recitation assignments.

No make-up exams will be given except as a result of scheduled school activities. If you have conflicts with an exam time as a result of scheduled school activities, you must inform me in advance and in writing on school letterhead with your advisor/instructor stating the nature of the conflict. There will be no opportunities to make up quizzes or recitation assignments; you must be in class on the assigned day in order to receive credit.

Grades will be assigned based on the following standard:

A	92-100%
A-	90-91%

B+	87-89%
B	82-86%
B-	80-81%
C+	77-79%
C	72-76%
C-	70-71%
D	60-69%
F	<60%

There will be no 'curve' applied to the exam results.

9. Topical Outline for the Course:

Chapters 10, 11	Exam 1
Chapters 12, 13	Exam 2
Chapters 14, 15	Exam 3
Chapters 16, 17	Exam 4
Chapters 18, 19	Exam 5

The Final Exam will be Friday, April 30th. The ACS nationally normed cumulative general chemistry exam will be used for the Final.

10. Help options: Come to regularly scheduled office hours. I will attempt to meet at other times if you have a conflict during my office hours. Check the schedule posted on my office door. Don't wait until the day before the test to come for help. Avail yourself of the discussion board and chat room at the course Canvas site to discuss issues and problems with your classmates. Find a study partner if possible. While you will need to be able to work problems on your own, collaboration is encouraged when working the textbook problems and recitation assignments.

The instructor reserves the right to make changes to this syllabus at any time throughout the semester. Such changes will be announced during class and posted on the course Canvas page. Students not attending class are still responsible for knowing about any and all changes to the syllabus.