| **Office Hours:** | Online Mon. and Wed., 1:00-2:30 PM, other times by appt. 
Please use the following link for online office hours:  
[https://usu.edu.zoom.us/j/8567161245?pwd=SUtOc0xkbDhuV0MydHIUEhIRG0xZz09](https://usu.edu.zoom.us/j/8567161245?pwd=SUtOc0xkbDhuV0MydHIUEhIRG0xZz09) |
| **Text:** | Dr. Ensign’s on-line textbook:  
[http://ensignchemistry.com/chem1/textbook.html](http://ensignchemistry.com/chem1/textbook.html) 
username: ensigns 
password tadpoles2020 |
| **Prerequisite** | Previous or concurrent enrollment in Math 1050 or higher |
| **Course description** | Chemistry 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 12 chapters of a typical general chemistry text. Chemistry 1220 will cover the remainder of the material in the text. |
| **Learning Management System** | Canvas instructure will be used for the management of Chem. 1210. Importantly, you will take your chapter quizzes and exams on line using Canvas. To log on to Canvas, go to the web address: [https://usu.instructure.com/login/canvas](https://usu.instructure.com/login/canvas) 
Your **USERNAME** is your BANNER login and your default **PASSWORD** is your BANNER password. Canvas has many useful features (your assignment scores, zoom portal, discussion page, mail, etc.) and you should take the time to explore them from within our course page. I will provide more instructions on using Canvas in the introductory lecture. |
| **Class resources** | My class resources, including chapter self tests, lecture overheads, lecture recordings, tutorials, recorded solutions, multimedia, practice exams, online textbook, and current exam keys are available from within canvas, or by using this external website [http://ensignchemistry.com/chem1/](http://ensignchemistry.com/chem1/) 
The username and password for accessing the resources from this website are **ensigns** and **tadpoles2020**. Accessing and using my resources is essential for your success in chemistry 1210. |
| **Supplemental Instruction and UTF** | Annalee Hovinga ([annahovinga@gmail.com](mailto:annahovinga@gmail.com)) will be the SI instructor for this course. The SI times and locations will be posted on our Canvas main page. 
Nathan Barber ([Nbarber2017@icloud.com](mailto:Nbarber2017@icloud.com)) has been assigned as an undergraduate teaching fellow (UTF) for this class. Nathan will hold weekly online office hours to provide personal help and tutoring. The times will be posted in canvas. |
| **Chapter self tests (non-graded)** | There will be an end of chapter (non-graded) self test consisting of ~40-50 questions for each chapter. I provide both written and recorded solutions (tutorials) to these self tests. You should work each question of the self tests as homework, and watch my recorded solutions as necessary, in order to master the concepts from each chapter. |
| **Online Quizzes (graded)** | 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. |
| **Midterm Exams (graded)** | Three midterm exams (100 points each) will be given from within canvas via proctorio during a three-day availability period. 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 graded online 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 posted in canvas and given in previous years as part of your exam preparation. |
| **Midterm exam second chance (retake) to raises your midterm score** | After the exam availability window closes, and after detailed exam results are released, you will have two days to "retake" the exam on your own computer in an open book format to increase your exam score. About 25% of the questions on the "retake" exam will be identical, and the remainder will test the same concepts as on the questions from your midterm but with changes in numbers, wording, etc. I recommend printing out your exam results ahead of the exam retake, and reworking any questions you missed so you can get the corresponding questions right when you complete the retake exam. The purpose of the retake exercise is to allow you to correct errors/mistakes you made on the original exam, and get the questions right on your second attempt. The point value for the exam retake will be determined by the class average on the exam. If the exam average is 73% or higher, the exam retake will be worth a maximum of two points added to your original exam score. If the exam average is less than 73%, the retake will be worth "75 minus the exam average". The points you receive on the retake will be added to your original exam score to increase your exam score by that number. For example, if the average on exam 1 is 67%, the retake will be worth (75 – 67) = 8 points total. If your original score was 74/100 (74%), and you retake the exam and score 93.3% (5.6/6), the 5.6 points will be added to your original score giving you 79.6/100. If you score 100/100 and retake the exam and score 100% (6/6), your score will be adjusted to 106/100. |
| **Online make-up exam (can substitute for 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 lower 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 taken in canvas using proctorio. Unlike the three midterms, there is no retake available for the make-up exam. More information about the make-up exam will be provided in class and in Canvas. |
| **Final exam** | The comprehensive final exam (200 points) will be given in the USU testing center. The exam may be taken anytime during finals week. The final exam will consist of 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 midterm exams 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 620 points are possible in Chem. 1210 and are distributed as follows:

