

Sul Ross State University
Syllabus for CHEM 1312 (Spring 2015)

Class: General Chemistry II	Instructor: Dr. David Leaver
Room: WSB 307	Office: WSB 318
Time: MWF 10:00-10:50am	Office Hours: T-F 3:00-5:00pm
Lab: Tuesday 1:00-2:50pm (Section 1)	Email: djl14jh@sulross.edu
Tuesday 3:00-4:50pm (Section 2)	Office Phone: (432) 837-8115

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. Summarize basic principles of research design and analyze experimental data using appropriate computer programs (e.g. Excel, Sigma-plot, etc.) in regards to the chemistry discipline

Student Learning Objectives (SLO):

At the end of this course, you should have a good understanding of:

- A. the basic concepts of intermolecular forces
- B. physical properties of solutions
- C. the basic concepts of chemical kinetics and equilibrium
- D. the 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 by Raymond Chang (7th Edition or older); Lab Manual: Freshman Chemistry by Rangra and Houston

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 9 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: 20%

Each Midterm Exam (15%): 45%

Final Exam: 35%

Midterm Exam I: Monday, February 16th

Midterm Exam II: Wednesday, March 11th

Midterm Exam III: Monday, April 13th

Final Exam: Monday, May 11th

Course Calendar

Lecture 1 (January 21): Discussion on Syllabus, exams and grade distributions. Importance of chemical energy

Lecture 2 (January 23): Types of energy, energy changes in chemical reactions and first law of thermodynamics

Lecture 3 (January 26): Enthalpy of chemical reactions and calorimetry

Lecture 4 (January 28): Revision on Chapter 6

Lecture 5 (January 30): Kinetic Molecular Theory of liquids and solids, types of intermolecular forces, and properties of liquids (**Homework 1 due**)

Lecture 6 (February 02): Crystal structure and bonding in solids, liquid-vapor equilibrium, and liquid-solid equilibrium

Lecture 7 (February 04): Phase diagrams; Revision on Chapter 12

Lecture 8 (February 06): Types of solutions, concentration units, factors affecting solubility (**Homework 2 due**)

Lecture 9 (February 9): Colligative properties;

Lecture 10 (February 11): Revision on Chapter 13 (**Homework 3 due**)

Lecture 11 (February 13): Exam revision on Chapters 6,12 &13

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

Lecture 13 (February 18): Terminologies related to rate laws, first order and second order reactions

Lecture 14 (February 20): Experimental determinations of rate laws, activation energy and temperature dependence of rate constants

Lecture 15 (February 23): Elementary reactions and catalysis

Lecture 16 (February 25): Revision on Chapter 14 (**Homework 4 due**)

Lecture 17 (February 27): The concepts of chemical equilibrium, equilibrium constants and reaction quotients

Lecture 18 (March 02): Calculation of equilibrium concentrations and factors affecting chemical equilibrium

Lecture 19 (March 04): Revision on Chapter 15 (**Homework 5 due**)

Lecture 20 (March 06): Concepts of acids and bases, acid-base properties of water and pH

Lecture 21 (March 9): Exam revision on Chapters 14 & 15

Lecture 22 (March 11): Exam II (Chapters 14 & 15)

Lecture 23 (March 13): Strength of acids and bases, ionization constants of weak acids and bases, percent ionization

March 16-20th is Spring Break (No classes)

Lecture 24 (March 23): Ionization constants of conjugate acid-base, acid-base properties of salts, Lewis acids and bases

Lecture 25 (March 25): Revision on Chapter 16 (**Homework 6 due**)

Lecture 26 (March 27): Concept of buffer solution and preparing buffer with a specific pH

Lecture 27 (March 30): Strong acid-strong base titrations, weak acid-strong base titrations and strong acid-weak base titrations

Lecture 28 (April 01): Acid-base indicators, Solubility product, molar solubility and predicting precipitation reactions

Lecture 29 (April 03): Common ion effect and solubility, complex ion equilibria and solubility

Lecture 30 (April 06): Revision on Chapter 17 (**Homework 7 due**)

Lecture 31 (April 08): Spontaneous processes and entropy, second law of thermodynamics

Lecture 32 (April 10): Exam revision on Chapters 16-17

Lecture 33 (April 13): Exam III; Chapters 16-17

Lecture 34 (April 15): Gibbs free energy and chemical equilibrium

Lecture 35 (April 17): Revision on Chapter 18 (**Homework 8 due**)

Lecture 36 (April 20): Redox reactions and balancing redox equations

Lecture 37 (April 22): Galvanic cells and standard reduction potentials

Lecture 38 (April 24): Electromotive force (emf) and Nernst equation.

Lecture 39 (April 27): Concepts of batteries, corrosion and electrolysis

Lecture 40 (April 29): Revision on Chapter 19 (**Homework 9 due**)

Lecture 41 (May 01): Final Exam Revision (Chapters 6,12 and 13)

Lecture 42 (May 04): Final Exam Revision (Chapters 14, 15 and 16)

Lecture 43 (May 06): Final Exam Revision (Chapters 17, 18 and 19)

Final Exam (May 11): At 10:15 am-12:15 pm; Chapters 6,12-19

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.