

SUL ROSS STATE UNIVERSITY

Lab Syllabus for Analytical Chemistry I: CHEM 2401 (Spring 2019)

LAB: Analytical Chemistry I
TA: Yelixza Avila
Room: WSB 307
Office hrs: WRF 12:00-2:00;

Time: Tuesday 1:00-4:50 pm
Email: yia13fw@sulross.edu

Required Laboratory Manual

Handouts will be provided before each lab meeting. Bring a printed copy with you to the lab each week.

OBJECTIVES

Student Learning Objectives (SLO):

A student graduating with the ***chemistry major*** is expected to demonstrate the ability 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.

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

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, 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!
- Food or drinks, or chewing gum are not allowed in lab. If you need to hydrate during lab time, you should leave drinks in the hall or secured in the TA office.

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 3 labs or more you will receive an automatic F.**

Outline for the labs

1. Orientation to the Analytical Laboratory
2. Determination of Iron in tap Water
3. Determination the concentration of manganese in Water
4. Acid-Base Titration (Using NaOH titrate Acetic Acid)
5. Precipitate Titration (AgNO₃ titrate NaCl)
6. Characterize Amino Acids using Fourier transform infrared spectroscopy (FTIR)
7. Characterize TiO₂ nanoparticles using X-ray powder diffraction
8. Brief introduction of the analytical lab (Rebecca Percoco)

Assignments:

Lab Assignments:

- Pre-lab report: Weekly labs will be provided electronically in the week before the lab meeting; print this out and bring a copy with you to the lab. Before the lab period, you are expected to read through the lab for understanding. No prelab report is required for this course, but it is important to display an understanding of the concepts and techniques during completion of the exercise.
- Post-lab report: Typed post-labs will be due the week following the conclusion of the experiment; that is, experiments that require two lab sessions will only have one report, due a week after the experiment is complete.

Written Assignments:

- Lab Report: Due the week after the lab is done. Turn lab reports in to Dr. Yue since he will be grading them. Since this class is quite small, we will be working together as a single lab group and completing one report for each experiment. All class members are expected to contribute to preparing for lab, performing the experiment, collecting and recording data, and generating the report.
- Guidelines for writing lab reports is provided below in a separate section.

Lab Grading:

- Each experiment is worth 30 points. These points will come from:
 - Attendance (5)
 - The experiment work & on time submission of data & result sheets/ written lab report (25)
 - ***Do not turn in lab work late.***
- Assignments must be completed and turned in on time
 - Assignments must be legible
 - Assignments and reports will be due the following week unless told otherwise. If you are responsible for turning in the lab report, do so promptly.

Outline for Written Lab Reports (Use Microsoft Word or similar)

- ***Introduction:*** Here you will discuss the concepts illustrated by the experiment and your hypothesis for the experimental procedure.
- ***Reagents:*** You will make a list of all of the chemicals used in the experiment along with relevant data (grams, volume, molarity et c.). This is how much you actually used, not how much the experiment handout asks for. For each reagent, include any relevant safety information.
- ***Apparatus:*** You will list all of the equipment that you used.
- ***Method:*** This is where you will outline the steps in the experiment. Note any difference between what you did and what the handout said to do.
- ***Data & Results:*** Note the observations made during the experiment. What are the findings? (percent yield, melting point, etc.)
- ***Discussion:*** Discuss the results and answer any questions that were asked in the **Data and Results** section of the experiment. Talk about the significance of the results. Was the hypothesis confirmed? Were the 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? How would you improve the experiment if you had to perform it another time? Consider both your own performance of the techniques and the lab procedure itself when suggesting ways to improve it.

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 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.

Analytical Chemistry Lab Schedule

Week #	Lab Title
0	Safety Video
1	Orientation to the Analytical Laboratory & Equipment, Performing Serial Dilution, Chemical Titration Techniques, Analytical balance
2	Introduction to Analytical Spectrophotometry: Iron in water (Uv-vis)
3	Determination of Manganese in environmental waters (Uv-vis)
4	Precipitate Titration (AgNO_3 titrate NaCl)
5	Determination Nickel in Steel (Muffle furnace)
6	Determination of Carbonate in Soda Ash
7	Acid-Base Titration (Using NaOH titrate Acetic Acid)
8	Redox Titration of Hypochlorite in Bleach
9	Determination of water hardness (EDTA Titration)
10	Introduction to Fourier-transform infrared spectroscopy (FT-IR / Amino acids)
11	Introduction to the Analytical Geology Lab – R. Percoco (TiO_2 /Powder x-ray diffraction)
12	Introduction to Atomic Absorption Spectrometry
13	**Final Exams, No Labs Meeting**