Total of 3 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.

Total points............................................................................................... 620 points

In addition, to encourage you to attend, prepare for, and be attentive during lectures, you may earn up to 8 points extra credit added to your midterm scores by taking additional quizzes covering the concepts covered on iclicker quizzes for the face to face sections.

extra credit points) ..................................................................................................... 8 points

In terms of final assignment of grades, you are guaranteed the following grades if your final class percentage lies within the indicated ranges:

<table>
<thead>
<tr>
<th>Name</th>
<th>Range:</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100 %  to 93.0%</td>
<td>100%</td>
</tr>
<tr>
<td>A-</td>
<td>&lt; 93.0 % to 88.0%</td>
<td>90%</td>
</tr>
<tr>
<td>B+</td>
<td>&lt; 88.0 % to 85.0%</td>
<td>85%</td>
</tr>
<tr>
<td>B</td>
<td>&lt; 85.0 % to 81.0%</td>
<td>80%</td>
</tr>
<tr>
<td>B-</td>
<td>&lt; 81.0 % to 77.0%</td>
<td>75%</td>
</tr>
<tr>
<td>C+</td>
<td>&lt; 77.0 % to 73.0%</td>
<td>70%</td>
</tr>
<tr>
<td>C</td>
<td>&lt; 73.0 % to 66.0%</td>
<td>65%</td>
</tr>
<tr>
<td>C-</td>
<td>&lt; 66.0 % to 60.0%</td>
<td>60%</td>
</tr>
<tr>
<td>D+</td>
<td>&lt; 60.0 % to 56.0%</td>
<td>55%</td>
</tr>
<tr>
<td>D</td>
<td>&lt; 56.0 % to 50.0%</td>
<td>50%</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 50.0 % to 0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

This is the grading scheme currently set in Canvas with the guaranteed breaks. Note that percentages DO NOT ROUND to these values: for example, a 92.99% average will not round to 93.0, and will result in an “A-” grade. To earn an “A”, your average must be 93.00% or better. If the overall class average on all assignments at the conclusion of the semester is less than 73%, the percentage cuts for the various grades may shift lower than the breaks shown at left. In other words, better grade may be assigned for lower percentages than those indicated above, a scenario that is to your favor, but only if the overall class average on all assignments is 73% or less. Grade breaks will not be shifted based on individual student petitions.

Course Withdrawal:

Withdrawal from the course after Feb. 8 will result in a “W” notation being placed on your transcript. No withdrawal is permitted after March 24.

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 through the use of the iclicker personal response system 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.

Course Schedule
Use the class schedule posted in canvas (link here) to keep track of assignment due dates. A detailed schedule for the resources associated with each recorded lecture (specific practice problems, multimedia exercises, assigned text readings) can be accessed from the class resources navigation bar using the link titled "class schedule".

The video links below will open within canvas. If you wish to watch the video in full screen mode in a separate window, click the icon in the lower right of the video player after initiating playback.

For those who are hearing impaired, or wish to read a transcript of the lecture while watching, subtitled versions of the lectures and tutorials can be accessed using this link (click here)

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Chemistry 1210 Learning 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 it’s elemental composition in mass percent, 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 reaction

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, and m, 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 Hunds 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, iso electronic 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-drawn 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