Course: Chem 1212 – 051 (#21222)  
Professor: Maureen Burkart, Ph.D.  
e-mail: mburkart@gsu.edu  
Office: NE-2222, 770-274-5053  
Physical Science Department Office: NE-2614, 770-274-5105  

*Note – The instructor checks GSU email at least once a day, Mon – Thurs. She may not check email over a weekend. She checks voice-mail less often, ~ once a week. The instructor does NOT check icollege email.

Classroom: NE-1260  
Lecture Time: TR 5:30pm – 6:45pm  
Tutoring/Advising:  
- Mon 1:15pm – 2:15pm; 4:00pm – 5:15pm; 6:45pm – 7:30pm;  
- Tues 11:45am – 12:45pm; 4:00pm – 5:00pm;  
- Wed 1:15pm – 2:15pm; 4:00pm – 5:15pm; 6:45pm – 7:30pm;  
- Thurs 4:00pm – 5:00pm; 6:45pm – 7:45pm.

Website: http://sites.pc.gsu.edu/mburkart/

Description: This is the second course in a two-semester sequence covering the fundamental principles and applications of chemistry for science majors. Topics to be covered include properties of solids and liquids, solutions, chemical kinetics, acid/base reactions, oxidation/reduction reactions, chemical equilibrium, thermodynamics, and electrochemistry.

Calendar:
- Jan 09: Classes begin  
- Jan 16: Holiday – Martin Luther King, Jr. Day  
- Feb 28: Midpoint, last day for student-initiated withdrawal  
- Mar 13 – 19: Spring Break – No classes, No Tutoring hours  
- Apr 24: Last day of classes  
- Apr 27: Final exam – Thursday, 5:30pm

Prerequisites: Chem 1211/1211L or Chem 1211K and Math 1113, each with a C or better.

Corequisite: Chem 1212L

Required Text & Materials: The required text is Chemistry, authors Zumdahl & Zumdahl, 9th edition – Brooks/Cole Cengage Learning. A scientific non-programmable calculator is required. An example of an acceptable calculator is the Texas Instruments TI-30XA. The OWL v2 program (Online Web Learning version 2) is required to complete the online homework assignments. Red Scantron forms are also required; they will be used as answer forms for exams.

Attendance Policy: Students are expected to attend all class meetings. There will be no excused absences. In the event of absence, it is the responsibility of the student to obtain assignments and information covered during the absence. An attendance sheet will be circulated at the beginning of class. Anyone who does not sign the attendance sheet will be counted absent. Signing the attendance sheet for someone else is falsifying the official record and is grounds for dismissal from the class. The GSU Attendance Policy may be found using the following link: http://codeofconduct.gsu.edu/files/2013/03/2013-14-Student-Code-IV.F.-Policy-on-Class-Attendance.pdf.

*Note: The course syllabus provides a general plan for the course; deviations may be necessary.
Course Grade: The course grade will be determined from student work as follows.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Class Exams</td>
<td>60%</td>
<td>Periodic exams, each covering 2 – 3 chapters from the text</td>
</tr>
<tr>
<td>OWLv2 Homework</td>
<td>10%</td>
<td>Online homework assignments</td>
</tr>
<tr>
<td>Study Group Projects</td>
<td>5%</td>
<td>Four group projects</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
<td>Comprehensive departmental exam(s)</td>
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</tbody>
</table>

Exams: There will be four class exams and a final exam. The final exam is mandatory.

***************THERE ARE NO MAKE-UP EXAMS**************

The final course average is obtained by averaging the three highest class exam scores to determine 60% of the course grade. If one of the class exams is missed, that exam becomes the dropped exam. The intent of this grading scheme is to accommodate instances of sickness, accident, or other emergency circumstance for which a student might miss a scheduled exam. If a second exam is missed, that exam grade will be recorded as zero. It is the student’s responsibility to be on time for the administration of exams. **No extra time will be given to those who show up late for the exam.** The grading scale is the standard scale with the following cutoffs:

- 100 - 90: A
- 89 - 80: B
- 79 - 70: C
- 69 - 60: D
- below 60: F

The final exam includes a standardized ACS exam that covers a full year of general chemistry, including both Chem 1211 and Chem 1212.

