CHEM 4212 Laboratory for Chemistry 4211 (CRN: 20675)
SPRING 2023

Schedule:

Lecture Monday 12:30 – 1:20 pm (PSCI 314)

Lab Monday 1:30 – 4:20 pm (CCSB G.0714)

Instructor:

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Teaching Assistant:

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I. Textbook: No textbook is required for this course. Laboratory activities will be posted on the course Blackboard site.

II. Course Objectives:

a. To practice and improve your skills and knowledge in Instrumental analytical chemistry.
b. To apply the knowledge and gain hands-on experience in subjects covered in the lecture.

III. Course Description:

- These experiments are intended to illustrate the major analytical techniques described in the lecture.
- Every Monday at 12:30 PM we will have student presentations about basics of the lab content, followed by hand-on experiments of the week.
- A pre-lab quiz will be available each week, to test basic knowledge about the lab.
- It is important that you invest in good preparation BEFORE coming to lab by reading the lab manuals and writing your own outlined procedure for each lab.
- A maximum of two chances (for the entire semester) will be given to make-up any missed lab(s) but it must be made up according to the availability of the scheduled labs.

IV. Course Evaluation:

You will be evaluated based on your overall grasp of the skills, concepts, and participation in the laboratory experiments and written exercises. Your overall lab grades will depend on:

Assessment Items	Points		Due Date
	Numeric	Percent	
a) Pre-Lab Quizzes	24 points each X10 = **240**	20 %	**Every Monday by 12:29 PM.**
b) Student presentations	24 points each X10 = **240**	20%	**Every Monday at 12:30 PM**
c) Lab Reports	36 points each X10 = **360**	30 %	**Every Sunday by 11:59 PM.**
d) Final Project	**150** points	12.5 %	**April 24th, 2023**
d) Final Exam	**150** points	12.5 %	**May 01st, 2023**
e) Attendance	**60**	5 %	
TOTAL POINTS	**1200**	100%	

Grade Breakdown:

Points	**1200**	**1056**	**936**	**816**	**660**	**0**
%	**100**	**88**	**78**	**68**	**55**	**0**
	A	**B**	**C**		**D**	**F**

a) **Pre-Lab Quizzes (in blackboard)** - Pre-Lab Quizzes will be available each week in blackboard for the upcoming lab experiment. Pre-labs are due by 12:29 PM every Monday. There will be no pre-lab for the first experiment. The quizzes are designed to test your basic understanding of the materials for the specific week. No make-ups for pre-lab will be given.

b) **Student presentations:** Each group will present the designated content (details are included in the table of Tentative Schedule). The group-based presentation will be 5-7 min and 3-5 min of questions and answers.

c) **Lab Reports**: Reports are turned in on individual basis in blackboard. A lab notebook is highly encouraged for recording data during experiments. Lab reports will only be counted if you attend the lab. Any missed lab will result in a zero on that lab.

Reports should be uploaded to Blackboard before due date which is the day before the next lab by 11:59 PM. Reports submitted past the deadline will not be accepted.

LABORATORY REPORT REQUIREMENTS:

A lab report (by group) should contain the following components.

1. Your name. (1 pt)

2. The date that the experiment was performed. (1 pt)
3. Title of the experiment. (1 pt)
4. Objectives of the experiment. (3 pts)
5. Introduction: A description of the basic theory of the experiment and the operation of the instrument used. (5 pts)
6. Materials and Methods: (5 pts)
   - List all chemicals (including solvents) to be used. List formula weights for each substance and other useful information such as the physical properties, MSDS, etc. Find this information in the reference libraries, or on-line.
   - A clearly and concise procedure statement. You are required to use a flow chart to illustrate the procedure.
7. Results and Discussions: (15 pts)
   - Data, numerical analysis, graphs, tables, etc. Show appropriate calculations and clearly identify important answers. Always use units in your calculations. Be sure to indicate any uncertainties.
   - Discussions of the results: Describe experimental conditions, observations, and interesting finding. You may find references to support your hypothesis and statements.
   - Discussions of any challenges or mistakes that you encounter during the experiment and how your group address the problems.
8. Conclusion: A conclusion statement summarizing the result and any conclusion. A summary statement about the data found and the determined results must be clearly stated. Also indicate what you have learned in this experiment. (3 pts).
9. References: List at least 2 references cited in your reported. (2 pt).

d) **Final Project:** A final project will be evaluated at the end of the semester. For that you must select one of the several techniques that is covered during the semester and apply it to solve an issue relevant to the community. You will collect the samples, prepare the experimental protocol, and come up with conclusions regarding the problem that is being investigated. The final evaluation will consist of a research report and a final presentation. The project will be done in a group basis and will be evaluated according to the following:

1- A tentative title and information about the instrument or instruments you will utilize during your research project. Send this information to your TA via email by **February 13, 2023**. (10 pts).

