



Chemistry 214, Quantitative Analysis Lab Spring 2024 Syllabus

Chem 214-001 and 002, Quantitative Analysis Lab (1 credit hour)
January 23 – April 29, 2024

Prerequisite: Chem 106/102 and 112, as well as active attendance or completion of lecture Chem 212.

Lab Location: Flanner Hall 313. Sections: (001) 8:20-12:20pm (002) 1:40-5:40pm

Instructors:

Teaching Assistant (TA): Monika Rasic email:mrsasic@luc.edu

Laboratory Coordinator: Dr. Conrad Naleway

Office Hours in STEM Center, St. Joseph's Hall Cafeteria & ZOOM (Meeting ID: 495 082 9636) and by a scheduled appointment (schedule in advance). <https://luc.zoom.us/j/4950829636>

Email: cnalewa@luc.edu | **Phone:** (773) 508-3115

Office: Flanner Hall 200C

Course Meeting Times: Students are only allowed to attend the course section they are formally enrolled in according to LOCUS. This course has mostly synchronous (real-time, in-person lab experiments) work and also one virtual online assignment on HPLC. It is the student's responsibility to pay attention to all course information, including the course schedule at the end of this syllabus. As a student enrolled in the course, you agree to abide by the syllabus and complete all course aspects including rules, requirements, labs/experiments/activities, lab report, assignments, homework, quizzes, abiding by due dates, etc. This course requires your full commitment. All times listed are Central Standard Time (CST). Expect the experiments to take the full 4-hours to complete!

On all scheduled lab days, students must come to lab to complete in person lab experiments/lab activities. Students are assigned days to come to lab and can only come to the lab section that they are formally enrolled in in LOCUS. Students cannot go to the other lab sections. No exceptions.

Academic Calendar: It is the student's responsibility to not only know the schedule for this course but also the official **University Academic Calendar** and important dates in the calendar.

Health, Safety, and Well-Being On Campus: Please be familiar with and adhere to all guidelines posted for **On-Campus Guidelines in Classroom Scenarios** and for **Campus Info & Resources**.

Course Description:

This lab course emphasizes application of topics/theory covered in the lecture course (Chem 212). It reminds students of laboratory and chemical safety, introduces students to classical and modern methods of chemical analysis wet chemical laboratory techniques in an online environment, demonstrates use of Excel for basic statistics and experimental data analysis, and exposes students to real-world experimental data to be prepared for future use of lab techniques and instrumentation. Topics covered will include Microsoft Excel, basic statistics and data analysis, acid-base titration, pH titration curves and corresponding derivative graphs, a module on chromatography focused on High-Performance Liquid

Chromatography (HPLC), Ion Chromatography (IC), and Gas Chromatography (GC), and a UV-Vis spectrophotometry module with a focus on external standards use and standard addition use to answer chemical questions about two analytes. Students will also be introduced on how to evaluate an analyte using ATR-FTIR spectroscopy. Chemical knowledge spanning from general chemistry to new topics in Chem 212 lecture is vital. This list is not exhaustive but mentions the highlights. To be successful in any course [including this one], an honest effort and time commitment on the students' part is vital. Students must choose to commit to learning course material, adequately manage time, complete course work, and ask for assistance when things are unclear.

Course Goals & Outcomes for Students:

Goals:

- 1) Teach the basics of Microsoft Excel and capabilities for data organization, graphing, data analysis, and statistics to note the importance of accuracy & precision of laboratory work
- 2) Acquaint students with common classical and modern techniques in analytical chemistry
- 3) Expose students to classical conventional data collection and instrumental data similar to what is gathered in both commercial and academic laboratories
- 4) Convey importance of interpretation and evaluation of experimental results, as well as being able to effectively report experimental results through scientific writing

Outcomes:

