



## Chemistry 329-001 Fundamentals of Analytical Science

**Semester and Year:** Spring 2020

**Course Credit:** 4 credit hours (2 lecture, 2 lab)

**How Credit Hours Are Met:**

CHEM 329 is a 4-credit class that meets each week for two 50-minute lectures, one 50-minute discussion, and two 4-hour laboratories. Over the course of the semester, students are expected to engage in at least 180 hours of learning activities, which includes class attendance, reading, studying, preparation, problem sets, laboratory reports, and other learning activities.

**Course URL:** <https://canvas.wisc.edu>

**Course Designations and Attributes:**

Breadth – Physical Science

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

**Instructional Mode:** All Face-to-Face

**Lecture:** MW 8:50 – 9:40 AM in Chem B371

**Lab:** MW 1:20 – 5:25 PM in MSC 5385

**Discussion:** F 8:50 – 9:40 AM (See Table)

Discussion Section	Room
321	Chem B379
322	Sterling 2329
323	Chem 2307
324	Sterling 2319

**Instructor:**

Dr. Amanda Buchberger

**Office:**

MSC 551C (Inside TA Office – MSC 551)

**E-mail:**

[amanda.buchberger@wisc.edu](mailto:amanda.buchberger@wisc.edu) (Include “Chem 329” in the subject line.)

**Office hours:**

Please see <https://canvas.wisc.edu>. Otherwise, feel free to stop by her office, email her with questions, or make an appointment.

**Lab Director:**

Dr. Pamela Doolittle

**Office:**

MSC 535

**Phone:**

2-9679

**E-mail:**

[pam.doolittle@wisc.edu](mailto:pam.doolittle@wisc.edu)

**Office hours:**

Dr. Doolittle has an “open door” policy for meeting students. Feel free to stop by her office, email, call, or make an appointment when seeking help related to the laboratory portion of this course.

**Teaching Assistants:**

Section	Teaching Assistant	Preferred Email
321/621	Hongyuan Sheng	<a href="mailto:hsheng7@wisc.edu">hsheng7@wisc.edu</a>
322/622	Natalia Spitha	<a href="mailto:spitha@wisc.edu">spitha@wisc.edu</a>
323/623	Fengrui Wang	<a href="mailto:fwang82@wisc.edu">fwang82@wisc.edu</a>
324/624	Andrew Zhu	<a href="mailto:zzhu285@wisc.edu">zzhu285@wisc.edu</a>

**Office Hours:** Please see <https://canvas.wisc.edu>.

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**Course Description:**

Fundamentals of chemical measurement in chemistry, biology, engineering, geology, and the medical sciences. Topics include equilibria of complex systems, spectroscopy, electrochemistry, separations, and quantitative laboratory technique. Lecture, lab, and discussion.

**Requisites:** Chem 104 or 109

**Modifications to the Syllabus/Course Content:**

The instructor reserves the right to modify, amend, or change the syllabus (schedule, course requirements, grading policy, etc.) as the curriculum and/or program require(s).

**Course Learning Outcomes:**

- Apply statistical methods for the evaluation of laboratory data
- Use calibration and sampling methods important to quantitative analysis
- Model chemical systems and experimental data using relevant quantitative, mathematical, and computational methods
- Learn analytical methods based on titrations, separations, electrochemical measurements, and spectroscopy and interpret the results for chemical analysis
- Identify, formulate, and solve integrative problems using appropriate information and approaches
- Develop skills in working collaboratively with others, both chemists and those from other disciplines, to solve problems and create new knowledge
- Communicate chemical knowledge effectively through written reports, oral presentations, and visual aids
- Locate, evaluate, and use information in the chemical literature

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**Textbook:** Harris, Daniel C. *Quantitative Chemical Analysis* 9th Ed.

**Lab Manual:** *A Manual of Experiments for Analytical Chemistry – Spring 2020*, Department of Chemistry, UW- Madison. Lab manuals will be sold in Chem 1375 beginning Tuesday, January 21 for \$20. WiscCard purchase only – NO CASH SALES.

**Lab Notebook:** Carbonless laboratory notebook with numbered, duplicate pages. Alpha Chi Sigma (AXE), a professional co-ed chemistry fraternity founded here at UW-Madison, will be selling suitable lab notebooks in Chem 1375 for \$15.

