TEXTBOOKS: **REQUIRED :**

1) " Chemistry, Structure and Properties ", Nivaldo Tro, 2015
2) Access to Mastering Chemistry
3) Clicker system

Grading:

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|---|---|
| Midterm Exam | 180 points |
| Final Exam | 320 points |
| Quizzes | 160 points |
| Homework | 80 points |
| Clicker questions | 55 points |
| Group Project | 205 points |
| Total | 1000 points |

The Midterm Exam will be given in lecture on July 13. The final exam will be given on Friday, August 7 and will be comprehensive. Quizzes (8) will be given in discussion sections(Clicker). The grading scale will be 1000-900 A, 899-800 B, 799-700 C, 699-600 D, below 600 F

LABORATORY; C126 is a separate course and the student will receive a separate grade for C106 and C126. Laboratories will, however, correlate with C106 lecture material.

HOMEWORK: Homework will be assigned Mastering Chemistry. Homework is due on due date.

DISCUSSION SECTIONS: Discussion sections will be for answering questions on lecture material, reading material, homework problems, etc., but no new material will be presented.

GENERAL REQUIREMENTS: Students will be responsible for all lecture material, reading assignments, and homework assignments. Students are expected to read all text material before it is presented in lecture. It is assumed that students have covered material contained in chapters 1 through 14 in this text in C105 or an equivalent course.

WITHDRAWAL POLICY: A student may withdraw at any time through Sunday July 26 without the consent of the instructor and receive the grade of W. Any student who decides to drop the course must fill out a withdrawal form or they will receive the grade of an F. After August 2, a student may withdraw only with the permission of his or her Dean. The approval is given only for urgent reasons related to extended illness or equivalent distress. To then qualify for a grade of W, a student must be passing the course on the day of withdrawal. If the student is failing, the grade recorded on the withdrawal date will be an F. This paragraph is University policy. Please make sure you understand this paragraph since no exceptions can be made.

GENERAL OUTLINE: Material contained in Chapters 15 through 22, in the text will be covered in the course. The following is a course outline. Exam dates are not subject to change unless the University is closed on a scheduled exam date due to bad weather. The exam would then be given on the next scheduled lecture date.

| DATE | TOPIC(S) | CHAPTER | Mastering Chemistry Due |
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| June | 29 | Chemical Kinetics Groups Due | 15 | |
| July | 1 | Chemical Equilibrium Determine | 16 | Intro, Kinetics |
| | 3 | July 4th Holiday | | |
| | 6 | Acid-Base | 17 | |
| | 8 | Acid Base/Buffers | 18 | Equilibrium |
| | 10 | Library Introduction Presentation Topic Outline due | Meet in RH 202 | |
| | 13 | Midterm | | |
| | 15 | Class Cancelled-Students work on papers in Library | | Acid/Base |
| | 17 | Class Cancelled-Students work on papers in Library | | |
| | 20 | Thermodynamics 1st Draft Due | 19 | |
| | 22 | Electrochemistry | 20 | Buffers |
| | 24 | Redox Reactions, | | Thermodynamics |
| | 27 | Nuclear, 2nd Draft Due | 21 | Electrochemistry |
| | 29 | Organic | 22 | |
| | 31 | Transition Metals | 23 | Nuclear |
| August | 3 | Presentations/Papers | | Organic |
| | 5 | Presentations/Papers | | |
| | 7 | Final Exam ( Comprehensive) | | |

<u>Presentation/Paper Guidelines:</u> The topic must be chosen from a recent (2014 or later) Science or Nature Journal. Papers/presentations are to be done in pairs. There must be a minimum of 5 journal (NOT INTERNET) sources. The paper & presentation are to be a summary of your research on the topic.