- Apply knowledge of Microsoft Excel capabilities to organize and analyze data through basic statistics; generate experimental graphs that are up to the standard of scientific publications
- Evaluate accuracy, precision, and validity of experimental data through applied techniques learned in MS Excel
- Demonstrate proficiency in the set-up of lab equipment and completion of experiments using classical and instrument techniques and understanding how changing instrument conditions affects analyte analysis
- Articulate experimental results in the format of scientific writing through lab reports

Required Materials:

1. Long-sleeve lab coat [white preferred, but any color is fine]. You must purchase this [LUC Bookstore or Amazon]. This is required in the laboratory at all times.
2. Lab goggles. Lab Coordinator will provide 1 free pair of goggles. Goggles required in the laboratory at all times.
3. Dressing appropriately for laboratory work, use of chemicals and glassware. See Footwear/Clothing section.
4. Composition style notebook (not spiral bound & no tear-out perforations). Line ruled. You must purchase this.
5. Chem 214 Lab Manual. Provided for free as a PDF in Sakai. Lab Coordinator will print 1 copy per student.
6. Cell Phone Pic to PDF app (such as CamScanner), for iPhone or Android. Any app that will convert a phone picture to a PDF file
7. A non-erasable pen. Pencil and white out are not allowed.
8. Scientific OR graphing calculator. Suggested model: CALC TI30XA SCIENTIF/STAT FRAC. A graphing calculator is o.k. too. Cell phones are not calculators; do not use them for calculations.
9. [Sakai access](#) (free for LUC students) via the internet to review and complete course content, access resources, review grades, etc.
10. Desktop or Laptop computer. Instrument simulation webpages may not work on tablets nor mobile devices and Sakai does not display well on them.
11. [ZOOM video & web conferencing software](#) (free for LUC students).
12. Panopto (free for LUC students). One format of recorded course content is Panopto videos. You may be prompted to log in with UVID username and password to view the specific videos. Links to videos will be provided in Sakai or via email when necessary.

Mask Requirement:

Masks are optional but HIGHLY encouraged. Consider the absence policy and the fact there are *very limited* opportunities to make up an in-person lab experiment. Masks mitigate illness/spread of it. It is course policy that if during the semester the University re-institutes/reverts back to required mask wearing, we will do so immediately.

Footwear/Clothing:

Closed toe, closed heel shoes are required [no sandals, flip flops, slippers, Crocs, ballet flats, boat shoes, perforated shoes, etc.] No skin on legs, ankles, or feet can be exposed. Long pants recommended. Shorts and skirts [unless floor length] are not allowed. Bare skin on the lower extremities is a safety hazard: Be advised, concentrated acids/bases will be used in some lab experiments. *Lab coats, goggles, mask, and gloves are required and must be worn at all times. This even applies when cleaning glassware!* Lab coats must be fully buttoned to be an effective shield against chemicals. Students will be sent home if proper clothing or footwear is not worn, this counts as an absence. A safety lecture will be given the 1st week of class; this lecture is required to perform lab experiments. Students will sign a lab safety sheet acknowledging their understanding and commitment to adherence of lab safety rules/policies. If a student is absent the 1st day and misses the safety lecture, they cannot perform wet chemistry until the safety lecture is completed & safety sheet is signed. It is advised students do not wear contact lenses in the laboratory, as contact lens material may react with chemicals/ chemical vapors if they get into the eye. All rules are meant to keep students safe in the laboratory. *Lab Coordinator and TA have complete discretion to prohibit a student from completing lab work if the student has clothing/footwear exhibiting a potential safety hazard OR exhibits behavior deemed unsafe to self or students.*

Instructional Format:

