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Chemistry 211
Principles of Chemistry I
Fall 2013 CRN: 1461

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Email: alexand1@marshall.edu   **Class Time:** M, W 4 – 5:15 PM   **Section**: 106
Classroom: 465 (Please note the room change from 473)
Office Hours: 10-11:30 AM M,W,F and 3:15-4 PM M, W and by appointment

Text: Chemistry-The Science in Context, **3rd Edition, Gilbert**, Kirss, Foster, and Davies. This book is available in print bundled with the required SmartWork homework access key and ebook, and as an ebook/SmartWork only bundle.

Purpose of Course: To begin the general study of chemistry emphasizing the problem solving skills necessary to apply the concepts of chemistry to a variety of situations. Several basic topics will be explored this term. These topics include properties of matter, atomic structure, chemical reactions and stoichiometry, the periodic table, thermochemistry, introductory acid-base and oxidation-reduction reactions, electronic structure of atoms and quantum mechanics, bonding, molecular geometry, gas laws, and intermolecular forces. This course is intended for chemistry majors and pre-professional students.

Course content and grading: Five tests will be given composed of multiple choice and free response (including problems) questions. The tests will make up 60% of the final grade. The final exam will count as 20% of the grade. Quizzes will be given and will represent 10% of the final grade (NXT clicker will be used for some quizzes). Approximately 1 in 5 quizzes will be dropped. Clicker questions will add up to 5% to your grade. Online homework will represent 10% of your grade. The grading scale will be no higher than $A \geq 90\%$, **B** 80 to 89%, **C** 70 to 79%, **D** 60 to 69%, and **F** < 60%. I reserve the right to use any modification to this system leading to no lower grades.

Attendance: Regular attendance is expected. No makeup tests or quizzes will be given unless prompt arrangements are made (complete before next class). Makeup day is 12/4 (sign up and a university excuse are required).
Homework problems will be assigned for each chapter, will need to be completed online in SmartWork, and will be collected for a grade. Problems similar to those on the homework will be included on the tests and quizzes.
Attendance, reading, and working the homework are essential for successful completion of this course. You should plan on working 2 hours outside of class for each hour in class.
Please seek me out if you want or need help. Should attendance problems arise contact me before you miss if at all possible. Please be on time and do not disrupt class by coming in late.

Required Materials:
Clicker: Turning Technologies Responsecard NXT used for quizzes and homework
SmartWork access for the textbook
Simple non-programmable calculator. Please use a simple non-programmable calculator for exams and quizzes. Using a calculator to store information for a test is a reason for receiving a zero on that test. Academic dishonesty will not be tolerated.

Comments on success in this class:
1. **Keep up.** Do reading, problems, etc. promptly.
2. **Ask for help.** Ask questions in class and seek out other students and the instructor for help. Study/homework groups are often helpful.

3. **Read before class to improve understanding.**
4. **Do the homework. View the posted PowerPoint's and videos.**
5. **Form a study group.** Study/homework groups are often helpful.

Electronic Device Policy: All cell phones and pagers must be turned to vibrate during class. The instructor reserves the right to answer any ringing cell phones during lecture, or to dismiss the offending student. Recording of lectures without the instructor's permission is prohibited. During examinations, all electronic devices except calculators must be inaccessible. Students **MUST BRING A CALCULATOR** to class for all lectures and exams. Calculators that are part of a cell phone or PDA are <u>not</u> acceptable during an exam or quiz.

All university policies, which can be found at this link http://www.marshall.edu/wpmu/academic-affairs/?page_id=802, will be observed.

Approximate Schedule

Week of	Chapters/ Tests	Week of	Chapters/ Tests
8/25	1	10/20	Test 3, 7
9/1	2	10/27	7
9/8	3, Test 1	11/3	8
9/115	3	11/10	8, 9, Test 4
9/22	4	11/17	9, 10
9/29	Test 2, 5	11/24	Fall Break
10/6	5, 6	12/1	Test 5, 10 Final Exam
10/13	6		

Important Dates

August 25	First day of Class
September 1	Labor Day Holiday
October 20	Freshman midterm grades due
October 31	Last Day to Drop
November 24-29	Fall Break No Class

December 6, SATURDAY 9:50 AM   Final Exam

Objectives:
At the end of each of the following chapters successful students will be able to:
Chapter 1
1. Describe forms of matter and their structures at the atomic level
2. Relate chemical formulas to molecular structures and vice versa
3. Distinguish between physical processes and chemical reactions and between physical and chemical properties
4. Use a systematic approach to solve problems
5. Describe the three states of matter and the transitions between them at the macroscopic and atomic levels
6. Describe the scientific method
7. Distinguish between exact and uncertain values
8. Express values with the appropriate number of significant figures

