SUL ROSS STATE UNIVERSITY
Syllabus for General Chemistry I-21477
CHEM 1311- 001 (Spring 2022)

General Chemistry I: Lecture
Room: WSB 307
Time: M/W/F: 10:00 am -10:50 am

Instructor: Dr. Hong Young Chang
Office: WSB 219
Email: hxc19tv@sulross.edu
Office Hour: M-R 2:00-6:30pm
(In person or zoom)
(Appointments only)

(The first week (Jan. 10 to Jan. 14) is on-line class (Blackboard)
(Revert to Face-to-Face: Jan.18 to May.4)

It is strongly recommended to wear a suitable mask/face on campus (including lectures & laboratories) while you took COVID-19 Vaccine shots. There will be COVID-19 Tests in this semester. If you have tested positive for COVID-19 (or have been exposed to someone who has tested positive for COVID-19), please do self-report: https://srinfo.sulross.edu/covid-19/self-report/. In order to do self-report, you will need to be signed in with your SRSU credentials (yellow "log in" button on the bottom left-hand side of the above website). Other web-site of SRSU is also helpful for COVID-19.

COVID Regulations - SUL ROSS

Free COVID-19 testing for all SRSU students, faculty and staff comes to Alpine,

Disinfection of Classroom Surfaces: Each person should disinfect their space at the beginning and end of every class meeting. The university has provided disinfectant wipes in the classroom. When you enter the classroom, please take a wipe and use it to clean your space before settling in. Please wipe down your space before you leave the classroom.

Orderly Dismissal: When class is over, Dr. Chang will dismiss students row by row. Please wipe down your desk/leave when Dr. Chang dismisses your row.

Food & Drinks: There will be no eating or drinking in the classroom. If you need to take a sip of your drink during class time, you may leave the room to do so.

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 for accessibility service. Please contact Ms. Rebecca Greathouse Wren, M.Ed., LPC-S, Director/Counselor, Accessibility Services Coordinator, Ferguson Hall (Suite 112) at 432.837.8203; mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. E-mail: rebecca.wren@sulross.edu Students should then contact the instructor as soon as possible to initiate the recommended accommodations.

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.***

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.

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 (atom, formula, mol, etc.)
2. The electronic structures of atoms and the periodic table
3. The basic concepts of molecular structures
4. Chemical reactions in aqueous solutions
5. The ideal gas equation
6. Quantum chemical approach on atomic structure
7. Periodic variations on elements by valence electrons
8. Electron configuration on atom and ionic structure
9. Ionic bonding and covalent bonding in molecules
10. Molecular geometry in molecules by chemical bonding
11. Lewis's structure on molecules

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.

The following chapters will be covered in General Chemistry I:

Chapter 1: Basic Concepts: Classification of Matter

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

Chapter 9 and 10: Chemical Bonding

Text Book:

"***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 are 6th editions are ok to use).

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

Suggested Reading and References:

1. "***OpenStax Chemistry 2e***" https://openstax.org/details/books/chemistry-2e by Paul Flowers, Klaus Theopold, Richard Langley, etc.

2. "***Chemistry LibreTexts***" (Beginning Chemistry (Ball), Introductory, Conceptual, and GOB Chemistry - Chemistry LibreTexts

Homework & Assignments: There are two kinds of homework assigned for each chapter. ***One homework will be solved in the SRSU Blackboard (multiple-choice homework).*** *You may try to solve the problem sets several times to attain the highest score. You need to keep their due day for each chapter. Their due day for each chapter will be notified.*

The other homework will be done with your pen. *This homework style is short answer problem sets. This homework will be uploaded in Blackboard.* After solving the problem sets, please, turn in your homework as one PDF file). You also need to keep their due day for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED.** Your professor will review and check your submitted homework to know whether you copy other students' homework or not.

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.

Examinations: There will be ***three midterm*** examinations and ***a final*** examination. The final is mandatory and comprehensive.

NO MAKE-UP EXAMS WILL BE GIVEN.

NOTE: all exams MUST be completed in pen!

ATTENDANCE PRERESQUITE: BEING ABSENT FROM MORE THAN 9 LECTURES WILL RESULT IN FAILING THE COURSE.

