

Sul Ross State University
Syllabus for General Chemistry I: CHEM 1311:01 (Fall 2020)

Class: General Chemistry I
Room: WSB 101
Time: TR 11:00am -12:15pm

Instructor: Dr. David Leaver
Office: WSB 318
Virtual Office Hours:
M-R 2:00-4:30pm (Phone or Zoom)
Zoom (appointments only)
Email: david.leaver@sulross.edu
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OBJECTIVES

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.

BSc in Chemistry Marketable Skills

1. Students will become good at punctuality and time management.
2. Students will analyze &/or synthesize molecules and perform spectroscopic characterization and interpret their results scientifically.
3. Students will become proficient at writing scientific papers and to identify appropriate references for their paper.
4. Students will be become proficient at orally presenting scientific topics including the use of visual aids.

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.

REQUIRED RESOURCES AND TEXTS:

You must wear a suitable mask/face covering while on campus (including lectures & laboratories). You will be asked to leave the classroom if you come to class without a suitable mask/face covering.

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html>

Required 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).

The SRSU library has one copy of this textbook in the “Textbook Collection” section. Please ask the library front desk if you need help finding this textbook.

Suggested reading: “*Chemistry 2e*” by Paul Flowers, Klaus Theopold, Richard Langley and William R. Robinson, OpenStax, Rice University, Houston, Texas, United States of America, **2019**. <https://openstax.org/details/books/chemistry-2e>

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.

SRSU Library Services: The Sul Ross Library offers **FREE** resources and services to the entire SRSU community. Access and borrow books, articles, and more by visiting the library’s website, library.sulross.edu. Off-campus access requires your LoboID and password. Check out materials using your photo ID. Librarians are a tremendous resource for your coursework and can be reached in person, by email (srsulibrary@sulross.edu), or phone (432-837-8123).

The following chapters will be covered:

Chapter 1: 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: The Ideal Gas Equation

Chapter 7: The Electronic Structure of Atoms

Chapter 8: The Periodic Table

Chapters 9 and 10: Chemical Bonding

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.**

NOTE: Homeworks and Exams MUST be completed in pen!

ATTENDANCE PRERESQUITE: BEING ABSENT FROM MORE THAN 6 LECTURES WILL RESULT IN FAILING THE COURSE.

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 25%

Each Midterm Exam (16.67%): 50%

Final Exam: 25%

Midterm Exam I: Thursday September 24th

Midterm Exam II: Tuesday October 20th

Midterm Exam III: Tuesday November 17th

Final Exam (online): Monday December 7th 10:15 am -12:15 pm

Course Calendar

Lecture 1 (August 25): Discussion on Syllabus, importance of chemistry, classifications of matter, overview of states and properties of matter, physical and chemical changes

Lecture 2 (August 27): Units of measurements (length, volume, density, temperature etc.) and scientific notation and significant figures

Lecture 3 (September 1): Precision and accuracy; discussion on selective questions and problems on chapter 1

Lecture 4 (September 3): Dalton's atomic theory, discoveries of subatomic particles (electron, proton, and neutron), Rutherford's atomic model, atomic number, mass number, and isotopes; *Homework 1 due*

Lecture 5 (September 8): Molecules, compounds, ions, molecular formula, empirical formula, chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids

Lecture 6 (September 10): Discussion on selective questions and problems on chapter 2; Molecular mass, mole, molar mass, atomic mass, formula mass and their relations; *Homework 2 due*

Lecture 7 (September 15): Chemical equations and balancing chemical equations
Calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields

Lecture 8 (September 17): Discussion on selective questions and problems on chapter 3, *Homework 3 due*

Lecture 9 (September 22): Exam Revision, terminologies related to solutions, electrolytes, non-electrolytes, and precipitation reactions

Lecture 10 (September 24): Exam I, Chapters 1, 2 & 3

Lecture 11 (September 29): Writing balanced ionic equations, acid-base reactions; oxidation numbers; oxidation-reduction reactions with examples

Lecture 12 (October 1): Solution stoichiometry, concentration units, and gravimetric analysis; discussion on selective questions and problems on chapter 4, *Homework 4 due*

Lecture 13 (October 6): Physical properties of gases-relation between temperature, pressure, volume and amount of gases; Ideal gas law and its applications;

Lecture 14 (October 8): Gas stoichiometry-calculation of reactant/product amounts in gaseous reactions using ideal gas equation; Kinetic theory of ideal gases, deviation of ideal gas properties, modification of ideal gas law for real gases;

Lecture 15 (October 13): Discussion on selective questions and problems on chapter 5; *Homework 5 due*

Lecture 16 (October 15): Properties of light, black-body radiation and photoelectric effect; atomic spectra and Bohr atomic theory; Exam Revision

Lecture 17 (October 20): Exam II – Chapters 4 & 5

Lecture 18 (October 22): De Broglie equation, dual nature of particles, Schrodinger wave equation and orbital concept, electronic configuration-Aufbau principle, Hund's rule, paramagnetism

Lecture 19 (October 27): Discussion on selective questions and problems on chapter 7, introductory discussion on periodic table, classification of elements, and electronic configuration of ions, periodic variation of properties of elements
Homework 6 due

Lecture 20 (October 29): Group properties of elements, discussion on selective questions and problems on chapter 8

Lecture 21 (November 3): Basic concepts of chemical bonding, ionic bonds, lattice energy, and calculation of lattice energy, *Homework 7 due*

Lecture 22 (November 5): Covalent bonds, polar covalent bonds and polarity, Lewis structures of molecules, formal charge calculations

Lecture 23 (November 10): Resonance structures and bond energy, discussion on selective questions and problems on chapter 9, *Homework 8 due*

Lecture 24 (November 12): Exam revision, molecular geometry-Valence shell electron repulsion theory

Lecture 25 (November 17): Exam III; Chapters 7-9

Lecture 26 (November 19): Prediction of molecular geometry and polarity, molecular geometry- valence bond orbital theory

Lecture 27 (November 24): Molecular orbital theories, discussion on selective questions and problems on chapter 10. (*online recording*) *Homework 9 due: email it to Dr. Leaver: david.leaver@sulross.edu or turn it in early.*

November 25-27: NO CLASS: THANKSGIVING HOLIDAY

Lecture 2 (December 1): Review for Final Exam (*online recording*)

Final Exam (Comprehensive) (Monday December 7th): 10:15 am - 12:15 pm (*online exam*)

SRSU Disability Services: ADA (Americans with Disabilities Act)

Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Rebecca Greathouse Wren, LPC-S, SRSU's Accessibility Services Coordinator at 432-837-8203 (please leave a message and we'll get back to you as soon as we can during working hours), or email rebecca.wren@sulross.edu. Their office is located on the first floor of Ferguson Hall (Room 112), and our mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas, 79832.

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, but it must be hand written and scanned (either with a scanner or a smart phone) and emailed to Dr. Leaver at: david.leaver@sulross.edu.*