Principles of Chemistry I
CHEM 1210, Fall 2016
Section 4, M W F, 9:30-10:20 AM, ESLC 046

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Office Hours:	M and W, 11:00 AM – 12:00 PM, other times by appointment.
Text:	"*Chemistry: The Central Science*", the latest edition is 13th ed., 2015; Brown, Lemay & Bursten, ISBN 0321910419. A previous edition of this text (9th, 10th, 11th, or 12th ed.) will work just fine for this course and CHEM 1220 and can be purchased for a fraction of the price of the current edition. Older edition ISBN numbers are: 12th edition, 0321696727; 11th edition, 0136006175; 10th edition, 0131096869; 9th edition, 0130669970.
Prerequisite	Previous or concurrent enrollment in MATH 1050 or higher
Course description	CHEM 1210 is the first of a two semester sequence of general chemistry for students in the physical and biological sciences and engineering. The course will cover topics presented in the first 13 chapters of the Brown, Lemay and Bursten textbook. CHEM 1220 will cover the remainder of the material in the textbook.
Recitation	All students must register for and attend a section of recitation listed in the course schedule. Recitation sections consist of groups of about 40 students and are administered by teaching assistants. The recitation setting is designed to develop problem solving skills needed for the class examinations, and to assess your understanding of concepts covered during previous class sessions. For assessment, there is a graded component to recitations (see below). Recitation sections will begin during the second week of classes.
Learning Management System	Canvas website will be used for the management of CHEM 1210. Importantly, *you will take your chapter quizzes on line using Canvas.* To log on to Canvas, go to the web address: canvas.usu.edu. Your **USERNAME** is your BANNER login and your default **PASSWORD** is your BANNER password. Canvas has many useful features (your assignment scores, a chat room, discussion page, mail, etc.) and you should take the time to explore them within our course page.
Online Quizzes	There will be 12 graded on line quizzes offered throughout the semester. Each quiz counts 10 points and is open book. You will take the quizzes on line through Canvas. Quizzes are to be taken during the availability periods indicated on the class schedule and within Canvas. Quizzes will usually consist of 10 questions, worth 1 point each. You will have 30 minutes to take each quiz. You may repeat a given quiz up to four additional times to improve your grade on that particular quiz, if you wish. Your highest score for the five attempts will be recorded. Note that each time you take a quiz you will receive a slightly different version, covering the same concepts but with different questions. I encourage you to take each quiz the full five times, as the problem solving skills you will gain from taking the quizzes multiple times will be very beneficial in preparing for the exams. Remember, there is no penalty for repeating a quiz; your highest score of all attempts is the one that will be entered into the gradebook. The quiz deadlines will be posted in Canvas and you should make note of them. All attempts of a quiz must be taken by the quiz deadline.

Recitation Quizzes	Multiple choice quizzes, consisting of 5 questions worth 5 points each, will be given at the conclusion of recitations in the weeks indicated with an asterisk on the class schedule. The quizzes will cover concepts covered in the previous week's lectures, which will be reviewed in recitation. Your highest 10 of 11 recitation quizzes will be counted for 50 points total.
Midterms	Three hourly exams (100 points each) consisting of 25 multiple choice questions will be given during class on the dates indicated on the course schedule. The exams are based on material covered in class and closely match the difficulty level and content of the practice exams, chapter self-tests, and quizzes. You are strongly encouraged to work the on-line chapter self-tests, take the quizzes the full five times, and work the practice exams given in previous years.
On line make-up exam (can substitute for the lowest midterm score)	An optional "make-up exam", covering all of the material covered on midterms 1-3 and worth 100 points, will be offered during the time interval indicated on the syllabus. If you score *higher* on this exam than on your lowest of three in-class midterms, the score will replace the lowest midterm score. If you score l*ower* on the make-up exam than on all three of your in-class midterms, then this exam score will not count. The make-up exam must be scheduled and taken on line in the TAR computer lab in the ESLC during the time period indicated on the class schedule. More information about the make-up exam will be provided in class and in Canvas.
Final exam	The final exam (200 points) will be given on Wednesday December 16 at 7:30 AM-9:20 AM, with the room location to be announced during the semester. The final exam will consist of 50 questions, and contain both a "new material" section (100 points, material covered since exam 3) and a "comprehensive portion" (100 points, material covered on exams 1-3).
Missed exams	If you miss one of the three in-class midterms due to illness or emergency, I will offer you the opportunity to take an exam covering the same material to substitute for the missed exam. If at all possible I should be notified of the absence and reason before the scheduled midterm. Missed exams may require written documentation from a doctor or other authority at my discretion.

