

SUL ROSS STATE UNIVERSITY
Syllabus for GENERAL CHEMISTRY II Lab:
CHEM 1112:2L1 (CRN: 31252) (Summer II 2021)

General Chemistry 2: Lab 01
Room: WSB 307
Time: Tues 1:30-4:30 pm

TA: Hong Young Chang
Office: WSB 219
Email: hong.young.chang@sulross.edu
Office Hours: after class

REQUIRED RESOURCES AND TEXTS:

Food & Drinks: **There will be no eating or drinking in the classroom.** If you need to take a sip of your drink during class time, you may leave the room to do so.

Required Laboratory Manual

General Chemistry II: Laboratory Manual CHEM 1112 by Dr. Leaver, 2015 (available from the bookstore)

Safety glasses are required for General Chemistry laboratories, which can be purchased from the SRSU Bookstore. Note: If you have prescription eye glasses they actually count as safety glasses in the chemistry laboratories, so if you wear prescription glasses you do not have to buy a pair of safety glasses to do labs. You will NOT be allowed to participate in General Chemistry laboratories without safety glasses!

Laboratory coats are recommended for General Chemistry laboratories, which can be purchased from the SRSU Bookstore.

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.

BSc in Chemistry Marketable Skills

1. Students will become good at punctuality and time management.
2. Students will analyze &/or synthesize molecules and perform spectroscopic characterization and interpret their results scientifically.
3. Students will become proficient at writing scientific papers and to identify appropriate references for their paper.
4. Students will be become proficient at orally presenting scientific topics including the use of visual aids.

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 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

TEXES® Core Subjects EC-6 (Texas Education Agency (TEA)), Science competencies covered in General Chemistry I (CHEM 1112):

Competency 001 (Lab Processes, Equipment and Safety): The teacher understands how to manage learning activities, tools, materials, equipment and technologies to ensure the safety of all students.

- A. Understand safety regulations and guidelines for science facilities and science instruction.
- B. Know procedures for and sources of information regarding the appropriate handling, use, disposal, care and maintenance of chemicals, materials, specimens and equipment.
- D. Select and safely use appropriate tools, technologies, materials and equipment needed for instructional activities.
- E. Understand concepts of precision, accuracy and error with regard to reading and recording numerical data from a scientific instrument.
- F. Understand how to gather, organize, display and communicate data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
- G. Understand the international system of measurement (i.e., metric system) and perform unit conversions within measurement systems, including the use of nonstandard units.

Competency 002 (History and Nature of Science): The teacher understands the history and nature of science, the process and role of scientific inquiry and the role of inquiry in science instruction.

- A. Understand, plan, design and implement instruction that provides opportunities for all students to engage in nonexperimental- and experimental-inquiry investigations
- B. Focus inquiry-based instruction on questions and issues relevant to students and use strategies to assist students with generating, refining and focusing scientific questions and hypotheses.

- C. Understand and instruct students in the safe and proper use of a variety of grade-appropriate tools, equipment, resources, technology and techniques to access, gather, store, retrieve, organize and analyze data.
- D. Know how to guide students in making systematic observations and measurements and posing questions to guide investigations.
- E. Know how to promote the use of critical-thinking skills, logical reasoning and scientific problem solving to reach conclusions based on evidence.
- F. Know how to teach students to develop, analyze and evaluate different explanations for a given scientific result, including that repeated investigations may increase reliability.
- G. Know how to teach students to demonstrate an understanding of potential sources of error in inquiry-based investigation.
- H. Know how to teach students to demonstrate an understanding of how to communicate and defend the results of an inquiry-based investigation.
- I. Understand principles of scientific ethics.
- K. Understand the historical development of science (e.g., cell theory, plate tectonics, laws of motion, universal gravity) and technology and the contributions that diverse cultures and individuals of both genders have made to scientific and technological knowledge.

Competency 003 (Impact of Science): The teacher understands how science impacts the daily lives of students and interacts with and influences personal and societal decisions.

- A. Understand that decisions about the use of science are based on factors such as ethical standards, economics and personal and societal needs.
- B. Apply scientific principles to analyze the advantages of, disadvantages of or alternatives to a given decision or course of action.
- E. Identify and understand the types and uses of natural resources and the effects of human consumption on the renewal and depletion of resources.
- F. Understand the role science and scientists can play in helping resolve personal, societal and global challenges.

Competency 004 (Concepts and Processes): The teacher knows and understands the unifying concepts and processes that are common to all sciences.