<u>COURSE OBJECTIVES:</u>

- Understand Rates of reactions and chemical equilibria
  - Students determine which experimental results to compare and determine the orders of reactions with respect to reactants
  - Students choose between possible mechanisms on the basis of the rates of the reaction
  - Students calculate rates of reactions and rate constants
  - Students will use the Arrhenius equation to determine activation energies
  - Students will use an ICE chart to calculate equilibrium constants
  - Use the LeChatlier principle to predict the outcome of stressing a system in equilibrium
- Understand acid, base, and buffered systems
  - Students will predict the titration curve of a strong acid/strong base, weak acid/strong base, and strong acid/weak base
  - Identify compounds as Lewis Acids/Bases, Bronsted-Lowry Acids/Bases or Arrhenius Acid/Bases & write balanced equations of the dissociation of Bronsted-Lawry acids & bases
  - Students will use ICE charts to predict the pH of solutions involving buffers
  - Students determine conjugate acids or bases from a weak acid or base.
  - Students predict the pH of a salt in water
  - Students will interconvert between Ka, Kb, Kw, pKa, and pKb
  - Students will calculate the % dissociation of a weak acid from the Ka and concentration.
- Understand Redox reactions
  - Assign oxidation numbers to each atom in a chemical species
  - Identify the species oxidized, reduced, the oxidizing reagent and reducing agent.
  - Use the electromotive series to predict whether a redox reaction will occur in a reaction
  - Balance redox reactions by the half-reaction method & identify the oxidation and reduction half reactions in common reactions
- Understand Thermodynamics

- Students will determine the $\Delta S$ of pairs of pictures of molecules
- Given $\Delta H$ and $\Delta S$, students will calculate G
- Given 2 of the thermodynamic properties, students will predict the spontaneity of a reaction
- Students will apply the three laws of thermodynamics

- Understand 3 bonding theories
  - Sketch a molecular orbital diagram for a simple diatomic molecule
  - Use the molecular orbital diagram to determine the number of unpaired electron & calculate the bond order.
  - Determine the hybridization of main group simple molecule central atoms
  - Combine valence bonding & molecular orbital theories to describe delocalized bonding
  - Write electron dot symbols for atoms, tell how many electrons must be shared, and give the symbol of the noble gas with the same number of valence electrons
  - Draw electron-dot structures for simple and polyatomic molecules.
  - Recognize when resonance structures are needed, draw them, and give the bond order
  - Calculate the formal charge on each atom in a molecule.
  - Use VSEPR to predict the geometries of molecules and polyatomic atoms
  - Show the orbital overlaps in σ and π bonds
- Understand Solubility
  - Students will calculate a solubility curve, given the Ksp of an ionic compound
  - Students will justify differences in molar solubilities using LeChatlier's Principle
- Understand Electrochemistry
  - Students will sketch a galvanic cell and identify, the anode, cathode, signs, half-reactions at each electrode, and electron and ion flow, and use shorthand notations for galvanic cells
  - Students will write balanced chemical reactions for a galvanic cell
  - Students will use the Nernst equation to calculate cell potentials
  - Students will calculate equilibrium constants from standard cell potentials
  - Compare fuel cells and batteries
- Understand Trends in Periodic Table Properties
  - Determine the empirical formula of a hydrate
  - Write balanced net ionic equations for the reaction of water with alkali metals, alkaline earth metals, and halogens
  - Draw molecular orbital energy-level diagrams and determine bond orders and magnetic behavior of peroxide and superoxide ions.
  - Identify trends in periodic table in terms of metallic character, ionization energy, atomic radius, electronegativity, acidic oxide, ionic hydride, ionic oxide.
  - Write balanced chemical equations
  - Assign oxidation states to transition metals
  - Draw structures for transition metal compounds containing chelate ligands, identifying the Lewis acid, Lewis base, ligand donor atoms, and chelate rings, and determine the coordination number, coordination geometry, and oxidation state of the metal.
  - Write formulas of coordination complexes. Identify the ligands and their donor atoms. Determine the coordination number and the oxidation state of the metal and the charge on any complex ion.