

San José State University	
Department of Chemistry Quantitative Analysis, Chem 55, Spring, 2021	
Instructor:	Griff Freeman
Office Location:	DH 412B
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Email:	Richard.freeman@sjsu.edu
Office Hours specifically for Chem 55:	MW - 10:30AM - 12:00 by email or Zoom
Additional office hours:	By Appointment
Class Days/Time:	MW 9:30 am – 10:20 am This is a synchronous course, which means you are required to be present at the stated time.
Classroom:	Zoom Meeting
Prerequisite:	CHEM 1B (with a grade of "C" or better; "C-" not accepted)

Course Description (from the University Catalog: <http://info.sjsu.edu/web-dbgen/splash/catalog.html>)

Introduction to theories and techniques of chemical analysis.

The purpose of Chem 55 and Chem 55 L is to provide students with an understanding of how quantitative measurements of chemicals are made and hands-on experience carrying out chemical measurements. The hands-on part of this instruction is covered in Chem 55 L. Chem 55 covers the theory of chemical measurements, the use of statistics to describe the results of measurements and several specific examples of chemical measurements.

Course Website

Course materials such as the syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas (<https://sjsu.instructure.com/>). You are responsible for regularly checking with the messaging system in Canvas to learn of any updates.

Course Goals and Learning Objectives

- Understand the theory behind different types of chemical measurements.
- Make careful chemical measurements using a variety of methods and equipment.
- Understand the errors inherent in these measurements.
- Use statistics to calculate the size of these errors.
- Clearly communicate the results of chemical measurements.

Program Learning Outcome (PLO)

Upon successful completion of this program, students will be able to:

PLO 3: Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in analytical chemistry.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

CLO 1: Analyze numerical problems relevant to chemical reactions, experiments, and tests and apply quantitative reasoning to accurately solve them with correct significant figures and units.

CLO 2: Use basic statistical methods to interpret analytical data.

CLO 3: Recognize and convert between various units in either equation or narrative form.

CLO 4: Describe analytical instrumentation, determine if the measurement from the instrument is an absolute or relative value, and understand what calibration or standardization is required for effective data analysis.

CLO 5: Give examples of analytical techniques that would help solve various scientific questions.

CLO 6: Draw connections between the material covered in this course and its applications in the students' chosen field of study.

Texts/Readings

Textbook (required for course readings)

Quantitative Chemical Analysis by Daniel C. Harris (10th edition, 2020).

The eTextbook is available through the online homework via Sapling and is part of the cost of the online homework, so you do not need to purchase a separate copy of the textbook. That said, if you would like a hard copy, this textbook is available in the SJSU campus bookstore and a copy is on reserve at the King Library.

Online Homework (required)

Required online homework is provided by Sapling at <http://www.saplinglearning.com>. You will register for Sapling through the Canvas site which can be accessed on any computer, tablet, or smartphone. Instructions will be posted to the Canvas site within the first week of school.

Online Exams (required)

All exams will be online. You will be required to use the Respondus browser and have a web camera that monitors your actions during the course of the exams. This is because there has been widespread cheating during online exams and as the instructor I must do everything I can to ensure the integrity of the evaluation process.

Library Liaison

You should have a student library account with the King Library that allows you access the library electronic databases. If you plan to access the library services from off-campus, you may need to obtain a password and/or proxy to do so. Check the Library website for information. The reference Librarian for Chemistry is Yen Tran and her email is yen.tran@sjsu.edu.

iClicker Reef and iClicker Cloud

In this course clicker questions will be employed at least once during each class period when there is no exam. The software, iClicker Reef and iClicker Cloud, will compile your responses in real time, will help me understand how the class is doing, and will give everyone a chance to participate. You must have a device every day in class (available at no cost, see options below) to participate. You must also set up your iClicker Reef account (see directions below).

