Georgia State University

CHEM 1211 - Principles of Chemistry I (CHEM 1211K) ACH 80

Course Syllabus, Fall 2024

The course syllabus provides a general plan for the course; deviations may be necessary.

IMPACT Statement

This is a Core IMPACTS course that is part of the STEM area.

Core IMPACTS refers to the core curriculum, which provides students with essential knowledge in foundational academic areas. This course will help master course content, and support students' broad academic and career goals.

This course should direct students toward a broad Orienting Question:

- How do I ask scientific questions or use data, mathematics, or technology to understand the universe?

Completion of this course should enable students to meet the following Learning Outcomes:

- Students will use the scientific method and laboratory procedures or mathematical and computational methods to analyze data, solve problems, and explain natural phenomena.

Course content, activities and exercises in this course should help students develop the following Career-Ready Competencies:

- Inquiry and Analysis
- Problem-Solving
- Teamwork

Instructor: Dr. Elina Stroeva
Email: estroeva@gsu.edu
Lecture time:**12:30- 1:20 PM M,W,F** Location: **Aderhold, room 024**

Practice hours	Day____ Time_____	Format: group in-person	Location: STEM Tutoring Center, room
Dr. Ahuja	M,W 12:00-1:00 PM	In-person	STEM Tutoring Center, room 110
Dr. Siemer	T 2:00-3:30 PM W 1:30-3:00 PM, Th 11:00-12:00	In-person	STEM Tutoring Center, room 110
Dr. Stroeva	M,W 2:00-3:30 PM	In-person	STEM Tutoring Center, room 110
Dr. Wang	F 9:00-10:30 AM	In-person	STEM Tutoring Center, room 110
Office hours:	**By appointment**	Format: individual	Location: office/Webex

Prerequisites: MATH 1111 or higher with a C or higher. Alternatively, students may take Math 1111 concurrently if they have met one of the following pre-conditions: 1) Score of 1 or higher on either the Chemistry, Calculus, or Physics AP exam; or 2) completed Chem 1050 or Chem 1151K (or Chem 1151/ Chem 1151L) or equivalent with a C or higher; or 3) placement into Math 1111 or higher based on math placement test; or 4) IB Chemistry with department approval.

Important Dates:

August 26	Classes begin (no laboratories during this week 08/26-08/30)
September 02	University Official Holiday (no classes or office hours)
October 15	Semester midpoint, last day to withdraw with a "W"
November 25-30	Thanksgiving Break
December 09	Last Day of classes

Monday, 12/16, at 10:45 AM is the course Final Exam. The University Policy is that students may not have "stacked exams", this is defined as 3 final exams within a 24-hour period. You must contact the instructor VIA EMAIL including a copy of your course schedule by October 15th , 2024 if this applies to you.

Course Description: This is the first course in a two-semester sequence covering the fundamental principles and applications of chemistry for science majors. Topics include composition of matter, chemical reactions, stoichiometry, periodic relations, nomenclature, thermochemistry, properties of gases, electronic structure, molecular geometry, and chemical bonding.

Learning objectives: The goals of this course are

- To provide students with effective and timely advisement in lecture and laboratory courses.
- To guide students in obtaining problem solving, critical thinking, and quantitative reasoning skills.
- To teach students to apply fundamental chemical principles to explain data or observations.

Course Required and Recommended Materials:

- Student must check iCollege page and GSU email daily for updates (mandatory required).
- A scientific non-programmable calculator (mandatory required). An example of an acceptable calculator is the Texas Instruments TI-30XA.
- Recommended (1st choice): OpenStax – free textbook. Chemistry (green) uploaded on iCollege.
- Recommended:(2nd choice optional) Text: Chemistry: A Molecular Approach by Nivaldo Tro (4th or 5th edition)
- Recommended: ACS Study guide. Preparing for Your ACS Examination in General Chemistry. The Official Guide. (2nd edition) ISBN978 -1-7327764-0-1

Learning outcomes: The goals of this course are set forth by the chemistry department.