**Calculator:** A scientific or graphing calculator is required. Only calculators that are permitted on SAT or ACT tests may be used on exams (*i.e.*, TI-83 and TI-84 graphing calculators are allowed, but TI-89 are not). You may NOT use any stored information, programs, or applications on exams unless given explicit permission.

**Personal Protection Equipment (PPE):**

Industrial quality eye protection is required at all times when you are in the lab. Indirectly vented safety goggles that completely seal around the eyes and fit over regular glasses can either be purchased from local bookstores or from Alpha Chi Sigma in Chem 1375 for \$5. The analytical stockroom also has full seal goggles for \$5 or Visorgogs for \$8. You're required to wear a laboratory coat at all times in lab; lab coats will be available for WiscCard purchase in Chem 1375 (if you need one) for \$12. You should transport your lab coat in a sealed plastic bag, such as a 1 gallon Ziploc.

**USB Drive:** A USB flash drive that will hold at least 2 GB is required for laboratory.

**Grading Scale:**

Final letter grades will be assigned based upon the following percentage scale, with a minimum score of 60% required to pass this course. Your grade will be determined out of 1000 points, with all points counting equally. There is no guarantee of extra credit, though some may be offered at the instructor's discretion. **Do not ask for extra credit.**

This scale may be adjusted downward at the end of the semester, depending on the overall class average. It will never be adjusted upward.

<b>Grade</b>	<b>Percent</b>	<b>Points</b>
A	92-100%	920-1000
AB	89-91.9%	890-919
B	80-88.9%	820-889
BC	79.0-81.9%	790-819
C	70-78.9%	700-789
D	60-69.9%	600-699
F	0-59.9%	000-599

You are responsible for the management of your grade. Please confirm that all grading has been inputted correctly. Changes will not be made to your grade after it is submitted to the registrar. It is your responsibility to make certain all assignments are accounted for and graded correctly.

Exams (3)	150 points each	45%	450 points
Homework Assignments (9)	10 points each	9.0%	90 points
Discussion Participation	1 point each	1.5%	15 points
In Class Participation (Top Hat)		1.9%	19 points
Project Lab		20.0%	200 points
Pre-Lab Quizzes (12)	6 points each	7.2%	72 points
Standard Labs (11)	14 points each	15.4%	154 points
<b>TOTAL</b>		<b>100%</b>	<b>1000 points</b>

Overall, lecture and discussion contribute to 57.4% of your grade, and lab contributes to 42.6% of your grade. Adjustments to graded items and point values may be made during the semester if needed.

**Lecture Sessions:***In Class Participation:*

We will use the Top Hat classroom response system in class. You may submit answers to in-class questions using Apple or Android smartphones or tablets (via the Top Hat app), laptops (via their website), or through text message. For directions on how to set up a Top Hat account go to <https://kb.wisc.edu/59937>. Top Hat registration is \$16 for one semester, \$20 for one year, or \$54 for life. Our Chemistry 329 course join code is 631573. Top Hat questions will involve calculations, so please bring a calculator to lecture.

**Homework:**

Homework is critical to your success in this class and on the exams. When doing homework assignments, you may work independently or collaborate with others, but you must work out and turn in your own solutions. If you cannot work out the problems yourself after completion of the homework, you will not gain the proficiency required to solve the problems on the exams within the timeframe of the exam. In all homework assignments, you must explain your thinking and show your work to receive full credit. Homework is graded based on completion, and they problems will be a mix of book problems and those developed by me (Dr. Buchberger). It is your responsibility to check the key (book or posted on Canvas) to determine if your answer is correct. Homework assignments will usually be due at the beginning of lecture (8:50 AM). **No late homework assignments (i.e., after start of lecture) are accepted. This is a strict deadline.**

**Exams:**

Exams are cumulative in the sense that many of the concepts covered in this course build on one another and a good understanding of earlier material is required for mastering later material. A study guide for each exam will be posted on Canvas one week prior to the exam. Each student will be provided an equation sheet, and each student will be allowed to have notes on 1 side of a 3"x5" notecard. All notecards will be inspected before the start of the exam period.