- A. Understand how a unifying, explanatory framework across the science disciplines is provided by the concepts and processes of systems, order and organization; evidence, models and explanation; change, constancy and measurements; and form and function.

- B. Demonstrate an understanding of how patterns in observations and data can be used to make explanations and predictions.
- C. Analyze interactions and interrelationships between systems and subsystems.
- D. Apply unifying concepts to explore similarities in a variety of natural phenomena.
- E. Understand how properties and patterns of systems can be described in terms of space, time, energy and matter.
- F. Understand how change and constancy occur in systems.
- G. Understand the complementary nature of form and function in a given system.
- H. Understand how models are used to represent the natural world and how to evaluate the strengths and limitations of a variety of scientific models (e.g., physical, conceptual, mathematical).

Competency 005 (Students as Learners and Science Instruction): The teacher has theoretical and practical knowledge about teaching science and about how students learn science.

- D. Understand common misconceptions in science and have effective ways to address those misconceptions.
- H. Understand how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science.

Competency 007 (Forces and Motion): The teacher understands forces and motion and their relationships.

- A. Demonstrate an understanding of the properties of universal forces (e.g., gravitational, electrical, magnetic).

Competency 008 (Physical and Chemical Properties): The teacher understands the physical and chemical properties of and changes in matter.

- A. Describe and measure the physical and chemical properties of substances (e.g., size, shape, temperature, magnetism, hardness, mass, conduction, density).
- B. Describe the physical properties of solids, liquids and gases.
- C. Distinguish between physical and chemical changes in matter.
- D. Apply knowledge of physical and chemical properties (including atomic structure) of and changes in matter to processes and situations that occur in life and in earth and space science.
- E. Distinguish between elements, compounds, mixtures and solutions and describe their properties.

- F. Describe and explain the occurrence and importance of a variety of chemical reactions that occur in daily life (e.g., rusting, burning of fossil fuels, photosynthesis, cell respiration, chemical batteries, digestion of food).

Competency 009 (Energy and Interactions): The teacher understands energy and interactions between matter and energy.

- A. Understand conservation of energy and energy transformations and analyze how energy is transformed from one form to another (e.g., potential, kinetic, mechanical, sound, heat, light, chemical, electrical) in a variety of everyday situations and how increasing or decreasing amounts affect objects.
- B. Understand the basic concepts of heat energy and related processes (e.g., melting, evaporation, boiling, condensation, conduction, convection, and radiation).
- C. Understand the principles of electricity and magnetism and their applications (e.g., electric circuits, electromagnetic fields, motors, audio speakers, lightning).
- D. Apply knowledge of properties of light (e.g., reflection, refraction) to describe the functioning of optical systems and phenomena (e.g., camera, microscope, rainbow, eye).

Competency 010 (Energy Transformations and Conservation): The teacher understands energy transformations and the conservation of matter and energy.

- A. Describe sources of electrical energy and processes of energy transformation for human uses (e.g., fossil fuels, solar panels, hydroelectric plants).
- B. Apply knowledge of transfer of energy in a variety of situations (e.g., the production of heat, light, sound and magnetic effects by electrical energy; the process of photo-synthesis; weather processes; food webs; food and energy pyramids).
- C. Understand applications of energy transformations and the conservation of matter and energy in life and in earth and space science.

Competency 015 (Structure and Function of Earth Systems): The teacher understands the structure and function of Earth systems.

- A. Understand the structure of Earth and analyze constructive and destructive processes (including plate tectonics, weathering and erosion) that produce geologic change, including how these processes have affected Earth history.
- B. Understand the form and function of surface water and groundwater.

- C. Apply knowledge of the composition and structure of the atmosphere and its properties.
- D. Apply knowledge of how human activity and natural processes, both gradual and catastrophic, can alter Earth systems.

Competency 016 (Cycles in Earth Systems): The teacher understands cycles in Earth systems.

- D. Apply knowledge of how human and natural processes affect Earth systems.
- E. Understand and describe the properties and uses of Earth materials (e.g., rocks, soils, water, atmospheric gases).

Competency 017 (Energy in Weather and Climate): The teacher understands the role of energy in weather and climate.

- A. Understand the elements of weather (e.g., humidity, wind speed and direction, air pressure, temperature) and the tools used for measurement
- B. Compare and contrast weather and climate.
- D. Apply knowledge of how transfers of energy between Earth systems affect weather and climate.