2- A detailed project report. Submit this final report by **April 17, 2023.** (70 pts).

FINAL PROJECT REPORT REQUIREMENTS:

i. Your name and your lab partners' names. (1 pt)
ii. The date that the experiment was performed. (1 pt)
iii. Title of the experiment. (1 pt)
iv. Introduction: A description of the basic theory of the experiment and the operation of the instrument used. (10 pts)

v. Problem that you are trying to understand or solve and hypothesis. (10 pts)

vi. Objectives of the experiment. (5 pts)

vii. Materials and Methods: (8 pts)

- List all chemicals (including solvents) to be used. List formula weights for each substance and other useful information such as the physical properties, MSDS, etc. Find this information in the reference libraries, or on-line.
- A clearly and concise procedure statement. You are required to use a flow chart to illustrate the procedure.

viii. Results and Discussions: (20 pts)

- Data, numerical analysis, graphs, tables, etc. Show appropriate calculations and clearly identify important answers. Always use units in your calculations. Be sure to indicate any uncertainties.
- Discussions of the results: Describe experimental conditions, observations, and interesting finding. You may find references to support your hypothesis and statements.
- Discussions of any challenges or mistakes that you encounter during the experiment and how your group address the problems.

ix. Conclusion: A conclusion statement summarizing the result and any conclusion. A summary statement about the data found and the determined results must be clearly stated. Also indicate what you have learned in this experiment. (10 pts).

x. References: List at least 5 references cited in your reported. (4 pts).

3- To present your project on **April 24, 2023.** Each team will have 20 minutes total (70 pts).

FINAL ORAL PRESENTATION RUBRICS:

i. **Presence (5 pts)**
-body language & eye contact
-contact with the public
-poise
-physical organization

ii. **Language skills (5 pts)**
-correct usage
-appropriate vocabulary and grammar
-understandable (rhythm, intonation, accent)
-spoken loud enough to hear easily

iii. **Organization (10 pts).**
-clear objectives
-logical structure
-signposting

iv. **Mastery of the subject (30 pts).**

-pertinence
-depth of commentary
-spoken, not read
-able to answer questions

v. **Visual aids (10 pts).**
- slides
-handouts
-audio, video, etc.

vi. **Overall impression (10 pts).**
-very interesting / very boring
-pleasant / unpleasant to listen to
-very good / poor communication

e) **Final Exam:** A comprehensive exam will be given at the end of the semester.

f) **Attendance** - You must be present during each lab experiment to be eligible for a grade on this category. DON'T SCHEDULE OTHER APPOINTMENTS/commitments during this lab time, as your grade will suffer if you are not in the lab at the scheduled times.

V. Course Policies:

- Goggles are required in the lab. No open toe shoes are allowed.
- The labs are long, and you will need to use your time wisely.
- **Academic honesty:** Materials (reports, quizzes, exam or otherwise) submitted to fulfill academic requirements must represent a student's own efforts. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Violations will be taken seriously and will be referred to the Dean of Students Office for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions.
- There could be small modifications made to the syllabus during the semester. The instructor and TA will inform the student about any change by announcing in the class and on blackboard course site. However, it is the student's responsibility to attend the class and/or check the course site to keep up to date with any information that is provided to him/her and to use it responsibly.

VI. Others:

- **Safety:** Please practice safety.
  - Safety eyewear and lab-coats must be worn during experiments.
  - Cell phones must be turned off. NO EXCEPTIONS.
  - Open-toe shoes are not allowed.
  - Gloves should be worn when appropriate and recommended by the instructor.
  - Long hair must be tied back so it will not accidentally fall into an experiment.
  - No foods or drinks are allowed in the lab.
  - You must wash your hands after dealing with chemicals or dirty glassware, and when you are done with the lab.