- Majority of the course is synchronous but there are a few asynchronous lab sessions. The class will be split in half into Group A and Group B; while some students [Group A] are synchronously in person completing lab experiments other students [Group B] will be completing online lab activities or in person completing a completely different lab. Then the next week they'll switch. Pedagogically, this enhances the laboratory experience as students will work independently, relying on their own lab skills to collect data and earn grades based on the accuracy of that data. There will be no partner labs as a result. This course design ensures students learn the skills first-hand in the laboratory and in the online lab activities, essential for real-world experience. Speaking from experience, when working in industry and in graduate school scientists analyze 100's of samples per day and could only rely on her lab skills learned.
- Attendance in synchronous sessions in person in the laboratory is required. I understand that "life happens" so if you must be absent contact Dr. Naleway right away. Allowances **may** be made to let a student come to the laboratory during their "off" [asynchronous] week but this will be decided on a case by case basis. Due dates for course work are not adjusted for absences. All assigned items have specific due dates.
- Other than office hours or a scheduled appointment, the laboratory sessions are the only other "real-time" opportunity to ask questions and communicate. Emails work great, but they are not "real-time." There is a delay with an email reply. Keep that in mind.

General Policies:

- Course work will be graded with an emphasis on correct significant digits, consistent results (do data & observations match conclusions), correctness of calculations, data analysis, or optimal instrument conditions for analyte applications, appropriate use of Excel functions, and thoroughness in responses. Following directions of reporting calculated answers are taken into account too.
- The Composition notebook needs to contain all laboratory experiment information [Date, Title, data/observations/calculations, and conclusion for an experiment]. Use the notebook as a resource. Feel free to take class notes in it to organize your thoughts too. Notebooks will be signed at beginning and end of lecture.
- **Before coming into the lab you need enter into your notebook the Date, Title of Experiment and most importantly the laboratory procedure IN YOUR OWN WORDS. This will help you pre-organize your thoughts and minimize waited time in starting experiments.**

- There is a point value associated with the work, and one cannot earn points for work not completed. Students are expected to complete all course work; no makeup work is given. Not completing work for 2 or more of the in-person lab experiments or online activities is significant and unacceptable and will result in academic failure.
- If a student was previously enrolled in a Chem 214 course but didn't finish it [dropped/withdraw] or didn't pass, note that any data collected for experiments in a previous Chem 214 course or course assignments are NOT valid in this semester. Students must complete all experiments & coursework in this current semester of course.

Loyola University Absence Policy for Students in Co-Curricular Activities (including ROTC):

Students participating in co-curricular activities must make information concerning time conflicts with University sponsored events available to the Laboratory Coordinator no later than **10 calendar days after the start of the semester**. The Laboratory Coordinator reserves the right to contact the Athletics Department confirming time conflicts, absence, and regarding concerns. Students missing classes while representing Loyola University Chicago in an official capacity (e.g. intercollegiate athletics, debate team, model government organization) will need to discuss their needs with the Laboratory Coordinator. Sakai work cannot be made up in any circumstances, no exceptions. Laboratory work generally cannot be made up, but this will be decided case by case when appropriate. If Lab Coordinator has PowerPoints for the day/content missed, they are posted to Sakai for student access 24/7. These types of absences are handled on a case-by-case basis with remedy. Students should discuss with faculty the potential consequences of missing class and the ways in which they can be remedied. Students must provide Lab Coordinator with proper documentation describing the reason for and date of the absence. This documentation must be signed by an appropriate Faculty/Staff member, and it must be provided as far in advance of the absence as possible. It is the responsibility of the student to make up any assignments under the timeline the Lab Coordinator decides upon.

Loyola University Absence/Accommodations Policy for Religious Reasons:

Students missing an in-person lab experiment due to observing religious holidays must alert the Lab Coordinator no later than **10 calendar days** after the start of the semester to request a special accommodation. This is handled on a case by case basis. The Lab Coordinator reserves the right to contact Campus Ministry, which keeps information on a plethora of religions. Students must plan ahead for online lab activities; work ahead if a due date is on a religious holiday. Students must discuss with the Lab Coordinator the consequences of missing lab and the ways [if any] they can be remedied, while also providing the Lab Coordinator with proper documentation describing the reason and date of the absence. The document must be signed by an appropriate Faculty/Staff member, and it must be provided as far in advance of the absence as possible. It is a student's responsibility to proactively ask what will be missed due to absence.

