

Sul Ross State University
Syllabus for CHEM 1311 (Spring 2017)

Class: General Chemistry I
Instructor: Dr. Yanfeng Yue
Room: WSB 307; Office: WSB 217
Time: Monday, Wednesday, Friday 9:00-9:50 am
Office Hours: Monday to Friday 11:00-12:00 am
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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
6. The converting between mass and number of moles
7. Basic chemical reactions in Biology (coordination chemistry, chiral molecules e.g. amino acids/peptides)
8. Inorganic reactions related to Geology (metal ions and oxidation, color transformations)

Core Objectives (CO):

1. **Interests of Chemistry** – Inspire and keep the students' interests of chemistry.

2. **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.
3. **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.
4. **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.
5. **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.
6. **Career Goals** – Students will be trained in a broad set of skills in many disciplines that are ideal for pursuing jobs in industry or academics in graduate schools.

Lecture sessions are designed to fulfill PLO 1, CO – 1, 2, 3, 4, and 5. Lab sessions are designed to fulfill PLO 3, CO 1-6.

Text: General Chemistry by Raymond Chang (5th Edition or newer); Lab Manual: Freshman Chemistry by Rangra and Houston.

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 (SLO 1)

Chapter 2: Atoms, Molecules, and Ions (SLO2)

Chapter 3: Stoichiometry (SLO 1)

Chapter 4: Reactions in Aqueous Solutions (SLO 2)

Chapter 5: The Ideal Gas Equation (SLO 5)

Chapter 7: The Electronic Structure of Atoms (SLO 2)

Chapter 8: The Periodic Table (SLO 2)

Chapter 9 and 10: Chemical Bonding (SLO 3)

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. Two midterm exams or final examination missing WILL RESULT IN FAILING THE COURSE.**

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

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 15%

Each Midterm Exam (15%): $15\% \times 3$

Final Exam: 40%

Final Exam: Tuesday, May 9th (8:00 am)

Course Calendar

Lecture 1 (Jan 18): Discussion on Syllabus, importance of chemistry

Lecture 2 (Jan 20): Classifications of matter, overview of states and properties of matter, physical and chemical changes

Lecture 2 (Jan 23): units of measurements (length, volume, density, temperature etc.), and Scientific notation and significant figures

Lecture 3 (Jan 25): Precision and accuracy

Lecture 4 (Jan 27): Review on Chapter 1

Lecture 5 (Jan 30): 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 6 (Feb 1): Molecules, compounds, ions, molecular formula and empirical formulas

Lecture 7 (Feb 3): Chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids.

Lecture 8 (Feb 6): Review on Chapter 2

Lecture 9 (Feb 8): Molecular mass, mole, molar mass, atomic mass, formula mass and their relations **(Homework 2 due)**

Lecture 10 (Feb 10): Chemical equations and balancing chemical equations, calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields

Lecture 11 (Feb 13): Review on Chapter 3

Lecture 12 (Feb 15): terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions **(Homework 3 due)**

Lecture 13 (Feb 17): Exam Revision Chapters 1, 2, and 3

Lecture 14 (Feb 20): **Exam I, Chapters 1, 2 & 3**

Lecture 15 (Feb 22): Writing balanced ionic equations, acid-base reactions; oxidation numbers

Lecture 15 (Feb 24): oxidation-reduction reactions- types with examples; solution stoichiometry, concentration units, and gravimetric analysis

Lecture 16 (Feb 27): Review on Chapter 4

Lecture 17 (March 1): Physical properties of gases-relation between temperature, pressure, volume and amount of gases

Lecture 18 (March 3): Ideal gas law and its applications, gas stoichiometry-calculation of reactant/product amounts in gaseous reactions using ideal gas equation **(Homework 4 due)**

Lecture 19 (March 6): Kinetic theory of ideal gases, deviation of ideal gas, properties, modification of ideal gas law for real gases

Lecture 20 (March 8): Revision on Chapter 5

Lecture 21 (March 10): Properties of light, black-body radiation and photo-electric effect **(Homework 5 due)**

Spring break March 13-17

Lecture 22 (March 20): Exam Revision on Chapters 4 and 5

Lecture 23 (March 22): **Exam II, Chapters 4 and 5**

Lecture 24 (March 24): Atomic spectra and Bohr atomic theory De Broglie equation, dual nature of particles

Lecture 25 (March 27): Schrodinger wave, equation and orbital concept

Lecture 26 (March 29): electronic configuration-Aufbau principle, Hund's rule, paramagnetism

Lecture 27 (March 31): Review on Chapter 7

Lecture 28 (April 3) Introductory discussion on periodic table (**Homework 6 Due**)

Lecture 29 (April 5): Classification of elements, and electronic configuration of ions

Lecture 30 (April 7): Periodic variation of properties of elements

Lecture 31 (April 10): Group properties of elements

Lecture 32 (April 12): Review on chapter 8

Lecture 33 (April 14): Basic concepts of chemical bonding, ionic bonds, lattice energy (**Homework 7 due**)

Lecture 34 (April 17): Calculation of lattice energy, covalent bonds, polar covalent bonds and polarity

Lecture 35 (April 19): Lewis structures of molecules, formal charge calculation, resonance structures and bond energy

Lecture 36 (April 21): Exam Revision on Chapters 7, 8 and 9 (**Homework 8 due**)

Lecture 37 (April 24): **Exam III, Chapters 7, 8 & 9**

Lecture 38 (April 26): Molecular geometry-Valence shell electron repulsion theory

Lecture 39 (April 28): prediction of molecular geometry and polarity

Lecture 40 (May 1): Molecular geometry- Valence bond and molecular orbital theories

Lecture 41 (May 3): Review on Chapter 10

May 4, Thursday Dead Day

Lecture 42 (May 5): Exam Revision

Lecture 41 (May 8): Exam Revision

Final Exam (May 9): 8:00 a.m. – 10:00 a.m.

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 Schwartze, 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. Yue at: yanfeng.yue@sulross.edu. Homework electronically completed in Microsoft Word or other similar programs will NOT be accepted.