- The student should demonstrate a general knowledge and understanding of the chemical concepts covered.
- The student should demonstrate the ability to successfully apply math skills previously learned to chemical systems.
- The student should demonstrate the ability to apply chemical principles to problems in physics, biology, and medicine.

Attendance: Students who want to do well in this course will attend class following the class attendance policy. Attendance is not mandatory, but strongly recommended.

Preparation Policy: that students are responsible for all material presented during the lectures. Chemistry is a *highly* structured course, with each new topic based on others previously developed. Thus, it is *critical* for students to keep *consistently* up to date in their readings and assignments. To fall even one module behind is to risk considerable difficulty in mastery of future material. Therefore, students highly recommended:

- Review previous material, especially if it was not perfectly understood.
- **Complete reading assignments *before* the lecture** in which the topics are covered, or at least immediately after the lecture.
- Complete assigned problems and exercises on time, with an emphasis on mastery of concepts and principals involved rather than looking for a formula that will give the expected answer (*remember that the question can be asked in a different way and not just with different numbers!*);
- Visit practice hours and ask your questions.
- Attend out of class activities such as STEM free tutoring sessions on a permanent bases throughout the semester.
- Be aware that the average student needs to do **12-15 hours of work** per week to meet the basic course requirements and reach out learning goals.
- Missed class(es) is(are) not excused for the preparations.

Withdrawal Policy: A grade of W will be assigned if the student officially withdraws by midpoint. After midpoint, withdrawal will result in a WF grade.

After the semester midpoint, the University policy requires that faculty members must:

- Give a WF to all those students who are on their rolls but no longer taking the class and
- Report the last day the student attended or turned in an assignment.

Incomplete: An incomplete (I grade) is available only if the course has been essentially completed. If the student misses the final exam due to illness, injury, or other special circumstance, he/she may request an I grade. Documentation will be required confirming the illness or other difficulty. The I grade must be made up within one semester. If not made up within one semester, the I grade automatically reverts to an F. Note that the student may receive an I grade only if he/she is passing the course but is unable to take the final exam only.
The policy on grades of "I" http://www2cas.gsu.edu/docs/oaa/incomplete_policy_and_form.pdf

Course Points Distribution: The course grade will be determined as a result of a student's individual work as follows:

Assignments	**Points**	**% out of 600**
Major Exams – 4 (3*120)	360 pts	60.0
Quizzes **in-class** – 4 (3 *10)	30 pts	5.0
Quizzes **on-line**– 4 (3 *10)	30 pts	5.0
HW* - 8 (6*10)	60 pts	10.0
Final Exam	120 pts	20.0
Laboratory	200	
Total	**800 pts**	

*HW assignments are under instructors' discretion and might include the following activities: Pre-chapter assignments with open response , i>Clicker sessions via outlook forms, Perusall, and other equivalent assignments

Each student is expected to have a passing laboratory grade; students must earn at least 65% (130 out of 200) in the lab portion and at least 65% in lecture portion of this course to pass (C or higher) Chem 1211 K course.
Letter grades are assigned based on the following scale (which may be varied slightly):

GRADE SCALE, Points	Percent	Letter Grade
760 - 800	95% - 100%	A+
720 - 759	90% - 94%	A
696 - 719	87% - 89%	A-
680 - 695	85% - 86%	B+
640 - 679	80% - 84%	B
624 - 639	78% - 79%	B-
584 - 623	73% - 77%	C+
520 - 583	65% - 72%	C
480 - 519	60% - 64%	C-
456 - 479	57% - 59%	D
<456	<57%	F

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

Final examination: is a multiple-choice examination covering material from CHEM 1211 (Students Learning Outcomes in Principles of Chemistry I course) This test is ACS Standardized test. To participate in exam student must arrive to the examination room 5 minutes prior the scheduled time. No time extension will be allowed. The Final Exam is on **12/16 at 10:45 AM**

Examinations: There are 4 major tests in this course during the semester in face-to-face format. The best three exams result out of four will be counted toward the total grade. There will be four in class exams given during the semester. The three exams with the highest scores will be averaged and will account for % of your grade. There will be no make-up exams. A missed exam will result in that exam being the dropped exam unless documentation is provided showing it was a university approved excused absence or exceptional circumstances as determined by consultation with the Dean of Students office. For these situations, an average of the three other exams will be used to replace the one missed exam score. If a student misses two exams and one satisfies the criteria above, then a comprehensive/cumulative exam will be

used to replace one missed exam and an average of that exam and the two in class exams will be used to replace the second missed exam. The comprehensive/cumulative exam will be administered at the end of the semester.