Grading	A total of 670 points are possible in CHEM 1210 and are distributed as follows: Total of 3 in-class midterms, or best two midterms and the on-line make-up exam ..... 300 pts. 12 on-line quizzes @ 10 points each ..... 120 pts. Comprehensive final exam ..... 200 pts. Recitation quizzes, best 10 of 11 @ 5 pts each..... 50 pts. Total points .....670 points In terms of final assignment of grades, you are *guaranteed* the following grades if your final class percentage lies within the indicated ranges: A/A- 100 to 88.0% (93.0 % or above is a guaranteed straight "A") B+/B/B- <88.0 to 77.0% C+/C/C- <77.0 to 60.0% D+/D <60.0 to 50.0% Based on the overall class average, the **percentage cuts for the various grades may shift lower than the above cuts.** In other words, better grade may be assigned for lower percentages than those indicated above, a scenario that is *to your favor.* However, the percentages will never shift higher than the above, so you are assured the indicated or a higher grade, depending on the class average at the conclusion of the course
Course Withdrawal:	Withdrawal from the course after Sept. 21 will result in a "W" notation being placed on your transcript. No withdrawal is permitted after November 2.
Provisions:	The administration of CHEM 1210 will adhere strictly to the academic policies outlined in the most recent USU General Catalog, which can be found here: http://catalog.usu.edu/content.php?catoid=12&navoid=3139
Course assessment	Students in this class are expected to develop proficiency in the principles listed on the class schedule and the attached "Learning Objectives" list. Questions provided on midterms, quizzes, and final exams will be used to assess your understanding of these principles. The formats to be used for assessment will include instructor-designed questions. Please note that assessment is a tool used by the Department of Chemistry and Biochemistry to improve the quality of instruction and proficiency of our students. Your grade will be based on your performance on the assignments indicated above, some of which will be used for course assessment.

In accordance with the Americans with Disabilities Act, reasonable accommodations will be provided for all persons with disabilities in order to ensure equal participation in CHEM 1210. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with disabilities. Please meet with the instructor during the first week of class to make arrangements. Alternative format print materials, large print, audio, diskette or Braille, will be available through the Disability Resource Center.

CHEM 1210 Schedule, Fall 2016

Lecture	Day	Date	Topic	Chapter	Recitation	Online Quiz
1	M	8/29	Matter, elements, and compounds	1	No	
2	W	8/31	Measurements	1		
3	F	9/2	Atomic structure	2		
	M	9/5	No class, Lab Day		Yes	1
4	W	9/7	Periodic table	2		
5	F	9/9	Nomenclature	2		
6	M	9/12	Balancing equations	3	Yes, quiz 1	2
7	W	9/14	Atomic//molecular weights	3		
8	F	9/16	Empirical formulas	3		
9	M	9/19	Calc. on chemical equations	3	Yes, quiz 2	3
10	W	9/21	Molarity and electrolytes	4		
11	F	9/23	Acid, base, salts, and ions	4		
12	M	9/26	Metals	4	Yes, quiz 3	4
13	W	9/28	Review for Midterm 1			
	F	9/30	**Midterm 1 (Chapters 1-4)**			
14	M	10/3	Energy, 1st law	5	Yes, quiz 4	5
15	W	10/5	Enthalpy, Hess's law	5		
16	F	10/7	Enthalpy of formation	5		
17	M	10/10	Radiant energy	6	Yes, quiz 5	6
18	W	10/12	Quantum effects	6		
19	F	10/14	Bohr atom, orbital	6		
20	M	10/17	Many electron systems	6	Yes	7
21	W	10/19	Atomic sizes, energies	7		
22	T	10/20	Electron ionization, affinity	7		
23	M	10/24	Review for Midterm 2		Yes, quiz 6	
	W	10/26	**Midterm 2 (Chapters 5-7)**			
24	F	10/28	Lewis structures	8		
25	M	10/31	Covalent bonds	8	Yes, quiz 7	8
26	W	11/2	Resonance, octet violations	8		
27	F	11/4	Bond energies	8		
28	M	11/7	VSEPR theory	9	Yes, quiz 8	9
29	W	11/9	Bond polarity	9		
30	F	11/11	Hybrid orbitals	9		
31	M	11/14	Review for Midterm 3		Yes, quiz 9	
	W	11/16	**Midterm 3 (Chapters 8-9)**			
32	F	11/18	Gases	10		
	M	11/21	Make up exam in TAR lab			
33	M	11/21	Gases	10	No	10
	W	11/23	No class, Thanksgiving			
	F	11/25	No class, Thanksgiving			
34	M	11/28	Gases	10	Yes, quiz 10	11
35	W	11/30	Liquids and solids	11		
36	F	12/2	Liquids and solids	11		
37	M	12/5	Solution properties	13	Yes, quiz 11	12
38	W	12/7	Solution properties	13		
39	F	12/9	Solution properties	13		
	W	**12/14**	**Final (Lectures 1-39)**			

CHEM 1210 Leaning Objectives

Define matter and classify it from the level of mixtures and compounds to elements

Differentiate physical and chemical properties and changes and intensive and extensive properties.

List and define the base S.I. units of mass, length, time, temperature and amount of a substance, and manipulate the base units to give derived SI units

Use the principles of dimensional analysis and conversion factors to convert quantities expressed in one unit to another unit.

Express numbers in different units by using the prefix and exponential notation methods.

Explain the difference between precision and accuracy, and relate these terms to the concept and usage of significant figures in experimental measurements.

Explain the atomic theory of matter, emphasizing the composition of the atom, and what defines the identity of a given element.

