

# Chemistry 248

## Course Syllabus

### Spring 2022

**Instructor:** Dr. Laura J. Cole  
**Office:** 412 Chemistry Biology Building  
**Phone:** (715)346-4302  
**Email:** lcole@uwsp.edu  
**Canvas:** Chemistry 248

**Office hours:** M – 2:00, T – 1:00, W – 11:00, R – 10:00. Other times by appointment.

#### Class Sessions

<b>Lecture:</b>	01	T, R	12:00 – 12:50	CBB	105	Dr. Cole
<b>Laboratory:</b>	01L1	M, W	8:00 - 10:50	CBB	466	Dr. Cole
	01L2	T, R	2:00 - 4:50	CBB	466	Dr. Cole

#### Course Description

Chemistry 248 is a course where the principles of quantitative analysis will be examined. Topics that will be covered include statistics and data analysis, acid-base equilibrium, gravimetric analysis, complexation reactions, spectroscopy, electrochemistry, and chromatography.

#### Required Materials

**Textbook:** Exploring Chemical Analysis, 5th Ed., by Daniel C. Harris. The textbook is available at text rental.

**Laboratory Manual:** Quantitative Analysis Experiments that is available for purchase at the bookstore.

**Laboratory Goggles:** These must be goggles, not glasses. They are to be purchased from the bookstore or nicer ones may be purchased from the Chemistry Club at the start of the semester.

**Laboratory Notebook:** Permanently bound, quadrille ruled which is available for purchase at the bookstore or other stores.

**Calculator:** A scientific calculator that will perform the functions  $\log x$ ,  $10^x$ ,  $\ln x$ , and  $e^x$ .

## **Policies & Procedures**

**Face Coverings:** Every individual who enters campus lands shall wear a face covering: i. In all indoor public spaces except students in their assigned residence hall rooms and employees when alone in a private, unshared office or lab. Any student with a condition that impacts their use of a face covering should contact the [Disability and Assistive Technology Center](#) to discuss accommodations in classes.

### **Other Guidance for in person class:**

- Please monitor your own health each day. If you are not feeling well or believe you have been exposed to COVID-19, do not come to class; email your instructor and contact Student Health Service (715-346-4646).
  - As with any type of absence, students are expected to communicate their need to be absent and complete the course requirements as outlined in the syllabus.
- Wash your hands or use appropriate hand sanitizer regularly and avoid touching your face.
- Please maintain these same healthy practices outside the classroom.

**Attendance:** It is important to attend the lecture because the material covered will include information pertinent to the laboratory portion of the class. In addition, homework assignments will also be distributed during the lecture. Material missed due to absence is your responsibility.

**Laboratory:** One of the primary objectives of this course is to introduce you to techniques of quantitative analysis. Since proper techniques are emphasized, the accuracy of your results is an important part of your grade. Overall, the accuracy of your results contributes about 50% to your grade. You will be expected to perform the experiments in your designated class period. You will be allowed to work at your own pace with specific due dates for each experiment. As long as the results are reported by the deadline, you are on schedule.

- **Be prepared.** It is important to be prepared for each laboratory period. The semester will go much more smoothly if you read the experiments before coming to lab and understand the purpose and procedures that will be performed. It is also worthwhile to prepare your laboratory notebook ahead of time for your data entries. Laboratory time should be used doing experiments and not figuring out what to do next!

In some experiments there are long waiting times - you can use this time to start another part of the experiment or a new experiment. Therefore, it is also extremely important to notice when this might occur and plan your day accordingly.

**Laboratory Notebook:** The laboratory notebook is an important record of the work that you have performed. It is vital that the notebook be kept organized and neat. If data is recorded wrong, one line is placed through the number in error and the corrected value written next to it. It is essential that all of the data that you take be recorded in the lab notebook as the data is taken and only on the right hand page. Otherwise, data can be misplaced, lost or stolen. The laboratory notebook will be collected when each experiment report is done.

- **Organization of Lab Notebook:** (points deducted if missing item)
  1. All entries must be made in **ink** which will not run or smear when wet.
  2. Up-to-date Table of Contents at the beginning of the notebook. (1 pt)
  3. Sequentially numbered pages on the right hand side. (0.5 pt)
  4. The date and your signature at the top of each page on the first page where data are recorded, as well as at the end of the day's data. (0.5 pt)
  5. On the first page and/or following pages for each experiment: the title of the experiment, purpose of the experiment, and procedure for the experiment including chemical reactions that are important. (3 pts) The data tables will follow.
  6. A complete record of all data taken. All data should be labeled (with units) and should have a heading indicating what the data represent. Any errors should be marked through with only one line, dated and initialed. (1 pt labels, 1 pt units)
  7. One set of sample calculations for each calculation made. (2 pts)
  8. A summary of your results – tape your report sheet into the notebook.
  9. Conclusions about your experiment and results. (1 pt)

An example of the organizational setup for the laboratory notebook will be distributed.