Chapter 2
1. Describe subatomic particles and how they are distributed inside atoms
2. Explain how the experiments of Thomson, Millikan, and Rutherford contributed to our understanding of atomic structure
3. Identify isotopes and use natural abundance data to calculate average atomic mass
4. Use the periodic table to predict the chemical properties of elements
5. Describe the general differences in the properties of metals, nonmetals, and metalloids
6. Name common ionic and molecular compounds and write their formulas
7. Describe how elements are synthesized in the cores of giant stars

Chapter 3
1. Use Avogadro's number and the definition of the mole in calculations
2. Write balanced chemical equation that describe chemical reactions
3. Use balanced chemical equations to relate the mass of a reactant to the mass of a product
4. Determine a molecular formula from the empirical formula and molar mass of a substance
5. Use data from combustion reactions in determining empirical formulas of substances
6. Determine the limiting reactant in a chemical reaction
7. Calculate the theoretical and percent yields in a chemical reaction

Chapter 4
1. Express the concentrations of solutions in different units and convert from one set of units to another
2. Calculate the molar concentration (molarity) of a solution, the mass of a solute, or the volume of a stock solution required to make a solution of specified molarity
3. Calculate the concentration of a solute from stoichiometry and titration data
4. Identify strong electrolytes, weak electrolytes, and nonelectrolytes from conductivity experiments
5. Write molecular, overall ionic, and net ionic equations for reactions
6. Predict precipitation reactions using solubility rules and quantify results from precipitation titrations
7. Identify redox reactions, oxidizing agents, and reducing agents, and balance redox reactions

Chapter 5
1. Identify familiar endothermic and exothermic processes
2. Calculate changes in the internal energy of a system
3. Calculate thermochemical values using data from Calorimetry experiments
4. Recognize and write equations for formation reactions
5. Calculate enthalpies of reaction
6. Calculate and compare fuel and food values and fuel densities

Chapter 6
1. Distinguish gases from liquids and solids
2. Calculate changes in the volume, temperature, pressure, and number of moles of a gas using the combined gas law and the ideal gas law
3. Calculate the density of any gas, and determine the mole fraction and the partial pressure of a gas in a mixture
4. Use kinetic molecular theory to explain the behavior of gases
5. Calculate the root-mean-square speed of a gas and relative rates of effusion and diffusion
6. Use the van der Waals equation to correct for nonideal behavior

Chapter 7
1. Describe the wavelike and particle-like properties of electromagnetic radiation
2. Explain the complementary nature of the absorption and emission lines of atomic spectra and describe the relationship of those lines to electron transitions between energy levels in atoms
3. Explain the photoelectric effect using quantum theory
4. Assign quantum numbers to orbitals and use their values to describe the size, energy, and orientation of orbitals
5. Use the aufbau principle and Hund's rule to write electron configurations and draw orbital diagrams of atoms and monatomic ions
6. Explain the energies of orbitals based on the concept of effective nuclear charge
7. Relate the ionization energies and electron affinities of the elements to their positions in the periodic table

Chapter 8
1. Describe ways in which covalent, ionic, and metallic bonds are alike and ways in which they differ
2. Draw Lewis structures of molecular compounds and polyatomic ions including resonance structures when appropriate
3. Predict the polarity of covalent bonds based on differences in the electronegativities of the bonded elements
4. Use formal charges to identify preferred resonance structures
5. Describe how bond order, bond energy, and bond length are related

Chapter 9
1. Explain the theory of valence-shell electron-pair repulsion (VSEPR)
2. Use VSEPR and the concept of steric number to predict the bond angles in molecules and the shapes of molecules with one central atom
3. Predict whether a substance is polar or nonpolar based on its molecular structure
4. Use valence bond theory to explain bond angles and molecular shapes
5. Recognize molecular shapes that are stabilized by delocalization of π electrons
6. Recognize chiral molecules
7. Draw molecular orbital (MO) diagrams of diatomic molecules and use MO diagrams to predict magnetic properties and explain spectra

Chapter 10
1. Estimate the relative strengths of ion-ion interactions
2. Explain the origins of ion-dipole forces, dipole-dipole forces, hydrogen bonds, and dispersion forces
3. Explain the effect of intermolecular forces on the boiling points of compounds and behavior of gases
4. Calculate the solubility of gases using Henry's law
5. Identify the regions of a phase diagram and explain the effect of temperature and pressure on phase changes
6. Describe the role of hydrogen bonding in the unique properties of water