

Sul Ross State University
Syllabus for CHEM 1312 (Spring 2016)

Class: General Chemistry II
Room: WSB 307
Time: TR 9:30-10:45am
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Office Phone: (432) 837-8217

Instructor: Dr. Yanfeng Yue
Office: WSB 217
Office Hours: MWF 11:00am-12:00 noon

Program Learning Objectives (PLO):

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

1. Explain atomic & molecular structures, bonding, thermodynamics, chemical equilibria & kinetics, stoichiometry, and electrochemical processes
2. Write and explain organic reactions, stereochemistry, and reactions in biological systems
3. Use essential modern instruments to perform chemistry experiments in the laboratory
4. Browse chemistry research journal articles and be able to perform chemistry literature searches via available databases such as Web of Science, Google Scholar and Sci-Finder Scholar.
5. Summarize basic principles of research design and analyze experimental data using appropriate computer

Student Learning Objectives (SLO):

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. Goldsby 7th Edition (older editions such as the 5th and 6th 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.**

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

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.**

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 15%

Each Midterm Exam (15%): 45%

Final Exam: 40%

- 1) **If one midterm exam missed, the score of the missed midterm exam can be averaged out from the other 3 exams (two midterm exams and the final exam).**
- 2) **Two midterm exams or final examination missing will result in failing the course.**

Course Calendar

Lecture 1 (Jan 19): Discussion on Syllabus. Importance of chemical energy, types of energy, energy changes in chemical reactions

Lecture 2 (Jan 21): First law of thermodynamics, Enthalpy of chemical reactions and calorimetry

Lecture 3 (Jan 26): Revision on Chapter 6, Kinetic Molecular Theory of liquids and solids,

Lecture 4 (Jan 28): 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 5 (Feb 2): Phase diagrams and revision on Chapter 12, types of solutions, concentration units

Lecture 6 (Feb 4): Factors affecting solubility, colligative properties (*Homework Chapter 12 due*)

Lecture 7 (Feb 9): revision on Chapter 13, terminologies related to rate laws (*Homework Chapter 13 due*)

Lecture 8 (Feb 11): Exam Revision, first and second order reactions and experimental determinations of rate laws

Lecture 9 (Feb 16): Exam I: Chapters 6, 12 & 13

Lecture 10 (Feb 18): Activation energy and temperature dependence of rate constants, elementary reactions

Lecture 11 (Feb 23): Catalysis, revision on Chapter 14, the concepts of chemical equilibrium, equilibrium constants

Lecture 12 (Feb 25): Reaction quotients, calculation of equilibrium concentrations, factors affecting chemical equilibrium, (*Homework Chapter 14 due*)

Lecture 13 (March 1): Revision on chapter 15, concepts of acids and bases, acid-base properties of water, pH, strength of acids and bases

Lecture 14 (March 3): 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 15 (March 8): Exam Revision, Lewis acids and bases

Lecture 16 (March 10): Exam II: Chapters 14 & 15

Lecture 17 (March 15): Revision on Chapter 16. Concept of buffer solution, preparing buffer with a specific pH,

Spring Break. March 16-18

Lecture 18 (March 22): Strong acid-strong base titrations, weak acid-strong base titrations, acid-base indicators, solubility product, molar solubility, (*Homework Chapter 16 due*)

Lecture 19 (March 24): Predicting precipitation reactions

Lecture 20 (March 29): common ion effect and solubility, complex ion equilibria and solubility

Lecture 21 (March 31): Revision on Chapter 17, spontaneous processes and entropy, second law of thermodynamics

Lecture 22 (March 5): Gibbs free energy and chemical equilibrium, (*Homework Chapter 17 due*)

Lecture 23 (April 7): Revision on Chapter 18, redox reactions and balancing redox equations,

Lecture 24 (April 12): Galvanic cells and standard reduction potentials Electromotive force (emf) and Nernst equation (*Homework Chapter 18 due*)

Lecture 25 (April 14): Exam Revision, Concepts of batteries, corrosion, and electrolysis

Lecture 26 (April 19): Exam III: Chapters 16, 17 & 18

Lecture 27 (April 11): Revision of Chapter 19

Lecture 28 (April 26): Exam Revision Chapters 6 & 12

Lecture 29 (April 28): Exam Revision Chapters 13-14 (*Homework Chapter 19 due*)

Lecture 30 (May 3): Exam Revision Chapters 15-16

Lecture 31 (May 5): Exam Revision Chapters 17-19

Final Exam (May 10): 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 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: djl14jh@sulross.edu or david.leaver@sulross.edu. Homework electronically completed in Microsoft Word or other similar programs will NOT be accepted.*