

Sul Ross State University
Syllabus for General Chemistry I (CHEM 1311) Summer I 2019

Class: General Chemistry I
Room: WSB 307
Time: M-F 9:50-11:25am

Instructor: Dr. David Leaver
Office: WSB 318
Office Hours: M-R 2:00-4:00pm
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Student Learning Objectives (SLO):

A student graduating with the *chemistry major* is expected to demonstrate that (s)he is able to do the following:

1. Organic Chemistry—Students will be able to draw organic molecular structures and explain organic reactions, stereochemistry, structural analysis and reactions in biological systems.
2. Inorganic Chemistry—The student will be able to demonstrate understanding of coordination chemistry, valence theory, elementary actions and advanced molecular theory.
3. Analytical Chemistry—The student will be able to demonstrate an understanding of theory of analytical chemistry and conduct analytical analysis, including data analysis and calibration, equilibrium chemistry, gravimetric analysis, titrimetric analysis, spectroscopic analysis, and electrochemical analysis.
4. Physical Chemistry—The student will be able to demonstrate an understanding of the application and theory of physical chemistry, including topics such as atomic structure, electrochemistry, surface chemistry, solid-state chemistry, and thermodynamics.
5. Research—The student will collect and analyze published chemical literature and undertake a chemistry research project.

General Chemistry I Learning Objectives:

At the end of this course, a student should have a good understanding of:

1. The basic concepts and terms used in chemistry
2. The electronic structures of atoms and the periodic table
3. The basic concepts of chemical bonding
4. Chemical reactions in aqueous solutions
5. The ideal gas equation

Core Objectives (CO):

1. **Critical Thinking Skills** – Students will gain/improve their critical thinking ability by solving real life chemistry problems through inquiry, analysis, and evaluation of available information. Students will be tested on their critical thinking ability in exams and through lab experiments.
2. **Communication Skills** – Students will have the opportunity of improving communication skills through oral discussion and writing reports (i.e. observation, explanation, and conclusion, etc.) on the experiments done in the lab sessions.
3. **Empirical and Quantitative Skills** – Students will use the mathematical skills needed to manipulate and analyze numerical data obtained through experimentation in order to form conclusions.
4. **Teamwork** – Students will use team-spirit and consider different points of view to work effectively while conducting experiments as a team working toward a shared purpose or goal.

Text: “*General Chemistry: The Essential Concepts 7th Edition*” by Raymond Chang and Kenneth A. Goldsby, McGraw-Hill, New York, United States of America, **2014**. (Older editions such as the 5th and 6th editions are ok to use)

Calculator: A scientific calculator is required for this course.

Cell phones **ARE NOT** permitted for use in exams and should be turned off during class time.

The following chapters will be covered:

Chapter 1: Introduction (Basic Concepts: Classification of Matter; Physical and Chemical Properties of Matter; Measurement; Handling Numbers; Dimensional Analysis in Solving Problems)

Chapter 2: Atoms, Molecules, and Ions

Chapter 3: Stoichiometry

Chapter 4: Reactions in Aqueous Solutions

Chapter 5: Gases

Chapter 7: The Electronic Structure of Atoms

Chapter 8: The Periodic Table

Chapters 9 and 10: Chemical Bonding I & II

Homework: There will be problems assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED.**

Examinations: There will be *three midterm* examinations and *a final* examination. The final is mandatory and will be comprehensive. **NO MAKE-UP EXAMS WILL BE GIVEN.**

ATTENDANCE PRERESQUITE: BEING ABSENT FROM MORE THAN 5 LECTURES WILL RESULT IN FAILING THE COURSE.