- Always look behind you before beginning to move in a lab.
- Speak loud and clear to warn others of an accident and or potential danger.
- Know your safety options before you begin (sinks, shower, eyewash, gloves).
- Know your path out of the lab, if it becomes necessary.
- Know where the fire extinguishers are.
- If an instructor is present during a fire, allow them to operate the fire extinguisher.
- Know what can go wrong and be prepared with a solution.
- Research any chemical that is unfamiliar to you. Know its properties.
- Familiarize yourself with the first-aid supplies and their location.

- **Waste**

  Improper waste disposal into the drain is not only dangerous to you, but hazardous to a whole community. Unpredictable and dangerous (explosive) chemical reactions can occur. Follow the directions given to you on the boards or hoods for properly disposing chemical waste. **Make sure to write down the name and the quantity of the waste put into the waste bottle.**

VII. Course Withdrawal Policy

Classes dropped prior to the official census date **(02/13)** will be deleted from the student's semester record. After this date, the University permits any student to drop with an automatic "W" by the course dropping deadline **(03/31).** After this date students who withdraw must receive grades of "F".

VIII. Course Calendar:

The content is tentative and subject to change. Any changes will be announced in advance.

Week	Date	Subject	Group	Content of Presentations
1.	01/16	No lab		
2.	01/23	No lab		
3.	01/30	Safety and Introduction Instrument Tours.	All	N/A
4.	02/06	Identifying an Unknown Compound by Infrared Spectroscopy.	Group 1	Theory and Procedure
		Spec 20 Visible Light Spectrometer- $CoCl_2$ and bromocresol green.	Group 2	Theory and Procedure
5.	02/13	Spec 20 Visible Light Spectrometer- $CoCl_2$ and bromocresol green.	Group 1	Application.
6.		Identifying an Unknown Compound by Infrared Spectroscopy.	Group 2	Application.
7.	02/20	A Cyclic Voltammetry Study of the Oxidation of Ascorbic Acid (Vitamin C) at A Glassy Carbon Electrode. Analysis of Trace Lead in Water by Anodic Stripping Voltammetry	Group 1	Theory and Procedure

		Measurement of Caffeine In Coffee Beans With UV/Vis Spectrometer.	Group 2	Theory and Procedure
8.	02/27	Measurement of Caffeine In Coffee Beans With UV/Vis Spectrometer.	Group 1	Application.
		A Cyclic Voltammetry Study of the Oxidation of Ascorbic Acid (Vitamin C) at A Glassy Carbon Electrode. Analysis of Trace Lead in Water by Anodic Stripping Voltammetry	Group 2	Application.
9.	03/06	Acid Digestion (Hot Block) of Plant Samples to Analyze Cu Content Using ICP-OES	Group 1	Theory and Procedure
		Quantification of Riboflavin in Energy Drinks by Fluorescence Spectroscopy.	Group 2	Theory and Procedure
10.	03/13	Spring Break.		
11.	03/20	Quantification of Riboflavin in Energy Drinks by Fluorescence Spectroscopy.	Group 1	Application.
12.		Acid Digestion (Hot Block) Of Plant Samples To Analyze Cu Content Using ICP-OES	Group 2	Application.
13.	03/27	Analysis of Bisphenol A by GC/MS.	Group 1	Theory and Procedure
		Analysis of Cadmium in Water Using ICP-MS and Yttrium as an Internal Standard	Group 2	Theory and Procedure
14.	04/03	Analysis of Cadmium in Water Using ICP-MS and Yttrium as an Internal Standard	Group 1	Application.
		Analysis of Bisphenol A by GC/MS.	Group 2	Application.
15.	04/10	Purifying and Analyzing carbon-based materials with Raman Spectroscopy and MALDI-TOF Mass Spectrometry.	Group 1	Theory and Procedure
		X-Ray Fluorescence Analysis of Pure Metals	Group 2	Theory and Procedure
16.	04/17	X-Ray Fluorescence Analysis of Pure Metals	Group 1	Application.
		Purifying and Analyzing carbon-based materials with Raman Spectroscopy and MALDI-TOF Mass Spectrometry.	Group 2	Application.
17.	04/24	**Final Presentation.**		
18.	05/01	**Final Exam.**		