PERCENTAGE BREAKDOWN OF MARKS:

Homework & Assignments: 20 %

(multiple-choice 10 % and short-answer 10 %)

Each Midterm Exam (20 %): 60 %

Final Exam: 20%

Exam I: Monday, February 7th

Exam II: Wednesday, March 2nd

Exam III: Monday, April 11th

Final Exam: Friday, April 29th from 10:15 am to 12:15 pm

Course Calendar

Lecture 1 (January 10): Discussion on Syllabus, importance of chemistry (***on-line recording***)

Lecture 2 (January 12): Classifications of matter, overview of states and properties of matter, physicals and chemical changes, units of measurements (length, volume, density, and temperature etc.) (***on-line recording***)

Lecture 3 (January 14): Scientific notation and significant figures, precision and accuracy (***on-line recording***)

January 17, Martin Luther King Jr. Holiday

Lecture 4 (January 19): Discussion on selective questions and problems on chapter 1

Lecture 5 (January 21): Dalton's atomic theory, discoveries of subatomic particles (electron, proton, and neutron), Rutherford's atomic model (***Homework Chapter 1 due***)

Lecture 6 (January 24): Atomic number, mass number, isotopes, molecules, compounds, ions, molecular formula, empirical formula

Lecture 7 (January 26): Chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids

Lecture 8 (January 28): Discussion on selective questions and problems on chapter 2

Lecture 9 (January 31): Molecular mass, mole, molar mass, atomic mass, formula mass and their relations (***Homework Chapter 2 due***)

Lecture 10 (February 2): Calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields

Lecture 11 (February 4): Exam Revision on chapter 1 & 2

Lecture 12 (February 7): Exam I (covers Chapter 1 & 2)

Lecture 13 (February 9): Chemical equations and balancing chemical equations

Lecture 14 (February 11): Discussion on selective questions and problems on chapter 3

Lecture 15 (February 14): Terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions, writing balanced ionic equations (***Homework Chapter 3 due***)

Lecture 16 (February 16): Acid-base reactions and oxidation numbers; oxidation-reduction reactions – types with examples

Lecture 17 (February 18): Solution stoichiometry, concentration units, and gravimetric analysis; discussion on selective questions and problems on chapter 4

Lecture 18 (February 21): Physical properties of gases-relation between temperature, pressure, volume and number of gases; Ideal gas law and its applications (***Homework Chapter 4 due***)

Lecture 19 (February 23): 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 ideal gas law for real gases.

Lecture 20 (February 25): Discussion on selective questions and problems on chapter 5

Lecture 21 (February 28): Exam Revision on chapter 3, 4, & 5 (***Homework Chapter 5 due***)

Lecture 22 (March 2): Exam II (covers Chapter 3, 4, & 5)

Lecture 23 (March 4): Properties of light, black-body radiation and photo-electric effect

Spring Break (March 7 to March 11): No Class

Lecture 24 (March 14): Atomic spectra and Bohr atomic theory

Lecture 25 (March 16): De Broglie equation, dual nature of particles, Schrodinger wave equation and orbital concept

Lecture 26 (March 18): Electronic configuration-Aufbau principle, Hund's rule, para-magnetism

Lecture 27 (March 21): Discussion on selective questions and problems on chapter 7

Lecture 28 (March 23): Introductory discussion on periodic table, classification of elements and electronic configuration of ions (***Homework Chapter 7 due***)

Lecture 29 (March 25): Periodic variation of properties of elements, Group properties of elements

Lecture 30 (March 28): Discussion on selective questions and problems on chapter 8

Lecture 31 (March 30): Basic concepts of chemical bonding, ionic bonds, lattice energy, and calculation of lattice energy, covalent bonds, polar covalent bonds and polarity (***Homework Chapter 8 due***)

Lecture 32 (April 1): Lewis structures of molecules, formal charge calculation, Resonance structures and bond energy, and discussion on selective questions and problems on chapter 9

Lecture 33 (April 4): Molecular geometry – Valence shell electron repulsion theory

Lecture 34 (April 6): Prediction of molecular geometry and polarity

Lecture 35 (April 8): Exam Revision on chapters 7, 8, & 9 (***Homework Chapter 9 due***)

Lecture 36 (April 11): Exam III (covers Chapter 7, 8, & 9)

Lecture 37 (April 13): Molecular geometry – Valence bond and molecular orbital theories

April 15, Good Friday (No Class)

Lecture 38 (April 18): Discussion on selective questions and problems on chapter 10

Lecture 39 (April 20): Review on chapter 10 (***Homework Chapter 10 due***)

Lecture 40 (April 22): Final Exam Revision (Chapter 1, 2, 3, 4, & 5)

Lecture 41 (April 25): Final Exam Revision (Chapter 7 & 8)

Lecture 42 (April 27): Final Exam Revision (Chapter 9 & 10)

Final Exam (*mandatory & comprehensive*): *Friday, April 29th from 10:15 am to 12:15 pm*