Note: Dr. Burkart does not reveal grades via email or phone due to privacy issues.

The only electronic device allowed during exams is a scientific non-programmable calculator. Students are **not** allowed to use the following devices during exams:

- Computers
- Cell phones
- Computerized dictionaries
- Molecular models
- Ipods
- Ipads
- Palm pilots
- Programmable calculators

OWLv2 Homework: There will be ~ ten OWLv2 homework assignments during the term. Each assignment has a specific due date that is related to the class exam date for that material. **THERE ARE NO LATE SUBMISSIONS FOR OWLv2**********

The final course average is obtained by averaging all of the OWLv2 homework scores to determine 10% of the course grade. None of the OWLv2 homework scores will be dropped; all count toward the course grade.

Study Group Projects: There will be four group projects during the term. Each assignment has a specific due date that is related to the class exam date for that material. **THERE ARE NO LATE SUBMISSIONS FOR GROUP PROJECTS***

The final course average is obtained by averaging all of the group project scores to determine 5% of the course grade. None of the group project scores will be dropped; all count toward the course grade. Note that part of each group project score will be based on peer evaluations.

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***Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take the time to fill out the online course evaluation.***
Withdrawal Policy: Voluntary withdrawals by the student are allowed through midpoint, **February 28.** Note that, depending on the total number of withdrawals on the student’s record, this may result in a W or a WF on the student’s record. Students are allowed to withdraw with a grade of W a maximum of three times in their undergraduate associate level careers at Georgia State; after receiving three W grades, the student will be assigned WF for any withdrawal. **Students are responsible for formally dropping or withdrawing from courses using the online registration system, PAWS at paws.gsu.edu.** The instructor will not withdraw students from the class. Withdrawal from Chem 1212 lecture automatically requires withdrawal from Chem 1212 laboratory, and likewise a withdrawal from lab will result in withdrawal from lecture. The GSU Withdrawal Policy may be found using the following link: [http://advisement.gsu.edu/self-service/policies/withdrawal-policy/](http://advisement.gsu.edu/self-service/policies/withdrawal-policy/).

Academic Honesty Policy: Cheating includes any attempt to defraud, deceive or mislead the instructor in arriving at an honest grade assessment. Plagiarism is a form of cheating that involves presenting as one’s own the ideas or work of another. All portions of any test, project (lab report, homework assignment, etc.), or final exam submitted by you for a grade must be your own work unless you are instructed to work collaboratively. Specific requirements will be described for collaborative projects, but all work presented must be the work of members of that group. Research materials used must be properly cited.

Violation of the Academic Honesty Policy will result in a grade of zero for that test, project or exam. The second offense will result in assignment of a grade of "F" for the course, and a formal charge of Academic Dishonesty will be lodged with the College Dean.

The GSU Academic Honesty Policy may be found using the following link: [http://codeofconduct.gsu.edu/files/2016/07/Academic-Honesty.pdf](http://codeofconduct.gsu.edu/files/2016/07/Academic-Honesty.pdf).

Americans with Disabilities Act Policy: Students who wish to request accommodation for a disability may do so by registering with the Office of Disability Services. Students may only be accommodated upon issuance by the Office of Disability Services of a signed Accommodation Plan and are responsible for providing a copy of that plan to instructors of all classes in which accommodations are sought.

Equal Opportunity and Affirmative Action Policy: It continues to be the policy of Georgia State University to implement affirmative action and equal opportunity for all employees, students and applicants for employment or admission without regard to race, color, religion, national origin, sex, age, sexual orientation, veteran status or disability. Information on the GSU Equal Opportunity and Affirmative Action Policy may be found using the following link: [http://odaa.gsu.edu/equal-opportunity-and-affirmative-action-policy/](http://odaa.gsu.edu/equal-opportunity-and-affirmative-action-policy/).

Incomplete: The grade of “I” (Incomplete) may be given to a student who for nonacademic reasons beyond his or her control is unable to meet the full requirements of a course. In order to quality for an “I,” a student must:

- a) have completed most of the major assignments of the course (generally all but one)
- b) be passing the course (aside from the assignments not completed) in the judgment of the instructor.