**Examinations:** There will be four exams each worth 100 points.

**Homework:** Homework assignments will be made during lectures. These will be due the week after they are assigned.

**Laboratory Results:** The score for this part of each experiment is based on the accuracy of the results. Each experiment is worth 50 points, with 5 points due to your lab notebook. Since there are nine regular experiments, regular laboratory reports will be worth a possible 450 points.

It is possible to **Redo**, or **Recalculate** any results.

**Redo** - The experiment may be repeated **once** with a new unknown (if time permits). The new score will be the average of the two scores. **Redo** experiments must be completed, and turned in within three weeks of the original due date.

**Recalculate** - In the case of a calculation error a new report must be submitted along with an indication in your lab notebook of where the error occurred. Errors in judgment may not be used to recalculate a result. For example, you may not change your result to a median value from a mean or vice versa. You should discuss recalculations with your laboratory instructor. Your new score will be determined by subtracting ten points from your “recalculated” score. Recalculations must be submitted within one week of the original due date.

Late lab reports will have five points subtracted from the score for each day that the lab is late. Late lab reports may not be redone or recalculated.

**Formal Report:** For the vanillin experiment, a formal report will be required. The sections that should be included in the report are: Objective, Introduction, Experimental, Data, Calculations, Results, and Discussion. The material that should be included in each section is described in a separate handout. A first draft is required for the formal report which is worth 15 points. The final draft will be worth 35 points.

**Electronic Resources:** A Canvas course site has been set up for our course. You can access it from [www.uwsp.edu/canvas](http://www.uwsp.edu/canvas) and log in with your UWSP log on information. I will post information related to class, such as worksheets, and a running total for your grades on this site.

**Safety:** Each student is expected to work safely (as outlined by the instructor, the lab safety agreement, MSDS's, and/or label information) at all times. Unsafe behavior will not be tolerated. In the event of behavior deemed unsafe by the laboratory instructor, the instructor may dismiss the student from that day's activities. The student will not be allowed to make up that lost time. If documented unsafe behavior continues, the student may be dismissed from the course.

**Grading:** The course grade will be determined by the sum of the points received from the following:

Laboratory Results (9 at 50 pts ea.)	450
Formal Report (total from rough draft and final draft)	50
Homework (11 at ~10 pts ea.)	110
Exams (4 at 100 pts ea.)	<u>400</u>
Total points	1010

The grading scale cutoffs will be as follows: A >939 pts (93%), B: 838 (83%), C: 737 (73%), D: 636 (63%), F < 636 (63%). Grades near a cutoff may be assigned + or - designations.

**Academic Responsibility:** Academic misconduct will not be tolerated. Academic misconduct is defined by the UWSP Handbook Chapter 14.03(1). Anyone who engages in academic misconduct will be subject to disciplinary measures according to the UWSP handbook. The handbook chapter can be found using the following web link:  
<http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/SRR-2010/rightsChap14.pdf>.

**Cell Phone Usage:** Cell phones should be turned off and not used during class for texting or talking.

**Disability Services:** Students with disabilities should contact the Office of Disability Services during the first two weeks of the semester if you wish to request accommodation.

**Religious Beliefs:** Religious beliefs will be accommodated according to UWS 22.03, as long as you notify me within the first three weeks of the beginning of classes of the specific days which you will request relief from an examination or academic requirement.

## A Few Notes

I am looking forward to a fruitful semester of teaching and learning with you in Chemistry 248. In order to help you learn the material, I have office hours which are listed. I may be available during the research/class prep time – contact me in advance if you want to see me at those time. My class schedule is shown below. Good luck with the semester!