Quizzes: These assignments will be given in class in format of open response questions and on-line via iCollege in lockdown browser format. The best 3 quizzes in in-person format and 3 in on-line format result out of total 8 will be counted toward the total grade. There will be no make-up quizzes.

"Homework" assignments: Include but not limited by pre-chapter assignments/assessments with open response questions , i>Clicker sessions via outlook forms, "Perusall', and other equivalent activities.

Chemistry Department Policy on Student Conduct and Integrity: The Georgia State University Policy on Academic Honesty is enforced in this course. This includes but is not necessarily limited to infractions in the area of *plagiarism*, *cheating on examinations*, *unauthorized collaborations*, *falsification*, and *multiple submissions*. This policy is published in *On Campus: The Student Handbook*, which is available to all members of the university community.

All examinations must represent your individual effort, with no unauthorized aid. To either *give* or *receive* unauthorized information during an examination is cheating, as is the use of *any* unauthorized supplementary material. Conduct disruptive of class, examinations, or laboratories *or* falsification or destruction of information related to chemistry courses will be taken as a violation of the policies of the Board of Regents of the University System of Georgia and the Georgia State University Student Code of Conduct, Section 6.0. Any suspected offenses may be referred to the Chairman of the Department or the Dean of Students for appropriate disciplinary action.

All content created in this course, including videos, handouts, etc., may be used only by students enrolled in the course for purposes relating to the course. No materials may be shared with students outside of the class or posted in any external forum. Failure to abide by these limitations constitutes a violation of the Policy on Academic Honesty and will be treated accordingly.

As members of the academic community, students are expected to recognize and uphold standards of intellectual and academic integrity. The Policy on Academic Honesty assumes as a basic and minimum standard of conduct in academic matters that students be honest and that they submit for credit only the products of their own efforts. The ideals of scholarship and the need for fairness require that all dishonest work be rejected as a basis for academic credit. They also require that students refrain from any and all forms of dishonorable or unethical conduct related to their academic work.

The Policy on Academic Honesty is published in the Student Code of Conduct and the Student Handbook and is available to all members of the university community. The policy represents a core value of the university, and all members of the university community are responsible for abiding by its tenets. Lack of knowledge of this policy is not an acceptable defense to any charge of academic dishonesty. Members of the academic community, students, faculty and staff, are expected to report violations of these standards of academic conduct in accordance with the procedures articulated in this Policy on Academic Honesty.

Students who are concerned about their own or another's immediate safety should call the University Police at 404-413-3333 on campus and 911 if they are off campus. Students in a crisis: Call the **Counseling and Testing Center** at **404-413-1640.** https://counselingcenter.gsu.edu/crisis-services/

FERPA The Family Educational Rights and Privacy Act (FERPA) was enacted to give students access to their education records and to protect their privacy. Unless a student is legally dependent, the university is prohibited by FERPA from releasing student account information to a parent or guardian or other unauthorized third party without the student's consent.

Students who wish to authorize an individual to have access to their student records should complete the Family Educational Rights and Privacy Act Waiver with the Office of the Registrar https://cdn.gsu.edu/sapp/#/FERPA-consent-form.