When a student has a nonacademic reason for not completing one or more of the assignments for a course (including examinations) and wishes to receive an “I” for the course, it is the student’s responsibility to inform the instructor in person or in writing of the reason.
Veterans and Serving Military: At Georgia State University, we respect the commitment our service men and women make to our country and we work to make our military and veteran students feel comfortable as they earn their college degrees.

The Military Outreach Center on each campus assists eligible veterans, active duty military, Reservists & National Guard members, and dependents with the support and services they need to reach their academic goals. There is a Military Outreach Center on every campus with a staff of advocates, all of whom are military veterans or dependents prepared to Serve Those Who Have Served.

Information on the GSU Military Outreach Centers may be found using the following link: http://veterans.gsu.edu/military-outreach-centers/.

Inclement Weather Policy: In the event that inclement weather strikes the Atlanta metro area, students are expected to tune into WSB radio (750 am) or WSB television (Channel 2) to determine if GSU-PC has closed or not. If the school is open, class will meet as regularly scheduled. If the school is closed, students will not be allowed on campus. If an exam is scheduled on a day that the college is closed, students should come to the next class meeting prepared to take the exam that was scheduled for the cancelled day.

Email Communication: Students must use GSU email for email communication with Dr. Burkart. Specifically, if students wish to contact Dr. Burkart via email, they must send the email to Dr. Burkart (at mburkart@gsu.edu) using their GSU email account (zzz@student.gsu.edu). Any email sent from a domain other than gsu.edu may go into “Junk Email”; such email will not be visible and thus will not receive a reply. Note also that Dr. Burkart does not check icollege email and therefore does not use icollege email except for special circumstances.

Tobacco and Smoke-Free Campus Policy: Smoking and tobacco use of any kind are prohibited on all GSU owned and/or leased locations/premises, on all internal and external areas, parking garages, and parking lots, in all GSU owned and/or leased vehicles. Smoking is also prohibited within 25-feet of all GSU building entrances and exits.

Perimeter College seeks to provide an environment that is free of bias, discrimination, and harassment. If you have been the victim of sexual harassment/misconduct/assault, we encourage you to report this. If you report this to a faculty member, he or she must notify one of our college’s Assistant Title IX Coordinators / Student Deans about the basic facts of the incident (you may choose whether you or anyone involved is identified by name). For more information please refer to our Title IX website – http://deanofstudents.gsu.edu/title-ix/

Classroom Conduct: Students are expected to act with respect for the professor and other members of the class. In order to maintain a beneficial learning environment, Rude and/or Disruptive behavior will NOT be tolerated. Any student whose conduct is deemed inappropriate will be asked to leave the class. The following are considered rude and disruptive:

- Conducting private conversations in the class during lecture/discussion.
- Not paying attention during lecture/discussion.
- Consistently arriving late for class. {In the event of a late arrival, enter and take a seat quietly.}
- Leaving class early. {This should occur only in an emergency}
- Walking in-and-out of the classroom while class is in session.
- Ringing beepers and cellular phones. {These should be turned off while in class.}
Student’s Responsibility: Students must develop a fundamental understanding of chemical concepts as well as skill in solving problems, and the best way to do this is to rewrite class notes and work through the homework. To be successful, expect 10 to 20 hours per week outside of class to study and do homework. Concepts in chemistry build on one another, so it is important not to fall behind. Note that the student is responsible for information in the book that may not necessarily be covered in the lecture.

The laboratory grade is separate and requires additional time. Expect 4 to 10 hours at home to prepare for laboratory sessions, calculate results, and prepare lab assignments.

Since chemistry is a course that is best learned with the student’s active participation, the instructor encourages students to ask questions in class when the need arises. However, the instructor is under certain time constraints and may need to hold off answering a question until after the class or at a mutually arranged time.
Chemistry 1212  Tentative schedule - subject to change

**Homework:** Read each chapter. Rewrite your class notes. Do all in-chapter questions and problems, and then complete the online homework assignments (OWLv2). Next, answer the blue colored end-of-chapter “Exercises.” The more practice you get, the easier it will be for you! {Note: The only homework assignments that will be graded are the online OWLv2 homework assignments. However, students should work the end-of-chapter homework problems in order to prepare for exams.}

Chapter outlines and supplemental handouts are available on the web: [http://sites.pc.gsu.edu/mburkart/](http://sites.pc.gsu.edu/mburkart/). Students are expected to access Dr. Burkart’s webpage and print copies of these materials before coming to class. Most of the documents are PDF format (requiring Adobe Acrobat). If students cannot access the files at home, they may use computers in room NE-0160.