	Monday	Tuesday	Wednesday	Thursday	Friday
08:00	248 Lab 01L1 CBB 466	Research Class Prep	248 Lab 01L1 CBB 466	Research Class Prep	Research Class Prep
09:00				Office Hour	
10:00				Office Hour	
11:00	Research Class Prep	248 Lec 01 CBB 105	Research Class Prep	248 Lec 01 CBB 105	
12:00		Office Hour	Research Class Prep	Research Class Prep	
1:00	Office Hour	248 Lab 01L2 CBB 466	106 Lab 02L4 CBB 236	248 Lab 01L2 CBB 466	Meeting
2:00	Research Class Prep				Meeting
3:00	Research Class Prep				
4:00					

## Chemistry 248 Tentative Lecture Schedule

<b>Date</b>	<b>Topic</b>	<b>Reading</b>
January 25	Class Information, Course Policies	
January 27	Introduction to Quantitative Analysis, Measurements & Calculations	Chapters 0, 1, 2
February 1	Errors in Analysis & Evaluation of Data: Statistics	Chapters 3, 4
February 3	Errors in Analysis & Evaluation of Data: Statistics	Chapters 3, 4
February 8	Titrimetric Methods	Chapter 6
February 10	Gravimetric Methods	Chapter 7
February 15	Chemical Equilibrium Review	
February 17	<b>Exam I</b>	
February 22	Chemical Equilibrium Review	
February 24	Chemical Equilibrium Review	
March 1	Acid-Base Equilibria	Chapters 8, 9
March 3	Acid-Base Titrations	Chapters 10, 11
March 8	Systematic Treatment of Equilibrium	Chapter 12
March 10	Systematic Treatment of Equilibrium	Chapter 12
March 15	EDTA Titrations	Chapter 13
March 17	<b>Exam II</b>	
March 21-25	<b>Spring Break</b>	
March 29	Spectroscopic Methods	Chapters 18, 19
March 31	Spectroscopic Methods	Chapters 18, 19
April 5	Introduction to Electrochemistry	Chapters 14, 15
April 7	Introduction to Electrochemistry	Chapters 14, 15
April 12	Redox Titrations	Chapter 16
April 14	Atomic Spectroscopy	Chapter 20
April 19	Atomic Spectroscopy	Chapter 20
April 21	<b>Exam III</b>	
April 26	Analytical Separations	Chapter 21
April 28	Analytical Separations	Chapter 21
May 3	Gas Chromatography	Chapter 22
May 5	Liquid Chromatography	Chapter 24
May 10	Coulometry	Chapter 17
May 12	Review	
May 17	<b>Exam IV: 8:00 – 10:00 am</b>	

## Chemistry 248 Laboratory Schedule

WEEK	DATES	CLEAN-UP ROW	EXPERIMENTS	PAGES IN LAB MANUAL	REPORT DUE DATE
1	1/ 24-25		Check-in and Calibration	Handout, 39	
	1/ 26-27		Calibration of buret and pipets	39	
2	1/ 31-2/1	1	Calibration of buret and pipets	39	
	2/ 3-4	2	Finish Calibration		
3	2/ 7-8	3	Standardization of HCl	41	Na <sub>2</sub> CO <sub>3</sub> Report Due 2/16-17
	2/ 9-10	4	Sodium Carbonate Titration		
4	2/ 14-15	5	Prep and Std of EDTA & Mn in Steel	67	Mn Report Due 3/2-3
	2/ 16-17	6	Mn in Steel	75	
5	2/ 21-22	1	Mn in Steel		
	2/ 23-24	2	Mn in Steel	75	
6	2/ 28-3/1	3	Vanillin in Vanilla Extract	81	First Draft Formal Report Due 3/16-17
	3/ 2-3	4	Vanillin in Vanilla Extract		
7	3/ 7-8	5	Vanillin in Vanilla Extract		
	3/ 9-10	6	Limestone for Fe	87	Limestone Rept Due 3/30-31
8	3/ 14-15	1	Limestone for MgO and CaO		
	3/ 16-17	2	Finish Limestone		
	3/ 21-25		<b>Spring Break</b>		
9	3/ 28-29	3	Acid Mixture	99	Acid Mix Report Due 4/6 - 7
	3/ 30-31	4	Acid Mixture		
10	4/ 4-5	5	Ethanol by Titration	107	Ethanol Report Due 4/13 – 14
	4/ 6-7	6	Ethanol by Titration		
11	4/ 11-12	1	Ethanol by GC	115	GC Report Due 4/20-21
	4/ 13-14	2	Ethanol by GC		
12	4/ 18-19	3	Cu-Zn by AA	123	AA Report Due 4/27-28
	4/ 20-21	4	Cu-Zn by AA		
13	4/ 25-26	5	Coulometry	129	Coulometry Rept. Due 5/4-5
	4/ 27-28	6	Coulometry		
14	5/ 2-3	1	Make-up		
	5/ 4-5	2	Make-up		
15	5/ 9-10	3	Make-up		
	5/ 11-12		Check-out		