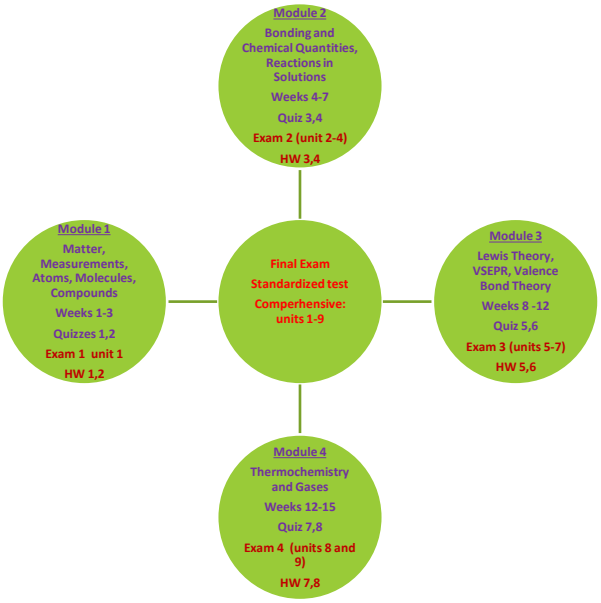
Americans with Disabilities Act Statement: Students who wish to request accommodation for a disability may do so by registering with the AACE. Students may only be accommodated upon issuance by AACE of a signed Accommodation Plan and are responsible for providing a copy of that plan to instructor of all classes in which accommodations are sought. Please seek assistance through the Access and Accommodation Center https://access.gsu.edu/. Students with AACE accommodations should then contact their instructor during the first week of classes to discuss any accommodations that need to be made. https://access.gsu.edu/

Diversity Highlights

Multicultural awareness and competency is the goal in all areas of service. The GSUCC staff represents the cultural

diversity of the student constituency, including race and ethnicity, sexual identity, age, religious affiliation, socioeconomic background and gender. Culturally diverse students are well represented as consumers of all services provided by the center. The GSUCC has been hosting Georgia State University's Cultural Competency Conference/Summit since 2002.
Statement of Non-Discrimination: Georgia State University supports the Civil Rights Act of 1964, Executive Order #11246, Title IX of the Educational Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act. No person shall, on the basis of age, race, religion, color, gender, sexual orientation, national origin or disability, be excluded from participation in, or be denied the benefits of, or be subjected to discrimination under any program or activity of the college.

The course structure and covered concepts.



Module 1 / Exam 1

1.1. Matter and its Classification
1.2. Conversion
1.3. Measurements and Significant figures
1.4. Accuracy and Precision
1.5. Mass, Volume, Density
1.6. Dimensional Analysis
1.7. Problem solving strategy.
1.8. Concepts in Atom. Atomic mass.
1.9. Isotopes. Average Atomic mass.
1.10. Periodic Table.
1.11. Ions.
1.12 The Mole. Atomic molar mass.
1.13 Bonding. Bond energy calculations.
1.14. Covalent and Ionic compounds. Classification.
1.15. Nomenclature.
1.16. Chemical Formula and formula mass. Molar mass of compound.
1.17. Mass % composition
1.18. Empirical Formula

Module 2 / Exam 2

2.1. Chemical Reactions. Chemical Equations. Balancing
2.2. Stoichiometry of Chemical Equations.
2.3. Reactions in solutions: Concentrations/Dilution/Ionic reactions/Oxidation-Reduction

Module 3/ Exam 3

3.1. Introduction to EMR. (Supplemental)
3.2. Atomic Models and Quantum Theory
3.3. Electron Configurations and Diagrams
3.4. Periodic Trends (including EN)
3.5. Ionic bonding. Lattice energy. Lewis structures
3.6. Covalent bonding. Lewis Structures. Formal Charge. Partial Charge
3.7. VSEPR. Molecular shapes and polarity.
3.8. Valence Bond Theory. Hybridization. Sigma and pi-bonding
3.9. Molecular polarity and IMF. Boiling point

Please be aware that individual additional assignments to improve your grade are NOT possible either during the semester nor after the end of the semester at any circumstance.

Module 4/ Exam 4

4.1. Thermochemistry: Internal energy. Heat and work.
4.2. System and the surroundings.
4.3. Calorimetry: Constant volume and constant pressure.
4.4. The change in Enthalpy of Reaction.
4.5. Standard states and standard enthalpy of formation.
4.6. Gases. Ideal Gas Laws.
4.7. STP. Molar volume. Density of gases.
4.8. Dalton's Law. Partial Pressure
4.9. Effusion/Diffusion.