**Unit 1:** Chapter 10 Liquids and Solids
Chapter 11 Properties of Solutions

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<th>Unit</th>
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<tbody>
<tr>
<td>1</td>
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<td>Tuesday, 31 January</td>
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**Unit 2:** Chapter 12 Chemical Kinetics
Chapter 13 Chemical Equilibrium
Chapter 14 Acids and Bases

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<tr>
<td>2</td>
<td>2</td>
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**Unit 3:** Chapter 15 Acid – Base Equilibria
Chapter 16 Solubility and Complex Ion Equilibria

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<tr>
<td>3</td>
<td>3</td>
<td>Tuesday, 28 March</td>
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**Unit 4:** Chapter 6 Thermochemistry (Chem 1211 Review – READ)
Chapter 17 Spontaneity, Entropy, and Free Energy
Chapter 18 Electrochemistry
Chapter 19 Nuclear Decay (Based on remaining time)

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<th>Unit</th>
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<tbody>
<tr>
<td>4</td>
<td>4</td>
<td>Thursday, 20 April</td>
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**Final Exam - Comprehensive** – Thursday, 27 April at 5:30pm

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**Website:** [http://sites.pc.gsu.edu/mburkart/](http://sites.pc.gsu.edu/mburkart/)

*Note: The course syllabus provides a general plan for the course; deviations may be necessary.*
**Expected Educational Results**

**Intermolecular Forces, Liquids, and Solids** – at the completion of the lecture course, students should be able to:

- Define and identify the various types of adhesive and cohesive intermolecular forces and rank them in order of increasing strength.
- Define and perform calculations involving the energy changes accompanying various phase changes.
- Write and interpret a Temperature-Pressure phase diagram for a one component system, define and identify the triple and critical point.
- Define vapor pressure, and boiling point. Explain how vapor pressure is affected by the types of intermolecular forces involved and temperature, both qualitatively and quantitatively using the Clausius-Clapyron equation.
- Explain properties of liquids including surface tension, viscosity, and solubility.
- Distinguish between various solids by type of bonding (metallic, ionic, and molecular), and be familiar with characteristic properties of these various solids.

**Properties of Solutions** – at the completion of the lecture course, students should be able to:

- Predict whether a solution will form based on the types of cohesive and adhesive intermolecular forces involved, and the enthalpy changes involved.
- Explain saturation in terms of an equilibrium process between dissolution and recrystallization of the solute.
- Explain how solute-solvent interactions, temperature, and pressure affect the solubility of liquid/liquid, solid/liquid, and gas/liquid solutions.
- Quantitatively express solution concentration in terms of percent composition, molarity, molality, and mole fraction; be able to convert between these units.
- Apply Raoult’s Law to calculate the vapor pressure of a solution containing either a volatile or nonvolatile solute.
- Explain how the amount of an electrolytic or nonelectrolytic solute affects the freezing point, boiling point, and osmotic pressure of a solvent; and perform calculations involving these colligative properties including determination of molar mass.

**Chemical Kinetics** – at the completion of the lecture course, students should be able to:

- Calculate the rate of a chemical reaction from the rate change of reactants or products, and the initial rate from concentration versus time data.
- Generate a rate law from initial rate-data, calculate the rate constant and assign appropriate units.
- Determine reactant concentration as a function of time, and determine the half-life for a first-order reaction using the correct integrated rate law.
- Explain how a reacting species must collide with sufficient energy and with correct orientation for a successful reaction event to occur, and explain how temperature, number of reactants, and a catalyst affect the odds of a successful event.
- Draw and interpret a simple reaction coordinate diagram for a chemical reaction.
- Apply the Arrhenius equation to calculate the rate constant at various temperatures, and to determine the activation energy for a chemical reaction.
- Interpret an elementary or multi-step mechanism, state the molecularity of an elementary step, state the significance of the rate determining step for a multi step mechanism.

