

**Sul Ross State University**  
**Syllabus for General Chemistry II: CHEM 1312- 21962 (Spring 2020)**

**Class:** General Chemistry II  
Room: WSB 307  
Time: TR 11:00 am-12:15 pm

**Instructor:** Dr. Hong Young Chang  
Office: WSB 219  
Office Hours: M-R 3:00-5:00pm  
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**Date:** Jan 13 to May 06, 2020

## **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 II Learning Objectives:***

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

1. The basic concepts of intermolecular forces
2. Physical properties of solutions
3. The basic concepts of chemical kinetics and equilibrium
4. The concepts of acid and bases
5. Laws of thermodynamics
6. Redox reactions

### ***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.

**Text Book:** “*General Chemistry: The Essential Concepts 7<sup>th</sup> Edition*” by Raymond Chang and Kenneth A. Goldsby, McGraw-Hill, New York, United States of America, **2014**. (Older editions such as the 5<sup>th</sup> and 6<sup>th</sup> editions are ok to use).

**The SRSU library has one copy of this textbook in the “Textbook Collection” section. Please ask the library front desk if you need help finding this textbook.**

**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.

The following chapters will be covered in General Chemistry II:

**Chapter 6:** Energy Relationships in Chemical Reactions

**Chapter 12:** Intermolecular Forces and Liquids and Solids

**Chapter 13:** Physical Properties of Solutions

**Chapter 14:** Chemical Kinetics

**Chapter 15:** Chemical Equilibrium

**Chapter 16:** Acids and Bases

**Chapter 17:** Acid-Base Equilibria and Solubility Equilibria

**Chapter 18:** Thermodynamics

**Chapter 19:** Redox Reactions and Electrochemistry

**Homework & Assignments:** There will be the problem-sets (the odd number of Questions and Problems) assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED. ELECTRONIC SUBMISSION OF HOMEWORK WILL NOT BE ACCEPTED.**

**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: Homework and 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: 25%  
Each Midterm Exam (16.67%): 50%  
Final Exam: 25%

**Midterm Exam I:** Thursday February 13<sup>th</sup>

**Midterm Exam II:** Thursday March 5<sup>th</sup>

**Midterm Exam III:** Thursday April 16<sup>th</sup>

**Final Exam:** Monday, May 4<sup>th</sup> at 10:15 am-12:15 pm, WSB307

## **Course Calendar**

**Lecture 1 (January 14):** Discussion on Syllabus. Importance of chemical energy, types of energy, energy changes in chemical reactions

**Lecture 2 (January 16):** The first law of thermodynamics, enthalpy of chemical reactions, and calorimetry.

**Lecture 3 (January 21):** Discussion on selective questions and problems on Chapter 6, and kinetic molecular theory of liquids and solids,

**Lecture 4 (January 23):** Types of intermolecular forces, properties of liquids, liquid-vapor equilibrium, liquid-solid equilibrium, and solid-vapor equilibrium (*Homework Chapter 6 due*)

**Lecture 5 (January 28):** Phase diagrams and discussion on selective questions and problems on Chapter 12, types of solutions and concentration units

**Lecture 6 (January 30):** Factors affecting solubility and colligative properties (*Homework Chapter 12 due*)

**Lecture 7 (February 4):** Discussion on selective questions and problems on Chapter 12, and terminologies related to rate laws.

**Lecture 8 (February 6):** First & second order reactions and experimental determination of rate laws (*Homework Chapter 13 due*)

**Lecture 9 (February 11):** Exam Revision

**Lecture 10 (February 13): Exam I: Chapters 6, 12 & 13**

**Lecture 11 (February 18):** Activation energy and temperature dependence of rate constants, elementary reactions, reaction mechanism, and catalysis

**Lecture 12 (February 20):** Discussion on selective questions and problems on Chapter 14, the concepts of chemical equilibrium, and equilibrium constants

**Lecture 13 (February 25):** Reaction quotients, calculation of equilibrium concentrations, and factors affecting chemical equilibrium (*Homework Chapter 14 due*)

**Lecture 14 (February 27):** Discussion on selective questions and problems on chapter 15, concepts of acids and bases, acid-base properties of water, pH, strength of acids and bases, ionization constants of weak and bases, and percent ionization

**Lecture 15 (March 3):** Exam Revision (*Homework Chapter 15 due*)

**Lecture 16 (March 5): Exam II: Chapters 14 & 15**

**NO CLASS: SPRING BREAK (March 9 to March 13)**

**Lecture 17 (March 17):** Ionization constants of conjugate acids-bases, determination of pH for weak acids and bases using ICE tables, acid-base properties of salts, Lewis acids and bases, and discussion on selective questions and problems on Chapter 16

**Lecture 18 (March 19):** Common ion effect in chemical equilibrium, Henderson-Hasselbalch equation, concept of buffer solution, and preparing buffer with a specific pH (*Homework Chapter 16 due*)

**Lecture 19 (March 24):** Strong acid-strong base titrations, weak acid-strong base titrations, acid-base indicators

**Lecture 20 (March 26):** Solubility product, molar solubility, predicting precipitation reactions, common ion effect and pH on solubility

**Lecture 21 (March 31):** Discussion on selective questions and problems on Chapter 17, spontaneous processes and entropy, and microstates related to entropy

**Lecture 22 (April 2):** The second law of thermodynamics, entropy changes in systems and surroundings, and the third law of thermodynamics (***Homework Chapter 17 due***)

**Lecture 23 (April 4):** Gibbs free energy chemical equilibrium, and discussion on selective questions and problems on Chapter 18

**Lecture 24 (April 7):** Redox reactions, balancing redox equations, spontaneous Galvanic cells, and standard reduction (***Homework Chapter 18 due***)

**Lecture 25 (April 9):** Potentials electromotive force (emf), Nernst equation, concentration cells, concepts of batteries,

**Lecture 26 (April 14):** Exam Revision

**Lecture 27 (April 16): Exam III: Chapters 16, 17, & 18**

**Lecture 28 (April 21):** Concepts of corrosion, electrolysis, and discussion on selective questions and problems on Chapter 19 (***Homework Chapter 19 due***)

**Lecture 29 (April 23): Final Exam Revision** (Chapters 6, 12, 13, 14, 15)

**Lecture 30 (April 28): Final Exam Revision** (Chapters 16, 17, 18, 19)

**NO CLASS: DEAD DAY (April 30)**

**Final Exam (Comprehensive): Monday, May 4<sup>th</sup>** at 10:15 am-12:15 pm, WSB307

**Students with Special Needs:** *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](mailto: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.*