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.

Tentative Schedule Fall 2024

Week	Dates	Covered Concepts	Assignments	Check Points	Dates of assignments
Module 1. Matter, Atoms, Mole, Bonding, Nomenclature					
1	08/26-08/30	1.1-1.5			
2	09/02-09/06	1.6-1.11	HW 1	Quiz 1 on-line 09/06 Available 2:00 – 11:59PM	09/02 HW1 is released. 09/09 HW 1 is due by 11:59 pm via iCollege
3	09/09-09/13	1.12-1.14	HW 2	Quiz 2 in-class 09/13	09/09 HW2 is released. 09/16 HW 2 is due by 11:59 pm via iCollege
4	09/16-09/20	1.15-1.18			09/16 HW3 is released. **Exam 1 in-class Friday 09/20**
Module 2. Chemical reactions, Stoichiometry					
5	**09/23-09/27**	2.1	HW 3	Quiz 3 on-line 09/27 Available 2:00 – 11:59PM	09/23 HW 3 is due by 11:59 pm via iCollege
6	09/30-10/04	2.2-2.3	HW 4	Quiz 4 in-class 10/04	09/30 HW4 is released. 10/07 HW 4 is due by 11:59 pm via iCollege
7	10/07-10/11	2.3			**Exam 2 in-class Friday 10/11**
Module 3. Lewis Theory, VSEPR, Valence Bond Theory					
8	10/14-10/18	3.1-3.3	HW 5	Semester midpoint 10/15	10/14 HW5 is released. 10/18 HW 5 is due by 11:59 pm via iCollege
9	10/21-10/25	3.4-3.6		Quiz 5 on-line 10/25 Available 2:00 – 11:59PM	
10	10/28-11/01	3.7-3.8	HW 6	Quiz 6 in-class 11/01	10/28 HW6 is released. 11/04 HW 6 is due by 11:59 pm via iCollege
11	11/04-11/09	3.9			**Exam 3 in-class Friday 11/09**
Module 4. Thermochemistry. Gases					
12	11/11-11/16	4.1-4.3	HW 7	Quiz 7 on-line 11/15 Available 2:00 – 11:59PM	11/11 HW7 is released. 11/18 HW 7 is due by 11:59 pm via iCollege
13	11/18-11/23	4.4-4.5	HW 8	Quiz 8 in-class 11/22	11/18 HW8 is released. 11/25 HW 8 is due by 11:59 pm via iCollege
14	11/25-11/30	Thanksgiving Break			
15	12/02-12/06	4.6-4.9			**Exam 4 in-class Friday 12/06**
	12/09	Last day of classes - Review			
12/16 the Final Exam (comprehensive, standardized test)					

Graded Lecture course assignment. Summary

Note: Laboratory points are not included, but required for the course passing grade to complement 800 points overall

Assignment	**number**	**Maximum points**
Examinations	4 (one drop)	3*120=360
Quizzes	8 (two drop as one of each format)	6*10 = 60
HW assignments	8 (two drop)	6*10 = 60
Final exam	1 (does **not** substitute any of the missed assignments)	1*120 = 120

CHEM 1211 Course content per Students Learning Outcomes mapping in Fall 2024 semester (Tentative)