Course Repeat Rule:

Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website: <http://www.luc.edu/chemistry/forms/> and obtain a signature from the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

Previous Course Work When Repeating the Course:

If you were enrolled in a Chem 214 lab course in a previous semester are re-taking it for any reason [withdraw, drop, unfavorable grade, etc.], please note that any coursework, data, etc. from a previous semester does NOT count in the current semester the course is being taken. Students must complete all coursework within the same semester of the enrolled course. Any previous data or coursework taken in prior semesters does not count in the current semester.

Pass/Fail Conversion Deadlines and Audit Policy:

A student may request to convert a course into or out of the "Pass/No-Pass" or "Audit" status only within the first two weeks of the semester. For the Spring 2023 semester, students are able to convert a class to "Pass/No-Pass" or "Audit" through Monday, January 30th. Students must submit a request for Pass/No-Pass or Audit to their Academic Advisor.

Accommodations via Student Accessibility Center (SAC) Policy:

If you have a documented disability and wish to discuss academic accommodations, discuss with the Lab Coordinator as soon as possible, ideally the first week of the semester. The Coordinator of Student Accessibility Center (SAC), formerly referred to as SSWD, is located in the Sullivan Center and must be contacted independently by you, the student. Necessary accommodations will be made for students with disabilities who procure a SAC letter. However, to receive any accommodations self-disclosure, proper documentation, and registration with the SAC office at Loyola University Chicago is required. Accommodations cannot be made until the Lab Coordinator receives proper SAC documentation. Furthermore, accommodations are not retro-active and begin only once appropriate SAC documentation has been received by the Lab Coordinator in a timely manner. Only those accommodations that are specifically listed in the formal SAC letter will be provided. If a SAC letter suggests the Testing Center be utilized, it does not apply for this course as there are no written exams. Read up on SAC Policies and Procedures.

Academic Integrity:

The standard of academic integrity and personal honesty delineated in the College of Arts & Sciences Statement on Academic Integrity. Integrity is expected of every student and will be enforced. Cheating can take many forms in a lab course, but the most common forms are copying data/data analysis, answers to analysis questions, sharing files, or completing Sakai work or other electronic content with another person. The data and analysis, homework, quiz answers, etc. submitted for grading must be your own. If it is not, no credit will be awarded, and no make-up work for those points will be granted. Findings of dishonest academic behavior are reported to the Chair of the Chemistry Department and to the Dean's Office; it is also entered into an individual's record. Copied answers to course work or copied formal lab reports will result in penalty for all students involved. Turn It In is utilized for formal lab reports to identify plagiarism, cheating, and other. Students can converse, brainstorm, and work through strategies together but copying other students' (current or previously in Chem 214) work and presenting it as one's own is unacceptable. There is a difference between sharing knowledge and cheating. If lab reports, data analysis, quizzes, or other materials in this course are plagiarized or have been shared between students (current or past), no credit will be given for the work in question. Cases of suspect academic dishonesty will be handled according to University guidelines.

Lab Experiments/Activities:

All in-person lab experiments and online simulated lab experiments, activities, and/or data analysis are completed *individually* by students, emphasizing development of an individual's skillset. The experiment/activity topics are located in the lab schedule. Each laboratory topic is approached uniquely. For the in-person lab experiments, students must be present in the laboratory to complete the experiments and collect the necessary data to satisfy the purpose of the experiment. Students will have their own "real-world" or "unknown" sample and have to process [experiment with] it, collect and analyze data, and report final results. There is no substitute for the in-person lab work. If the lab experiment/activity requires data analysis [calculations, etc.] students must report their data of each individual determination (trials), mean/average concentration (or percent composition), standard deviation, and parts per thousand (ppt) associated with the overall determination. *Students are NOT permitted to repeat/redo a lab experiment/activity.* No exceptions.