Device Options:

1. **iClicker Reef App for Smartphone or Tablet:** Allows you to use your smart phone or tablet as a clicker to participate. On your smartphone or tablet go to Mac App Store or Google Play and download iClicker Reef (formerly REEF polling).
2. **iClicker Reef Polling Site for Laptop:** If using a laptop, go to the iClicker Reef site at <https://app.reef-education.com/#/login>.
3. **Clicker Remote Handset:** If you do not have a smart phone, tablet, or laptop, you can request to borrow a Clicker remote handset from eCampus (eCampus@sjsu.edu) for free. Send an email to eCampus@sjsu.edu and request to loan a Clicker remote. Further instructions will be provided to you by eCampus on scheduling a pickup. Remotes are to be returned to eCampus at the end of the semester. If you already own a clicker, you can use it to respond to polls. *Note: Please let me know if you will be using a clicker remote handset so that I can check out a receiver from eCampus.*

Setting up an iClicker Reef Account and Adding the Course:

1. Create and activate your iClicker account by following the iClicker Account Setup Guide at <http://www.sjsu.edu/ecampus/docs/iClicker%20Account%20-%20Setup%20Guide%20-%20Student.pdf>. *Note: Please include your 9-digit SJSU ID. This way it will be integrated into Canvas effectively.*
2. To add the course, look for “SP20 CHEM 55”. For additional guidance on how to add the course see <http://www.sjsu.edu/ecampus/docs/iClicker%20-%20Add%20Your%20Course%20-%20Setup%20Guide%20-%20Student.pdf>.
3. To sync with the Canvas course, follow the directions at <http://www.sjsu.edu/ecampus/docs/iClicker%20Sync%20with%20your%20Course%20in%20Canvas%20-%20Student.pdf>.

Course Requirements and Assignments

Graded work will include in-class clicker questions, worksheets, online homework, two in-class exams, and one comprehensive final exam, which all contribute to the course learning outcomes. Dates for the exams are in the Course Schedule below. All relevant dates are also posted to Canvas. Reading along in the text is an excellent way to prepare for classes and exams. Exams and assignments in the course will be weighted as follows:

Assignments	Points
In-class Clicker Questions (details below)	100
Worksheets (15 points each, lowest score gets dropped)	150
Online Homework (15 points each, lowest score gets dropped)	150
Midterm Exams (125 points each)	375
Final Exam	225
Total	1000

Final Examination or Evaluation

The Final Exam is comprehensive and will be written in a style similar to the Midterm Exams.

Grading Information

Determination of Grades

Points will be distributed as described in Course Requirements and Assignments above. I will not curve because I believe that everyone can succeed in this course. I may, at the end of the course, linearly shift the scale. I will only shift it to benefit you. The course grade will be determined from the resulting average of the point total as follows: Percentage of Total Points	Final Course Grade
96 and above	A+
92 to 95.9	A
88 to 91.9	A-
84 to 87.9	B+

80 to 83.9	B
76 to 79.9	B-
72 to 75.9	C+
68 to 71.9	C
64 to 67.9	C-
60 to 63.9	D+
56 to 59.9	D
52 to 55.9	D-
less than 52	F

In-Class Clicker Questions

Each class when we do not have an exam, I will ask questions and collect responses via iClicker Reef. We will be doing various types of clicker questions in class. These questions will be graded for participation, not correctness. If you answer 80% of the clicker questions over the course of the semester, you will earn the full 100 possible points. The 20% buffer is designed to account for days when you forget your clicker, are sick, run out of batteries, excused absences, etc. Clicker Questions Answered (%)

	Score
80 to 100	100
75 to 79	80
70 to 74	60
60 to 69	40
50 to 59	20
less than 50	0

Keep in mind, different class periods will have a variable number of clicker questions, so that 80% of class days \neq 80 % of the clicker questions .

- You must register your iClicker or accessible device by the second week of class (2/1/21).
- If you have any technical issues, you must notify me by 6 pm of that class day.
- If you are using a smart device, you can click in even if you are out of class. This is cheating and will result in the loss of all participation points (i.e. 0 of 100 total points).

Worksheets

Worksheets will be passed out during class nearly every week (11 total). Each worksheet will have 3 to 5 questions and be worth 15 points. We will discuss how to approach these questions in a qualitative way in class. Then you will take the worksheet home and tackle solving the problems quantitatively. You may work with a group, but each student must submit their own individual work. Working in groups does not mean copying down each other's answers. Please

do your own work as that will greatly enhance your ability to do similar questions on the exams. You will input your answers with the correct significant figures and units to Canvas for grading. Your lowest worksheet score will be dropped.