Explain the relative sizes, masses, and charges of the proton, neutron, and electron, and how they assemble to form an atom.

Define the term isotope, and be able to discern the subatomic composition of an atom given its atomic and mass numbers. Represent the atom using the element symbol with superscript and subscript denoting the composition.

Use the Periodic Table to rationalize similarities and differences of elements, including physical and chemical properties and reactivity. Predict common ion charges of group 1A, 2A, 3A, 6A, and 7A elements based on position in the periodic table.

Name and predict ions formed from the elements, and recognize and be able to name common polyatomic cations and anions.

Differentiate between ionic and molecular compounds, and empirical and molecular formulas.

Given the chemical formula for an ionic compound or molecule, provide a proper unambiguous systematic name for the compound. Conversely, given the compound name, write the single chemical formula that matches the name.

Given the reactants and products for a chemical equation, balance the equation using whole number coefficients.

Recognize the following common chemical reactions: combustion, decomposition, combination.

Given the atomic weights and relative abundances of naturally occurring isotopes, calculate the average atomic weight of an element.

Use average atomic weights from the Periodic Table to calculate formula weights and molecular weights for compounds.

Use the concepts of the mol, molar mass and Avogadro's number and conversion factors derived from their relationships to interconvert between mass, mols, and numbers of particles for atoms and molecules.

Explain the basis for the "mass defect" seen when an experimentally determined molar mass for an atom is compared to the sums of the masses of the subatomic particles in that atom.

Use the stoichiometric relationships between atoms in molecules, and the stoichiometric coefficients on reactants and products in chemical reactions, to interconvert between numbers of particles, mols, and masses within compounds and for chemical changes.

Given the molar mass of an unknown compound and its elemental composition in mass percentage, determine the empirical and molecular formulas for the compound.

Given a chemical reaction and masses of reactants, determine the limiting reagent if the reaction goes to completion, and calculate the masses of products formed and excess reagent remaining at the conclusion of the reaction.

Understand solution composition and the terms solvent and solute.

Differentiate between weak and strong electrolytes and nonelectrolytes.

Define and differentiate strong and weak acids and bases.

Define "solubility" and "miscibility" and understand the factors that make a solute soluble in water

Define and write representative equations for aqueous reactions involving neutralization, precipitation, gas generation, and oxidation/reduction.

Define and write representative equations for molecular equations, complete ionic equations, net ionic equations.

Recognize spectator ions in aqueous reactions.

Define solution concentration in units of molarity and use dimensional analysis to interconvert molarity, mass, mols, and volume.

Define energy in terms of work and radiation (heat), and differentiate the following types of energy and the terms that relate to it: kinetic, potential, thermal, chemical energy; conservation of mass, system and surroundings, state function.

Describe energies, energy changes, and associated signs referenced relative to the system of interest.

Define enthalpy and exothermic and endothermic reactions.

Determine the enthalpy for a reaction given information from a standard table of enthalpies of formation or using specific heat and calorimetry data.

Apply Hess' law to determine enthalpies of reactions.

Describe the properties of electromagnetic radiation, and use the appropriate equations that interrelate energy, frequency, wavelength, Planck's constant, and the speed of light.

Explain the concept of "photons" and "quanta" and the dual nature of radiant energy.

Explain the Bohr model of the hydrogen atom and use the Rydberg equation to determine the energies associated with electronic transitions.

Explain the dual nature of matter (wave and particle).

Explain how the Heisenberg uncertainty principle and Schrodinger models relate to electronic structure.

Describe electronic structure in terms of orbitals, with associated quantum numbers n, l, m_l, and m_s and how these quantum numbers relate to the energies, shapes, orientations, and spins of electrons in atoms.

Use the above principles of quantum chemistry together with the Pauli exclusion principle and Hund's rule to predict the electronic configurations of multielectron atoms.

Predict periodic properties, including relative sizes of atoms, ionization energies, and electron affinities using the principles outlined in class.

Understand and describe chemical bonding at the level presented in class, with particular emphasis on understanding and applying the following terms/concepts: Lewis symbols and atoms, ionic bonding, lattice energy, isoelectronic series, covalent bonding, electronegativity and bond polarity, Lewis structures, formal charges, resonance, octet violations, bond strengths, oxidation numbers.

Apply valence shell electron pair repulsion theory to properly draw Lewis structures to predict bond angles and geometries about atoms in molecules.

Use valence bond theory to describe covalent bonding in terms of orbital overlaps and hybridizations.

Describe the properties of a gas in terms of the variables P, V, n, and T.

Use the ideal gas law to interconvert between P, V, n, and T for a gas.

Understand and explain Kinetic-molecular theory.

Explain the factors that lead to non-ideal behavior for a gas.

Understand and identify the intermolecular forces important in different solids and liquids.

Describe the processes by which states of matter are changed.

Define vapor pressure and boiling point.

Interpret heating curves and phase diagrams for a compound.

Understand the solution process in terms of thermodynamics.

Explain the factors that affect solubility of a solute.

Understand and explain the different colligative properties and use the proper mathematical equations to quantitatively describe these effects.