Module 1. Fundamentals of Chemistry. Matter, Atoms, Mole, Bonding, Compounds,			
Week	Topic	Students Learning Outcomes	Course Activities
1	1.1. Matter and its Classification 1.2. Units Conversion 1.3. Mass, Volume, Density. 1.4. Measurements and Significant figures 1.5. Accuracy and Precision	• Define atoms and molecules. • Know and understand the classification of matter. Define solid, liquid and gas per description. • Classify matter per its composition. • Define homogeneous and heterogeneous mixtures. • Know and understand physical and chemical properties and changes. • Know and understand different systems of measurements: English, Metric, SI. • Know and understand unites conversions and prefix multipliers. • Know and understand derived unites: volume and density. • Define reliability of measurements: Precision and accuracy • Know and understand significant figures, exact numbers. • Be able to do calculations with significant figures. • Be able to calculate density.	
2	1.6. Dimensional Analysis 1.7. Problem solving strategy. 1.8. Concepts in Atom. Atomic mass. 1.9. Isotopes. Average Atomic mass. 1.10. Periodic Table. 1.11. Ions.	• Know and understand General problem-solving strategy. • Define **atomic mass unit**, **atomic number**, and **chemical symbol**, **isotope**, **mass number**, and **natural abundance**, • Be able to determine the number of protons and neutrons in an isotope using the chemical symbol and the mass number. • Be able to apply the dimensional analysis. • Know and understand PT • Know the general properties of elements in some specific groups: noble gases, alkali metals, alkaline earth metals, and halogens. • **Define ion**, **anion**, and **cation**. • Know and understand ion charge per the position in PT • Be able to calculate atomic mass from isotope masses and natural abundances.	09/02 HW1 is released. 09/09 HW 1 is due by 11:59 pm via iCollege. Quiz 1 on-line 09/06 Available 2:00 – 11:59PM
3	1.12 The Mole. Atomic molar mass.	• Define **mole** and **Avogadro's number**. • Be able to calculate and interconvert between number of moles and atoms, between number of moles and mass.	09/09 HW2 is released. 09/16 HW 2 is due by 11:59 pm via iCollege. Quiz 2 in-class 09/13 **(15 minutes, 4 open response questions)**

4	1.13 Bonding. Bond energy calculations. 1.14. Covalent and Ionic compounds. Classification. 1.15. Nomenclature. 1.16. Chemical Formula and formula mass. Molar mass of compound. 1.17. Mass % composition 1.18. Empirical Formula	• Define **Chemical bonding** and understand the difference between **ionic** and **covalent bonds**. • Define **bond energy**. • Differentiate between atomic or molecular elements and ionic or molecular compounds. • Know and understand the rules for naming and writing by name for ionic and covalent compounds including acids and hydrates. • Understand and calculate the molar mass of a compound. • Define and understand empirical **formula**, **molecular formula**, and **structural formula**. • Define and understand **mass percent** (mass percent composition) • Be able to write the empirical formula, molecular formula, and structural formula for simple molecules. • Be able to write formulas for ionic compounds using the charges of the ions and the principle of electrical neutrality. • Be able to calculate and interconvert between mass, moles, and molecules of a compound. • Be able to calculate mass percent from a chemical formula. • Be able to write the empirical formula, molecular formula, and structural formula for simple molecules.	
09/20 Exam 1 (30+2 MCQ questions)			
Module 2 Chemical reactions, Stoichiometry			
5	2.1. Chemical Reactions. Chemical Equations. Balancing 2.2. Stoichiometry of Chemical Equations	• Understand how a chemical reaction can be represented by a chemical equation. Define and understand **stoichiometry**, • Understand and use a balanced chemical reaction to calculate the mole relationships between components. • Determine empirical and molecular formulas from experimental data including combustion analysis. • Define **limiting reactant** and **theoretical yield**. • Understand and calculate the molar mass of a compound. • Define and understand **mass percent** (mass percent composition) • Be able to use coefficients to balance all atoms in a chemical equation. • Be able to calculate amount of reagent, product, and reactant in excess. • Be able to predict a limiting reactant using initial reactant masses and the theoretical yield. • Be able to calculate and determine a theoretical yield and a percent yield.	09/16 HW3 is released. 09/23 HW 3 is due by 11:59 pm via iCollege. Quiz 3 on-line 09/27 Available 2:00 – 11:59PM
6	2.2. Stoichiometry of Chemical Equations 2.3. Reactions in solutions: Concentrations/Dilution	• Define **solution**, **solvent**, **solute**, **aqueous solution**, and **molarity**. • Define and understand **electrolyte**, **strong electrolyte**, **weak electrolyte**, and **nonelectrolyte**. • Define **strong** and **weak acids**. • Know the solubility trends for compounds made from common anions and cations. Define **precipitate** and **precipitation reaction**. • Be able to recognize the strong and weak electrolyte. • Be able to calculate the molarity of a solution.	09/30 HW4 is released. 10/07 HW 4 is due by 11:59 pm via iCollege. Quiz 4 in-class 10/04 **(15 minutes, 4 open response questions)**
7	2.3. Reactions in solutions: Precipitation reactions Ionic reactions Oxidation-Reduction	• Be able to calculate reaction component amounts using volume, moles, concentration, and stoichiometry. • Define and understand **acid-base reaction** (**neutralization**) and **gas-evolution reaction**. • Understand the equivalence point of a titration and use solution stoichiometry and equivalence point to calculate the concentration of an unknown in a titration. • Recognize gas–evolution reactions and predict the identity of evolved gases. • Be able to write and describe a molecular, a complete ionic equation that shows all the individual ions present in a reaction, and **spectator ions**. • Be able to write and describe a net ionic equation.	