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 23%

Midterm Exams (15% each): 45%

Final Exam: 25%

Lecture Attendance: 7%

Midterm Exam I: Monday, June 10th

Midterm Exam II: Monday, June 17th

Midterm Exam III: Tuesday, June 25th

Final Exam: Friday, July 5th

Course Calendar

Lecture 1 (May 29): Discussion on Syllabus; importance of chemistry; classifications of matter, overview of states and properties of matter, physical and chemical changes, units of measurements (length, volume, density, temperature etc.), scientific notation and significant figures

Lecture 2 (May 30): Precision and accuracy, Revision on Chapter 1; Dalton's atomic theory, discoveries of subatomic particles (electron, proton, and neutron), Rutherford's atomic model, atomic number, mass number, and isotopes

Lecture 3 (May 31): Molecules, compounds, ions, molecular formula and empirical formulas (**Homework 1 due**)

Lecture 4 (June 3): Chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids, review on Chapter 2

Lecture 5 (June 4): Molecular mass, mole, molar mass, atomic mass, and formula mass (**Homework 2 due**)

Lecture 6 (June 5): Chemical equations and balancing chemical equations, calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields

Lecture 7 (June 6): Terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions, writing balanced ionic equations, acid-base reactions; oxidation numbers; oxidation-reduction reactions- types with examples (**Homework 3 due**)

Lecture 8 (June 7): Solution stoichiometry, concentration units, and gravimetric analysis; revision on Chapter 4, physical properties of gases-relation between temperature, pressure, volume and amount of gases **Exam Revision on Chapters 1, 2, and 3**

Lecture 9 (June 10): Exam I, Chapters 1, 2 & 3

Lecture 10 (June 11): Ideal gas law and its applications, gas stoichiometry-calculation of reactant/product amounts in gaseous reactions using ideal gas equation

Lecture 11 (June 12): Kinetic theory of ideal gases, deviation of ideal gas, properties, modification of ideal gas law for real gases; revision on Chapter 5, properties of light, black-body radiation and photo-electric effect (**Homework 4 due**)

Lecture 12 (June 13): Atomic spectra and Bohr atomic theory De Broglie equation, dual nature of particles, Schrodinger wave, equation and orbital concept, electronic configuration-Aufbau principle, Hund's rule, paramagnetism (**Homework 5 due**)

Lecture 13 (June 14): Review on Chapter 7; **Exam Revision on Chapters 4 and 5**

Lecture 14 (June 17): Exam II, Chapters 4 and 5

Lecture 15 (June 18): Introductory discussion on periodic table, classification of elements, electronic configuration of ions and periodic variation of properties of elements Group properties of elements (**Homework 6 Due**)

Lecture 16 (June 19): Revision on chapter 8; basic concepts of chemical bonding, ionic bonds, lattice energy

Lecture 17 (June 20): Calculation of lattice energy, covalent bonds, polar covalent bonds and polarity, Lewis structures of molecules (**Homework 7 due**)

Lecture 18 (June 21): Formal charge calculations, resonance structures and bond energy, revision on Chapter 9 (**Homework 8 due**)

Lecture 19 (June 24): Exam Revision on Chapters 7, 8 and 9

Lecture 20 (June 25): Exam III, Chapters 7, 8 & 9

Lecture 21 (June 26): Molecular geometry-Valence shell electron repulsion theory

Lecture 22 (June 27): Prediction of molecular geometry and polarity

Lecture 23 (June 28): Molecular geometry and valence bond theory

Lecture 24 (July 1): Molecular orbital theory, Revision on Chapter 10 (**Homework 9 due**)

Lecture 25 (July 2): Exam Revision, Chapters 1-4

Lecture 26 (July 3): General Exam Revision

NO CLASS ON Thursday JULY 4th (INDEPENDENCE DAY HOLIDAY)

Final Exam (Friday July 5): At 9:50-11:25 am

Students with Special Needs: *Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Mary Schwartz, M. Ed., L.P.C., in Counseling and Accessibility Services, Ferguson Hall, Room 112. The mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. Telephone: 432-837-8203. E-mail: mschwartz@sulross.edu .*

Scholastic Dishonesty: Students who violate the University rules on scholastic dishonesty are subject to penalties, including the possibility of an **F** in the course and/or dismissal from the University. **All assignments (including homework) need to be individually completed and not copied from another student's work.** Electronic submission of homework is accepted after hours (not recommended), but must be hand written and scanned (either with a scanner or a smart phone) and emailed to Dr. Leaver at: david.leaver@sulross.edu. Homework electronically completed in Microsoft Word or other similar programs will **NOT** be accepted.