Laboratory Safety Points:

Unsafe actions in the lab are NOT tolerated. All students start with 20 safety points. either earn the points. Deductions are taken for being late or unsafe actions in the lab. A student is told when a safety infraction is witnessed by

TA/Instructor and that safety points were deducted. This is documented on the sign-in sheet. **Potential safety point deductions:*** Coming late to lab, not signing the sign-in sheet when present, not wearing or needing to borrow borrowing lab goggles or a lab coat, eating/ drinking in lab, chewing gum, taking goggles off in FH-313 when chemicals/glassware are still on any of the 3 lab benches (even if not your chemicals/lab bench), taking mask off or putting mask below nose at any point in the lab, not wearing goggles during lab, touching face/cell phone/personal belongings with gloves on, leaving lab with gloves on, not cleaning up chemical spills on bench top/balances/fume hood, standing/kneeling on chairs, improper chemical disposal, not starting clean-up on time, etc. *The list is not exhaustive; if an [unlisted] action is unsafe, a student will lose safety points.

Lab Clean-up:

Students are REQUIRED to begin cleaning 10 minutes before the official end time of class listed in LOCUS. Students are not allowed to stay past lab time to do wet chemistry under any circumstances NOR can a student gain access to the laboratory room, FH-313, outside of the LOCUS scheduled class day & time.

Laboratory Quizzes :

There will be a short quiz on the content for ALL lab experiment/activities. Graded quizzes will be returned the following class and all grades will be posted on Sakai.

Lab Report Format and General Guidelines

Lab reports for Quantitative Analysis should be complete, accurate, and detailed. This is an upper division level science class, and more thoroughness is expected of the student. Lab reports MUST be turned in on time (see lab schedule), automatic 20% reduction per day for being late.

Only **two** experiments will require laboratory reports but these must be done with great care:

- 1) Acid-Base Titration: KHP and NaOH. Determination of % KHP in an Unknown
- 2) EDTA and IC Analysis of the Hardness of Water

Lab reports consist of the following elements:

Title page – lab experiment name and number centered; your name, lab partners name (for partner labs only), and date the report is due in the lower right-hand corner of the title page

Purpose – brief statement of the reason for performing this experiment.

Materials – two separate lists: one for a listing of all equipment (including the balance used) and the second list for chemicals used (including any unknowns, but excluding any solutions the student makes)

- Concentrations of solutions used should be included. Include concentrations of stock solutions, not concentrations of solutions made. Concentrations of solutions made should be given under the results section.

Procedure – this is a list of all the steps that you did to perform the lab, including any changes that you may have made to the original printed procedure.

- This can be summarized from that listed in the lab handouts.
- It must be so clear that anyone not familiar with the lab would know exactly what to do.
- It should not contain the actual masses, volumes, etc. used by the student.

- Be careful how you write your prep instructions for solutions. You will dissolve/dilute chemicals in a volume smaller than what the final volume will be and then dilute to the final volume mark. For example: Dissolve 12 g KOH in 300 mL DI water, dilute up to 500 mL mark, and shake to mix well.

Results – list data obtained, such as volumes measured, weights, temperatures, in a table format.