**Exam 1:** Wednesday, March 4th, 1:20 – 3:20 PM, room TBA

**Exam 2:** Wednesday, April 8th, 1:20 – 3:20 PM, room TBA

**Exam 3:** Sunday, May 3rd, 7:45 – 9:45 AM, room TBA (Final Exam Period)

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**Discussion Sessions:**

Attendance is required. Your TA will provide important pre-lab information, reinforce lecture material, as well as answer any questions you may have about labs, homework, or lecture material. It is your responsibility to communicate to your TA the concepts you do not understand and the skills you need to practice. Bring your lab notebook, lab manual, and calculator with you to discussion.

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**Laboratory Sessions:****General:**

The laboratory sessions are a significant and inseparable part of this course. **You must complete all of the labs and earn a minimum score of 60% on all laboratory assignments (combined prelab, lab report and project grades) in order to receive a passing grade in the course.**

**Laboratory Conduct:**

Safety goggles and proper attire (*i.e.*, lab coats) must be worn at all times in the laboratory. Your lab begins at 1:20 pm, and it is essential that you arrive on time so that you do not miss important information. Points will be **deducted** from your lab score for unsafe or inadequate conduct including, arriving late (-1 point), not wearing goggles, not cleaning up spills promptly, and not cleaning your lab area before leaving the lab. Individuals that are not following appropriate safety measures (*i.e.*, removing goggles in

lab, eating in lab, drinking in lab, being physically aggressive, etc.) will be (a) asked to leave lab and (b) receive a 0 for the lab.

*Special Laboratory Accommodations:*

Students requiring special accommodations in lab should contact the laboratory director, Dr. Pam Doolittle (pam.doolittle@wisc.edu) as soon as possible.

*Standard Labs:*

11 standard laboratory sessions related to the course content are designed to help you practice and gain proficiency in mastering course concepts, as well as develop specific laboratory techniques important to the field of analytical chemistry. Each of the standard labs is worth 20 points and has three graded components. (1) You must take the online Pre-lab Quiz on Learn@UW prior to coming to lab (6 points). (2) You will be graded on the accuracy and precision of your lab results (10 points). Finally, (3) your lab notebook will be graded for completeness and clarity (4 points). **Please note that for some weeks each lab section has a different lab schedule.** Be sure to check the schedule at the end of this syllabus so that you prepare for the appropriate lab and take the appropriate online Prelab Quiz.

- **Pre-Lab Quiz:** The primary goal of the pre-lab quizzes is to prompt you to prepare for the labs beforehand and to test your knowledge and understanding of the concepts behind the standard experiments. You can have two attempts at each quiz, the higher grade will be the final grade. It is advised that you make your first attempt for each quiz at least 1 day before the lab so that you have time to ask questions before your second attempt (in case you encounter any difficulties). Most quizzes have questions that involve calculations, so you should have a calculator, scratch paper, pencil, and your lab manual available when you attempt a quiz. When taking a quiz, do not include units when entering numbers for computational questions. Also be sure to enter the correct number of significant figures for a calculated answer. An error in the number of significant figures will result in an incorrect answer and zero points for your answer. Quizzes must be completed before the start of the lab or you will receive zero points for the prelab. The quiz for each lab becomes unavailable when that lab starts.
- **Lab Notebook:** Your lab notebook should include the following: (1) overview of the experiment or purpose statement, (2) experimental procedure, (3) relevant chemical reactions, (4) raw data from all measurements, (5) one complete sample calculation including units and proper significant figures for all calculations, and (6) results and summary section.

The first three items and tables for the raw data should be prepared ahead of time. Sample calculations should be outlined ahead of time and doing so may help you with the prelab quiz. In addition to your final results, the results and summary section should include comments on whether your data are reasonable, any problems that occurred that could affect your results, and a real world connection to the lab.

**Someone else should be able to repeat the experiment based on what you've written in the notebook.** For more guidelines on proper record keeping, consult the lab manual and section 2-2 of the textbook.

- **Laboratory Reports:** Your laboratory report for the 11 standard labs will consist of the carbonless copies of the relevant pages from your laboratory notebook and the completed (yellow) summary sheet from your lab manual. **The results from these experiments are to be turned in no later than the start of the laboratory period following the completion of the experiment.** You will lose 4 points per day if the result is turned in late. Lab reports placed in your TA's mailbox must be accompanied by an email message sent prior to submitting the report. Failure to email your TA may result in additional points lost if your TA does not know to look for your report in their mailbox.