**Chemical Equilibrium** – at the completion of the lecture course, students should be able to:

- Define and explain chemical equilibrium as a dynamic process.
- (Optional) Calculate the equilibrium constant, forward rate constant, or reverse rate constant, given values for the other two parameters.
- Calculate a new equilibrium constant when a reaction is reversed and/or the coefficients are changed, or when two or more reactions with known equilibrium constants are combined.
- Generate an equilibrium mass balance expression in terms of concentration or pressure for both homogeneous and heterogeneous chemical reactions; and apply it to calculate between the equilibrium constant and equilibrium concentrations (or pressures).
• Predict whether reactants or products are favored based on the magnitude of the equilibrium constant, and the direction a reaction will proceed to reach equilibrium by comparison of the equilibrium constant and reaction quotient.
• Apply Le Châtelier’s principle to predict how a reversible chemical reaction will respond to changes in concentration, temperature, volume, or pressure.
• Calculate equilibrium concentrations (or pressures) given initial concentrations (or pressures) and the equilibrium constant.

Chemical Thermodynamics – at the completion of the lecture course, students should be able to:
• Define entropy, calculate the enthalpy change for a chemical reaction, and state the second law of thermodynamics.
• Calculate Gibbs free energy for a chemical reaction from either standard free energy changes or from \( \Delta G = \Delta H - T\Delta S \), and based on the sign of \( \Delta G \) state if the reaction is spontaneous, nonspontaneous, or at equilibrium.
• Calculate the equilibrium constant for a chemical reaction given the standard free energy change, and vice versa.

Acid-Base Equilibria – at the completion of the lecture course, students should be able to:
• Define and distinguish between an acid and a base for an aqueous system applying the Arrhenius, Bronsted-Lowry, and Lewis definitions
• Define and identify conjugate acids, bases, and conjugate acid base pairs.
• State the molecular factors determining acid/base strength for binary and oxyacids, and salt solutions.
• Utilize the autoionization equation for water to determine the H\(^+\) concentration given the OH\(^-\) concentration and vice versa.
• Determine the pH of a strong acid (or base), a weak acid (or base), and a salt solution.

Additional Aspects of Aqueous Equilibria – at the completion of the lecture course, students should be able to:
• Calculate the pH of a weak acid or base in the presence of a common ion.
• Define a buffer and buffer capacity, measure the pH of a buffer solution, determine the ratio of conjugates needed to produce a buffer of a given pH, and calculate the change in pH for a buffer upon addition of a strong acid or base
• Sketch and interpret titration curves for mono and polyprotic acids, identifying the end point and equivalence regions
• Determine the pH during the titration between an acid and base when both are strong, and when one is weak.
• Compute the solubility product constant of a salt given its solubility and vice versa
• Determine if a precipitate will form in a solution based on K\(_{sp}\), and in the presence of a common or uncommon ion

Electrochemistry – at the completion of the lecture course, students should be able to:
• Write and balance a redox equation, identify the reducing and oxidizing agent.
• Determine the cell potential from standard reduction potentials.
• Write and read cell notation for an electrochemical cell
• Apply the Nernst equation to relate cell potential to free energy and the equilibrium constant, and to calculate nonstandard cell potentials.
Removal Policy for Non-attendance:
Any student who does not attend this class at least once during the first two weeks of the academic term will be reported as not having attended, which will result in them being removed from the class roll and also from any co-requisite lecture and lab course. Once students who’ve not attended during the first two weeks have been reported for removal, I will not be doing any instructor initiated withdrawals during the remainder of the term. It is each student’s responsibility to attend class regularly and complete all assignments on time. If you do not do so your grade will be penalized as stated elsewhere in this syllabus. It is also each student’s responsibility to complete and submit a withdrawal form before the term midpoint (see GSU academic calendar) if they do not want to receive a final grade in this course. Students who do not withdraw themselves by the term midpoint will receive a final grade in the course calculated with penalties or grades of zeroes for all late or un-submitted work. Perimeter College students are limited to a maximum of 3 course withdrawals (lecture and lab count as one withdrawal since they are co-requisites). Any withdrawals above 3 are recorded as WF on the student transcript.
http://www2.gsu.edu/~wwwhb/sec401.html#401.03
https://catalog.gsu.edu/associate20162017/university-academic-regulations/#dropping-classes-and-voluntary-withdrawal