		• Define **oxidation**, **reduction**, and **oxidation-reduction** (**redox**) **reactions**. • Be able to assign oxidation states to atoms in a chemical formula. • Be able to identify the elements undergoing oxidation and reduction in a redox reaction.	
10/11 Exam 2 (30+2 MCQ questions)			
Module 3. Lewis Theory, VSEPR, Valence Bond Theory			
8	3.1. Introduction to EMR. 3.2. Atomic Models and Quantum Theory 3.3. Electron Configurations and Diagrams	• Define **electromagnetic radiation**. Define and understand **amplitude**, **wavelength**, and **frequency**. • Understand the Bohr model. • Define **orbital.** • Know the properties and allowed values of the principal quantum number, *n*; the angular momentum quantum number, *l*; the magnetic quantum number, m_l. • Know the shapes of *s*, *p*, *d*, and *f* orbitals and the relationships to quantum numbers. • Know and understand that the periodic law summarizes the behavior of the elements—arranging them by atomic number results in strong correlation with elemental properties. • Know and understand electron configurations. • Be able to apply electron configurations for the chemical reactivity. • Know that the spin quantum number, m_s. • Know the Pauli exclusion principle. Understand that the sublevels. • Know, understand and be able to depict electron configurations, valence electrons, core electrons, and electron diagrams. • Know the *s*, *p*, *d*, and *f* blocks of the periodic table. Be able to use the periodic table to predict electron configurations. • Be able to write electron configurations.	10/14 HW5 is released. 10/18 HW 5 is due by 11:59 pm via iCollege
9	3.4. Periodic Trends (including EN) 3.5. Ionic bonding. Lattice energy. Lewis structures 3.6. Covalent bonding. Lewis Structures. Formal Charge. Partial Charge	• Define and understand **ionic bond**, **covalent bond**, and **metallic bonding**. • Know and understand Lewis dot theory • Define and know the **octet rule**. • Be able to draw Lewis structures for ionic compounds. • Know and understand **bond polarity, dipole moment, and partial charge.** • Define **resonance structures**. • Define **formal charge** and understand how to calculate it for the atoms in a Lewis structure. • Know and be able to predict Periodic Trends in: the size of atoms, effective nuclear charge, metallic character, ionic radii, ionization energy, electron affinity, and electronegativity. • Be able to identify and distinguish between paramagnetic and diamagnetic atoms/ions. • Be able to draw Lewis structures for covalent compounds, and polyatomic ions. • Be able to determine magnitude and the location of formal charge in molecules and polyatomic ions. • Be able to depict single, double, and triple bond.	Quiz 5 on-line 10/25 Available 2:00 – 11:59PM