#### *Laboratory Projects:*

The lab project could be the most challenging and also most rewarding part of this course. You will work in small groups of 3-5 students and have 10 laboratory periods to conduct your experiments. Your group will communicate your results in written progress reports and in a final report. More information regarding the project will be provided during the semester.

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#### **Academic Integrity:**

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

<https://conduct.students.wisc.edu/syllabus-statement/>

#### **Accommodations for Students with Disabilities:**

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. <https://mcburney.wisc.edu/instructor/>

#### **Diversity and Inclusion:**

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

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## Frequently Asked Questions:

### *Is attendance required for the class?*

Your attendance at all scheduled classes (lecture, discussion and lab) is mandatory and essential for success in the course. However, circumstances occasionally occur where you may need to miss a class. If you need to miss class for a religious observance, a UW athletic commitment, graduate school interview, or some other legitimate reason, you must make arrangements to make up the missed work **a minimum of one week before the absence occurs**, otherwise, the absence will be unexcused and you will receive a zero on the missed work. **Homework and labs must be turned in before the deadline if you will be absent on the day it is due.** If you are seriously ill or experiencing a family emergency and are unable to attend lab, inform your TA via email and copy me (Dr. Buchberger). If you need an extension on your homework due to a serious illness or family emergency, arrangements must be made with me **before** the homework or lab due date.

### *What do I do if I must miss a class?*

Your attendance at all scheduled classes (lecture, discussion, and lab) is mandatory and essential for success in the course. However, circumstances occasionally occur where a student must miss a class. The best way to handle an absence depends somewhat on the particular situation. Below are some guidelines.

If you have a planned absence from class: Students sometimes need to miss class for a religious observance, a UW athletic commitment, graduate school interview or some other legitimate reason. These are **planned** absences and any arrangements for making up missed work must be made one week **before** the absence occurs. Otherwise, the absence will be unexcused and you will receive a zero on the missed work. In general, homework should be turned in early (before the deadline) if you will be absent on the day the homework or lab is due.

If you miss class because of illness: Students should usually attend classes if they have a minor illness, such as the common cold or a headache that is not a migraine. If you are vomiting or have flu-like symptoms (fever of 100 °F/37.8 °C or higher with cough or sore throat) you should stay home until you are well. For flu-like illnesses, you should be fever-free without fever-reducing medication for 24 hours. This means you should not attend classes, work, or extracurricular activities. **You should inform your TA of your illness via email promptly (i.e., as soon as you know you will be missing class).**

If you need an extension on your homework because of illness, you need to make arrangements with the professor **before** the homework due date. Depending on your circumstances, I will consider an extension without penalty. Late homework cannot be accepted once the answer key is posted.

Labs are very difficult to make up. Your TA (with assistance from Dr. Doolittle, the lab director) will advise you on the best way to get caught up. In some cases you might be

able to catch up by using spare time in subsequent labs. Lab absences will be handled on a case-by-case basis, and accommodations will only be made if lab is missed for a legitimate reason.

TA lecture notes, slides from lecture, and homework assignments will all be posted on Canvas. I recommend that you also borrow notes from a classmate. Make sure you check in with your TA and/or a classmate for any announcements you might have missed.

If you are well enough, you should try keeping up by studying the text and lecture notes and working on the homework problems. Of course, how much you are able to do will depend on the severity of your symptoms. Getting plenty of rest, lots of fluids, *etc.*, is the top priority. You will be back in action much sooner if you take good care of yourself! But keeping up with your classes might provide some relief to the boredom of not being able to go anywhere.

Email your TA again when you expect to return to classes. The sooner you notify your TA about your expected return, the easier it will be to make any needed accommodations.

*What can I expect from the professor?*

Analytical chemistry and all related topics are exciting fields to be learning about! Even as professors, we are still learning everyday about analytical techniques being developed. You will find I will express genuine excitement for each new chapter and topic, and will do my best to provide clear and concise information. If I don't know the answer to your question(s), I will get back to you as soon as possible. All emails will be responded within 24 hours, although I reserve the right during extreme circumstances to delay responses. Please send emails before 10 PM if you are looking for a quick response, although complicated questions will be answered the next morning. All homework and exams will be graded and returned within 2 weeks. If you want to get to know me better, please send me an email with a photo of your pet or favorite animal. I will send you back an email with a photo of my pets!