- Multiple trials must always be done to verify data as having good precision. All data must be shown, including repeat lab data. Teaching assistants will grade lab reports based on precision.
- Data must be represented in table format with appropriate column and row headings and include the individually determined values, averages (for concentrations, percents, unknowns, etc.), standard deviations, and other necessary values.
- Statistical analysis of your data should also be put in this section.
- If applicable, graphs should go in this section, and they must be clearly labeled with a title and proper x axis and y axis names as well as units. Graphs should be done in Excel.
- Include calculations in this section labeled appropriately with units, chemicals and properly identifying what is being calculated (ex.: Calculation for volume of HCl for 0.1M HCl). The calculations may be written, but please write them neatly so they can be read and understood.
 - Show an outline of equation being used and at least one example with your numbers.
 - ex.: $m_1v_1=m_2v_2$ $12\text{ M}(v_1)=0.1\text{M}(1000\text{ mL})$ $v_1=8.33\text{ mL}$
 - Please utilize leading zeros before the decimal point (0.1 mL and not .1 mL).
- A paragraph statement of the results must also be present to interpret/summarize the data shown in tables and graphs-
- All reported values MUST be reported with correct units, this includes values in text, tables, and on graphs
- If doing a titration, you need to include the logic behind the use of an indicator which includes color change and chemical explanation for the color change.

Conclusion – a restatement of your results, and what the results mean

- Include a **detailed** analysis of error (at least 3 errors). This should be done based on the students own data and results. An analysis of error can also be done on theoretical errors as well though the student may not have made these errors.
 - How does the error change the outcome (concentration higher/lower than it should be, etc.)? How does the error affect the subsequent steps in the experiment?
- How can the experiment be improved and/or made simpler?
- How can the student's technique be improved?

Additional Considerations

- Order is also important for excellent scientific work – the lab report write-up should follow the order listed on these directions.
- All parts of this report must be typed (calculations are an exception). Please use at least 11 point font, 1.5 lines spacing for paragraphs, and 1 inch margins.
- Please keep entire tables on a single page. If you must split up a table, remember to include column and row headings again.
- Reports should have good spelling, sentence structure, etc. Do not use run-on sentences, sentence fragments, or misspelled words. Do not use personal pronouns (I, we, me, etc.).
- Take the time to check over your work and re-read your report to make sure that what you wrote is clear and makes sense.
- Make sure to number pages in lab report

The lab report write-up is a **VERY IMPORTANT** part of a laboratory-based course, especially at the junior and senior undergraduate level, and of course for graduate level work and future employment

Lab Report Grading Rubric

The following is a rough guideline of how points will be assigned on your lab reports. All lab reports will be out of 200 total points.

Lab Report Categories	Points	Percent
Title Page	20	10
Introduction/Purpose	45	22.5
Results and Data	50	25
Discussion	30	15
Conclusion	20	10
Grammar/Format/Spelling	25	12.5
Proper File Format(Word or PDF and Submission to Sakai	10	5
TOTAL	200	100%

Lab Notebook Format and General Guidelines

One bound composition type notebook is required, as pages are bound [can't be torn out]. Complete notebook pages in PEN. All in-person lab experiments must have a complete notebook entry written in the lab notebook. Several notebook entries will be formally graded. If the lab data has Excel components you do NOT have to put Excel in the physical lab notebook, but you need to show some example calculations written in the lab notebook [even if the calculation work was done via Excel].

Before class begins which means for each class, students should come to lab having organized their lab notebook by writing experiment title, brief introductory paragraph (including the purpose of the lab), and an outline of the procedures (in your own words) of the experiment to be undertaken. This is intended to better prepare you for what you are about to undertake beforehand. This should save you a lot of valuable time in the lab. Both instructor and TA will check your notebook and assess if adequate preparation for the lab has been undertaken and then signed/initialed when complete. You will be penalized severely if not done before entry into the lab.

During the lab, students should actively be taking notes on observations, recording masses and volumes of materials used and completing calculations in the lab notebook. ALL data must be written in notebook NOT on scraps of paper. A brief conclusion statement should be added (possibly after leaving) when the lab is completed. Lab notebook does not need to be perfectly organized and neat, but it must be legible. Do not erase any errors that are made, but place a single bold line through the error, or strike-out the error.

At the end of class either instructor or TA will then sign at the bottom of the raw data that your work is complete. Lab notebooks must be signed/initialed before leaving just as if you worked in a commercial or government laboratory.