Calculator: A scientific calculator is required for this course.

Cell phones ARE NOT permitted for use in exams and should be turned off during laboratory time.

Expectations:

- Read over the experiment before lab
- Follow all safety procedures:
- Shorts, flip-flops, chewing gum and open-toed shoes are **NOT** allowed in lab. If you come to class without appropriate clothing, you will be asked to leave. **NO EXCEPTIONS!**

Attendance:

Coming to lab is mandatory. Be on time and SIGN IN at the beginning of the lab period. Plan to spend the entire period in lab. The TA may deduct points for students who arrive late or leave early.

If you miss 2 labs or more you will receive an automatic F.

Assignments:

Lab Manual Assignments:

- Pre-Lab: Due at the beginning of the lab that the experiment will be performed
- Data Sheet: Due the lab period after the lab is done

Written Assignments:

- Pre-Lab Write Up: Due at the beginning of the lab that the experiment is performed
- Lab Report: Due the lab period after the lab is done
- Guidelines for writing lab reports are shown on the next page and are found in your General Chemistry II Laboratory Manual

Lab Grading:

- Each experiment is worth 30 points
- These points will come from:
 - o The pre-lab definitions (5)
 - o Attendance (10)
 - o The experiment work & on time submission of data & result sheets/written lab report (15)
 - o **Note:** Points will be deducted for not turning in lab reports data/results sheets on time

- **Assignments must be completed and turned in on time**
 - o Assignments must be legible
 - o Assignments and reports will be due the following week unless told otherwise
 - o 10% of the grade will be deducted for assignments not turned in at the beginning of lab. An additional 10% will be deducted for each day that the assignment is late

Outline for Written Pre-lab Reports

- **Aim:** Here you will state the goal of the experiment (in your own words).
- **Reagents:** You will make a list of all of the chemicals used in the experiment along with relevant data (grams, volume, molarity etc. that is indicated in your experiment).
- **Apparatus:** You will list all of the equipment that you will use.
- **Method:** This is where you will outline the steps in the experiment. The steps will be put in your own words.

Outline for Written Lab Reports (Use Microsoft Word or related program)

- **Aim:** Here you will state the goal of the experiment (in your own words).
- **Reagents:** You will make a list of all of the chemicals used in the experiment along with relevant data (grams, volume, molarity etc.). This is how much **YOU** used, not how much the manual asks for.
- **Apparatus:** You will list all of the equipment that you used.
- **Method:** This is where you will outline the steps in the experiment. Be sure to note any difference between what you did and what the manual said to do.
- **Data & Results:** Note the observations that you made during the experiment. What are your findings? (percent yield, melting point, etc.)
- **Discussion:** Discuss your results and answer the questions that were asked in the **Data and Results** section of the experiment. Talk about

the significance of your results. Were your results expected or unexpected? Why or why not?

- **Conclusion(s):** Summarize the key points and findings of the experiment. Was the experiment successful or unsuccessful?

ADA Statement: *Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. Students with qualifying disabilities who seek accommodations must initiate a request for a meeting for accessibility services. Students seeking accessibility services must contact Rebecca Greathouse Wren, M.Ed., LPC-S, Counseling & Accessibility Services, Telephone: 432-837-8203, or E-mail: rebecca.wren@sulross.edu*

For more information see: <https://www.sulross.edu/page/1384/accessibility-services>

Please inform Dr. Hong Young Chang if you are pregnant or get pregnant during this summer semester as chemicals used in the chemistry laboratory could have harmful effects on an unborn child and extra safety precautions and due diligence need to be taken into consideration during laboratory periods.

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.

General Chemistry 1112 Lab Schedule

<u>Date</u>		<i>EXPERIMENT</i>
July	13	Syllabus discussion, Safety Practices and Procedures in the Laboratory (Exp.1) & Heat of Reaction (Exp. 2)
July	15	Enthalpy of Solutions (Exp. 3)
July	20	Colligative Properties (Exp. 5)
July	22	Rates of Chemical Reactions (Exp. 6)
July	27	Determination of Dissociation Constant of a Weak Acid (Exp. 8)
July	29	Titration of Polyprotic Acids (Exp. 9)
August	3	Solubility Product & Common ion Effect (Exp. 10)
August	5	Qualitative Analysis of Cations (Exp. 11) and lab clean up
August	6	Final Exam (online Blackboard)

(by CDT, Time: 10:00AM to 5:00PM)