*I heard analytical chemistry (Chem 327 and 329) is hard. Is it?*

Analytical chemistry is unique from all types of chemistry; it requires the individual to be detail-oriented, to critically think about **every** situation, as well as be adaptable in lab. All skills learned in analytical chemistry are immensely valuable for your future career as a chemist, engineer, researcher, *etc.* Many people struggle, but, by listening during lecture, working diligently through the homework, and utilizing your TA, you will be successful!

*What happens if I come to class late?*

While attendance will not be directly monitored, missing lecture will cause you to miss opportunities for points on Top Hat questions. Individuals found to be submitting Top Hat questions for others will be reported for academic dishonesty.



*What happens if I come to lab late?*

Your lab begins at 1:20 PM, and it is essential that you arrive on time so that you do not miss important information, such as the pre-lab talk. 1 point will be **deducted** from your lab score for arriving late. Your TA reserves the right to excuse you from lab if they feel you will not be able to complete the lab safely due to a late arrival (*i.e.*, arriving after the pre-lab talk is complete).

*I need to stay in lab past 5:25 PM. Is this OK*

The doors to the lab will close at 5:25 PM. **No exceptions.** If a student does not finish the lab in that time period, the student will need to complete the lab at a different time.

*What happens if I come to discussion late?*

Your discussion begins at 8:50 AM, and it is essential that you arrive on time so that you do not miss important information, such as lab information or activities. Your TA will be keeping track of your attendance, and you will receive 1 point each discussion you attend on time (<10 minutes late). Anyone that arrives more than 10 minutes late will not receive credit for attending discussion.

*When can I drop the course?*

You must drop the course by January 29<sup>th</sup>, 2020 to avoid a notation on your transcript. You must withdrawal from the course by March 27<sup>th</sup>, 2020.

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**Approximate Schedule:**

The instructor will make every attempt to maintain this schedule, but it may change if necessary. For example, we may spend more or less time on a particular subject if it is required. Exam dates **WILL NOT** change unless drastic circumstances require it. Any changes will be announced as soon as possible. If school is cancelled on an exam day, the exam will be given on the next day class meets.

*Tentative Lecture Schedule:*

This schedule will change as we go along, depending on how the lectures goes. You should also note that textbook chapters 0, 2, and 27 are devoted to analytical laboratory practices. Although you will not be directly tested on these chapters, you may find information in these chapters that will boost your performance in the laboratory.

Week	Lecture	Date	Day	Chapter	Topic	HW**
1	--	20-Jan	Mon	--	<b>NO CLASS — MLK DAY</b>	
	1	22-Jan	Wed	1	Introduction	
2	2	27-Jan	Mon	3	Measurements & Statistics	
	3	29-Jan	Wed	3,4	Measurements & Statistics	
3	4	3-Feb	Mon	4	Measurements & Statistics	
	5	5-Feb	Wed	4,5	Measurements & Statistics	1
4	6	10-Feb	Mon	5	Measurements & Statistics	
	7	12-Feb	Wed	18	Spectrophotometry	2
5	8	17-Feb	Mon	18	Spectrophotometry	
	9	19-Feb	Wed	18,19	Spectrophotometry	3
6	10	24-Feb	Mon	20,21	Spectrophotometry	
	11	26-Feb	Wed	6	Equilibria	4
7	12	2-Mar	Mon	6	Equilibria	
	13	<b>4-Mar</b>	<b>Wed</b>	9	Equilibria; <b>Exam #1</b>	
8	14	9-Mar	Mon	10	Equilibria	
	15	11-Mar	Wed	7	Equilibria	5
9	--	<b>Mar 16-20</b>			<b>NO CLASS — SPRING BREAK</b>	
10	16	23-Mar	Mon	11	Equilibria	
	17	25-Mar	Wed	8	Equilibria	6
11	18	30-Mar	Mon	8	Equilibria	
	19	1-Apr	Wed	12	Equilibria	7
12	20	6-Apr	Mon	13	Equilibria	
	21	<b>8-Apr</b>	<b>Wed</b>	14	Redox; <b>Exam #2</b>	
13	22	13-Apr	Mon	15	Redox	
	23	15-Apr	Wed	15	Redox	8
14	24	20-Apr	Mon	16,17	Redox	
	25	22-Apr	Wed	23	Chromatography	9
15	26	27-Apr	Mon	24, 25	Chromatography	
	27	29-Apr	Wed	22, 26	Chromatography	
16	--	<b>3-May</b>	<b>Sun</b>	--	<b>Exam #3: 7:45 - 9:45 AM</b>	