10	3.7. VSEPR. Molecular shapes and polarity. 3.8. Valence Bond Theory. Hybridization. Sigma and pi-bonding	• Know and understand that VSEPR theory. • Know that VSEPR predicts five basic shapes according to the number of electron groups surrounding a central atom: linear (2), trigonal planar (3), tetrahedral (4), trigonal bipyramidal (5), and octahedral (6). • Know the bond angles for each basic shape. • Understand the difference between electron geometry and molecular geometry. • Know and understand the effect of lone pair electrons on molecular geometry with respect to shape, bond angle, and molecular polarity. • Be able to recognize molecules in their correct shapes based on their number of electron groups. • Be able to predict and draw molecular geometries. • Be able to predict bond angle in polyatomic molecules. • Define and understand **hybridization** and the role of atomic orbitals. • Know and understand the common types of hybridization: sp^3, sp^2, and sp. • Know the hybridizations for expanded octets: sp^3d and sp^3d^2. • Be able to recognize hybridization of atom in polyatomic molecules.	10/28 HW 6 released. HW 6 is due **Monday 11/04 by 11:59 pm** submission via iCollege. Quiz 6 in-class 11/01 **(10 minutes, 4 open response questions)**
11	3.9. Molecular polarity and IMF. Boiling point	• Know and understand the molecular polarity as a function of bond polarity and molecular geometry. • Understand physical properties of compounds as a function of molecular polarity. • Know and understand IMF. • Be able to rank physical properties based on molecular formula.	
11/09 Exam 3 (30+2 MCQ questions)			
Module 4. Thermochemistry. Gases			
12	4.1. Thermochemistry: Internal energy. Heat and work. 4.2. System and the surroundings. 4.3. Calorimetry: Constant volume and constant pressure. 4.4. The change in Enthalpy of Reaction. 4.5. Standard states and standard enthalpy of formation.	• Define **energy**, **work**, **heat**, **kinetic energy**, **thermal energy**, **potential energy**, and **chemical energy**. • Know the law of conservation of energy. • Understand the difference between the system and the surroundings. • Define the **state function**. • Define and understand **thermal equilibrium**. • Define and understand **heat capacity**, **specific heat capacity**, and **molar heat capacity**. • Understand the Constant-Volume Calorimetry. • Define **enthalpy** in terms of internal energy, pressure, and volume. • Define and understand **endothermic** and **exothermic** reactions. • Be able to predict amount of heat gained or lost per the specific heat capacity. • Define **enthalpy of reaction**. • Understand and be able to calculate enthalpy changes with respect to the stoichiometry of chemical equations. • Know, understand, and calculate using reaction enthalpies. • Understand the use of Hess's law to calculate the enthalpy change for a reaction from a series of steps. • Define and understand **standard state** and **standard enthalpy of formation**. • Be able to write thermochemical equations for the formation of compounds. • Be able to calculate amount of heat released or gained per the thermochemical equation. • Be able to calculate the enthalpy of reaction using enthalpies of formation of products and reactants. • Be able to determine enthalpy of the process using Hess's law.	11/11 HW7 is released. 11/18 HW 7 is due by 11:59 pm via iCollege. Quiz 7 on-line 11/15 Available 2:00 – 11:59PM

13	4.6. Gases. Ideal Gas Laws. 4.7. STP. Molar volume. Density of gases.	• Know and be able to rationalize the simple Gas Laws: Boyle's Law, Charles's Law, and Avogadro's Law, The Ideal Gas Law • Define **standard temperature and pressure** and **molar volume** of an ideal gas. • Know and understand the relationship between molar volume, molar mass, and density. • Be able to calculate using density, molar mass, and molar volume.	11/18 HW 8 released. HW 8 is due **Monday 11/25 by 11:59 pm** submission via iCollege. 11/22 **Quiz 8 in class (15 minutes, 4 open response questions)**
15	4.8. Dalton's Law. Partial Pressure 4.9. Effusion/Diffusion .	• Define and understand **partial pressure** of a gaseous component in a mixture. • Define and determine **mole fraction** of a component in a mixture. • Be able to interconvert between molar mass, gas density, and average molecular velocity.	
12/06 Exam 4 (30+2 MCQ questions)			
12/09 the last day of classes. Wrap-up/Review/Recitation			
12/16_Final Exam ACS Comprehensive Standardized Test (70 MCQ questions, 110 minutes duration)			