

Sul Ross State University
Syllabus for CHEM 1312 (Spring 2017)

Class: General Chemistry II
Room: WSB 307
Time: TR 9:30-10:45am
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Instructor: Dr. Yanfeng Yue
Office: WSB 217
Office Hours: MWF 11:00-12:00

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, you should have a good understanding of:

- A. Basic concepts of intermolecular forces
- B. Physical properties of solutions
- C. Basic concepts of chemical kinetics and equilibrium
- D. Concepts of acid and bases
- E. Laws of thermodynamics
- F. Redox reactions

Core Objectives (CO):

- A. **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

- B. **Communication Skills** – Students will have the opportunity to improve their communication skills through oral discussion and writing reports (i.e. observation, explanation, and conclusion etc.) on the experiments done in the lab sessions.
- C. **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
- D. **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

Lecture sessions are designed to fulfill PLO 1, CO -A, B & C, and lab sessions are designed to fulfill PLO 3, CO A-D.

Text: “*General Chemistry: The Essential Concepts*” by Raymond Chang and Kenneth A. Golds by 6th Edition (editions such as the 5th or 7th editions are ok to use as well).

The following chapters will be covered:

- Chapter 6:** Energy Relationships in Chemical Reaction (SLO E)
- Chapter 12:** Intermolecular Forces and Liquids and Solids (SLO A)
- Chapter 13:** Physical Properties of Solutions (SLO B)
- Chapter 14:** Chemical Kinetics (SLO C)
- Chapter 15:** Chemical Equilibrium (SLO C)
- Chapter 16:** Acids and Bases (SLO D)
- Chapter 17:** Acid-Base Equilibria (SLO D)
- Chapter 18:** Laws of Thermodynamics (SLO E)
- Chapter 19:** Redox Reactions (SLO F)

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

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 15%

Each Midterm Exam (15%): 45%

Final Exam: 40%

Final Exam (Monday, May 8): Time: 8:00 am-10:00 am

Course Calendar

Lecture 1 (Jan 17): Discussion on Syllabus. Importance of chemical energy, types of energy, energy changes in chemical reactions

Lecture 2 (Jan 19): First law of thermodynamics

Lecture 3 (Jan 21): Enthalpy of chemical reactions and calorimetry

Lecture 4 (Jan 24): Revision on Chapter 6, Kinetic Molecular Theory of liquids and solids,

Lecture 5 (Jan 26): Types of intermolecular forces, properties of liquids, crystal structure and bonding in solids, liquid-vapor equilibrium, and liquid-solid equilibrium (*Homework Chapter 6 due*)

Lecture 6 (Jan 31): Phase diagrams and revision on Chapter 12, types of solutions, concentration units

Lecture 7 (Feb 2): Factors affecting solubility, colligative properties (*Homework Chapter 12 due*)

Lecture 8 (Feb 7): revision on Chapter 13, terminologies related to rate laws (*Homework Chapter 13 due*)

Lecture 9 (Feb 9): Exam Revision, first and second order reactions and experimental determinations of rate laws

Lecture 10 (Feb 14): Exam I: Chapters 6, 12 & 13

Lecture 11 (Feb 16): Activation energy and temperature dependence of rate constants, elementary reactions

Lecture 12 (Feb 21): Catalysis, revision on Chapter 14, the concepts of chemical equilibrium, equilibrium constants

Lecture 13 (Feb 23): Reaction quotients, calculation of equilibrium concentrations, factors affecting chemical equilibrium, (*Homework Chapter 14 due*)

Lecture 14 (Feb 28): Revision on chapter 15, concepts of acids and bases, acid-base properties of water, pH, strength of acids and bases

Lecture 15 (March 2): Ionization constants of weak acids and bases, percent ionization, Ionization constants of conjugate acids-bases, acid-base properties of salts, (*Homework chapter 15 due*)

Lecture 16 (March 7): Exam Revision, Lewis acids and bases

Lecture 17 (March 9): Exam II: Chapters 14 & 15

Spring Break. March 13-17

Lecture 18 (March 23): Revision on Chapter 16. Concept of buffer solution, preparing buffer with a specific pH,

Lecture 19 (March 28): Strong acid-strong base titrations, weak acid-strong base titrations, acid-base indicators, solubility product, molar solubility, (*Homework Chapter 16 due*)

Lecture 20 (March 30): Predicting precipitation reactions

Lecture 21 (April 4): common ion effect and solubility, complex ion equilibria and solubility

Lecture 22 (April 6): Revision on Chapter 17, spontaneous processes and entropy, second law of thermodynamics

Lecture 23 (April 11): Gibbs free energy and chemical equilibrium, (*Homework Chapter 17 due*)

Lecture 24 (April 13): Revision on Chapter 18, redox reactions and balancing redox equations,

Lecture 25 (April 18): Galvanic cells and standard reduction potentials Electromotive force (emf) and Nernst equation (*Homework Chapter 18 due*)

Lecture 26 (April 20): Exam Revision for Midterm Exam III

Lecture 27 (April 25): Midterm Exam III

Lecture 28 (April 27): Final Exam Revision

Lecture 29 (May 2): Final Exam Revision

Lecture 30 (May 4): Dead day

Final Exam (May 8): Time: 8:00 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 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.*