\*\*Due Date; Important Date

## Tentative Laboratory Schedule:

Week	Date (TR)	621 Hongyuan Sheng	622 Natalia Spitha	623 Fengrue Wang	624 Andrew Zhu
1	20-Jan	<b>No Lab</b>	<b>No Lab</b>	<b>No Lab</b>	<b>No Lab</b>
	22-Jan	Check-in/ Weighing Experiment	Check-in/ Weighing Experiment	Check-in/ Weighing Experiment	Check-in/ Weighing Experiment
2	27-Jan	Glass Volumetric Apparatus	Glass Volumetric Apparatus	Glass Volumetric Apparatus	Glass Volumetric Apparatus
	29-Jan	Prep. of Standard HCl & NaOH Solutions	Prep. of Standard HCl & NaOH Solutions	Prep. of Standard HCl & NaOH Solutions	Prep. of Standard HCl & NaOH Solutions
3	3-Feb	Prep. of Standard HCl & NaOH Solutions	Prep. of Standard HCl & NaOH Solutions	Prep. of Standard HCl & NaOH Solutions	Prep. of Standard HCl & NaOH Solutions
	5-Feb	Determination of % KHP in a Mixture	Determination of % KHP in a Mixture	Determination of % KHP in a Mixture	Determination of % KHP in a Mixture
4	10-Feb	Spectrophotometric Determination of Fe	Spectrophotometric Determination of Fe	Spectrophotometric Determination of Fe	Spectrophotometric Determination of Fe
	12-Feb	Project Day	Project Day	Project Day	Project Day
5	17-Feb	Project Day	Project Day	Project Day	Project Day
	19-Feb	Project Day	Project Day	Project Day	Project Day
6	24-Feb	Project Day	Project Day	Project Day	Project Day
	26-Feb	Project Day	Project Day	Project Day	Project Day
7	2-Mar	High Pressure Liquid Chromatography	Spectrophotometric Study of Fluorescein	Chemical Oxygen Demand	Spectrophotometric Study of Fluorescein
	4-Mar	<b>No Lab – EXAM 1 (room TBA)</b>			
8	9-Mar	Chemical Oxygen Demand	High Pressure Liquid Chromatography	Spectrophotometric Study of Fluorescein	Chemical Oxygen Demand
	11-Mar	Spectrophotometric Study of Fluorescein	Chemical Oxygen Demand	High Pressure Liquid Chromatography	Adventure with Buffers
9	16-Mar 18-Mar	<b>SPRING BREAK</b>			
10	23-Mar	Adventure with Buffers	Adventures with Buffers	Adventure with Buffers	High Pressure Liquid Chromatography
	25-Mar	ID of an Unknown Weak Acid	ID of an Unknown Weak Acid	ID of an Unknown Weak Acid	ID of an Unknown Weak Acid
11	30-Mar	Study of Bromocresol Green	Study of Bromocresol Green	Study of Bromocresol Green	Study of Bromocresol Green
	1-Apr	Project Day	Project Day	Project Day	Project Day
12	6-Apr	Project Day	Project Day	Project Day	Project Day
	8-Apr	<b>No Lab – EXAM 2 (room TBA)</b>			
13	13-Apr	Project Day	Project Day	Project Day	Project Day
	15-Apr	Project Day	Project Day	Project Day	Project Day
14	20-Apr	Project Day	Project Day	Project Day	Project Day
	22-Apr	Silver Electrode Study of Equilibria	Fluoride Ion Electrode	Silver Electrode Study of Equilibria	Fluoride Ion Electrode
15	27-Apr	Fluoride Ion Electrode	Silver Electrode Study of Equilibria	Fluoride Ion Electrode	Silver Electrode Study of Equilibria
	29-Apr	<b>Checkout</b>	<b>Checkout</b>	<b>Checkout</b>	<b>Checkout</b>