Notebook Rubrics	Points	Percent
Experimental Title, Purpose, and Outline of Procedure (Pre-Checked)	12	6%

All Data has been included properly and in an organized fashion in lab book	8	4%
Total	20	10%

* (10 experiments x 20 pts) = 200 pts (10%)

Grading Policy

The established grading policy is subject to change at Instructor and/or TA discretion. Please note the University uses a +/- grading scale system and it will be implemented in this course.

Grading Category	#	Pts/each	Pts	Percent
Analytical Findings (Accuracy)*	10	100	1000	50%
Detailed Laboratory Reports	2	200	400	20%
Lab Quizzes (top 10/11)	10	30	300	15%
Lab Notebook	10	20	200	10%
Safety Review	10	10	100	5%
Total			2000	100.0%

Final Grade Assignments:

Points Range	Letter Grade
1800 - 2000	A- to A
1600 – 1799	B- , B, or B+
1400 - 1599	C-, C, or C +
1200 - 1399	D-, D, or D+
Below 1200	F

Typical Grading Scale (%): A 100-94.0, A- 93.9-90.0,
 B+ 89.9-86.9, B 86.8-83.0, B- 82.9-79.9, C+ 79.8-77.0,
 C 76.9-72.9, C- 72.8-70.0, D+ 69.9-67.9, D 67.8-63.0,
 D- 62.9-60.0, F ≤ 59

TENTATIVE Chem 214 Quantitative Analysis Schedule* (Spring 2024)

General Topic	Week #	Quiz	Lab Report	Date	Proposed Experiment
First Day-Check-in,safety Review,Sample Quiz	1			Monday, January 22, 2024	Syllabus, Safety, SF/Equipment, S.J., locker check-in, EXCEL overview
Statistics and Intrinsic Sampling Error	2	Prelab Quiz on Statistics		Monday, January 29, 2024	Statistics Review ,Application on Analytical Balance Pennies and Volumetric Pipetting and Prepare NaOH solution
Determine %KHP	3	Prelab Quiz on KHP Titration		Monday, February 5, 2024	Standardize NaOH with KHP and then Determination of % KHP in an Unknown
Determine % Carbonate	4	Prelab Quiz on Carbonate Titration	KHP Lab Report Due Beginning of Class	Monday, February 12, 2024	Determination of % Sodium Carbonate in an Unknown (will be given standardized HCl)
Polyprotic Titration	5	Prelab Quiz on Polyprotic Acids		Monday, February 19, 2024	Polyprotic Acids(Maybe AA) pH Titration Curve and Analysis of Acid and Concentration
Gas Chromatogrpahy	6	Prelab Quiz on GC		Monday, February 26, 2024	Gas Chromatography (Simulated + GCMS Demo) and Prep EDTA + CaCO3 solutions
	7			Monday, March 4, 2024	SPRING BREAK
Redox Titration on Vitamin C	10	Prelab Quiz on Redox Titration		Monday, March 11, 2024	Vitamin C Redox Titration Experiment
Water Hardness via EDTA and IC	8	Prelab Quiz on EDTA Method		Monday, March 18, 2024	Determination of Total Hardness (Ca & Mg) via EDTA Titration and Ion Chromatography
	9	Prelab Quiz on IC Method		Monday, March 25, 2024	
	11			Monday, April 1, 2024	EASTER BREAK
Spectrophotometric Analysis of Iron	12	Prelab Quiz on Spectroscopy Experiment	Water Hardness Lab Report Due Beginning of Class	Monday, April 8, 2024	UV-Vis Spectrophotometric Analysis of Iron
UV-Vis Standard Addition Method	13	Prelab Quiz on Addition Method of Analysis		Monday, April 15, 2024	Standard Addition Method (Gatorade ?)
Quantified Attenuated Total Reflectance Method	14	Prelab Quiz on ATR Method		Monday, April 22, 2024	ATR Quantification of Eugenol and Checkout