Online Homework

Required online homework via Sapling at <http://www.saplinglearning.com> will be assigned most weeks of the semester (11 total). Each assignment will have 10 to 40 questions and will be worth 15 points. While you will have an unlimited number of attempts, each attempt will slightly reduce your score for that question (by 5%). Please use the resources at hand if you need them: the hints and feedback. Your lowest homework score will be dropped.

I have decided to use online homework so that you will get immediate feedback on your work. That said, the questions I have chosen from Sapling may approach problems in a different way than I present in lecture or may provide answers in a different format than you have seen before. Keep in mind that neither is “wrong” or “right”, they are simply different ways to present the material.

Missed Exams or Assignments

If an exam or assignment is missed without a legitimate excuse, a score of 0 will be entered for that assignment. If an acceptable excuse is provided, then the grade will be the average of your other grades in that assignment category. In no case will a make-up exam or assignment be given. Contact me *in advance* if you will miss an exam date for a legitimate activity. There will be no final exam rescheduling unless you have 3 exams on the same date.

Exam Regrades

To qualify for an exam regrade, you must take the exam in ink and not use white-out. Do not write on your exams that are submitted for a regrade. Submitting a modified exam for regrading is a serious breach of academic integrity. Regrades must be submitted within one week of the exam being handed back to you. Regrade requests must include a written description of what you feel was graded incorrectly. One exception to all of the above: if I made an arithmetic error in your point tally, simply write “tally error” and I will check the point tally.

Classroom Protocol

Be on time to class; class starts at 9:30 am sharp. Device use in class should be limited to taking notes and responding to clicker questions. Students are strongly encouraged to participate during the class period.

Email policy

I receive a lot of emails, so to be sure that I see your email, all Chem 55 emails should have Chem 55 in the subject line. I will do my best to respond to class-related emails within 1

business day of receiving them, however, keep in mind that this may not always be possible, especially during high volume times (around exams).

University Policies

Per University Policy S16-9 (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at <http://www.sjsu.edu/gup/syllabusinfo/>.

Safe and Respectful Community

I hope that the classroom will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. Behavior that interferes with the normal academic function in a classroom is unacceptable. Students exhibiting this behavior will be asked to leave the class. The university has a brochure on student conduct at <http://www.sjsu.edu/studentconduct/docs/ENGLISH%20Brochure.pdf>.

Examples of such behavior include

1. Persistent interruptions or using disrespectful adjectives in response to the comments of others.
2. The use of obscene or profane language.
3. Yelling at classmates and/or faculty.
4. Persistent and disruptive late arrival to or early departure from class without permission.
5. Physical threats, harassing/bullying behavior, or personal insults (even when stated in a joking manner).
6. Use of personal electronic devices such as pagers, cell phones, PDAs in class, unless it is part of the instructional activity.

Quantitative Analysis, Chem 55, Spring 2021, Course Schedule

The tentative course calendar [here](#) includes weekly course content, exam dates, worksheet due dates (labels as WS#), the date for the final exam. Dates may be subject to change, but prior to this, fair notice will be given during class and through Canvas. The recommended reading from our primary textbook, Quantitative Chemical Analysis, 9th edition, will be listed on the Canvas site.

This page is under construction - Items in gray are still being reviewed

Tentative Course Schedule Class	Week	Date	Topics, Readings, Assignments, Deadlines
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1	1	W 1/27	First day of classes Introduction to course. Read Chapter 0 and Chapter 1 of Harris.
2	2	M 2/1	Units, dimensional analysis, concentration units, preparation of solutions.
3	2	W 2/3	Error and error propagation, statistics, Chapter 3 of Harris.
4	3	M 2/8	Normal Distribution, Student's t-test
6	4	W 2/10	Confidence intervals and other uses of t-table
7	4	M 2/15	Outlier tests
8	5	M 2/22	Monoprotic acid-base equilibria WS3 due
9	5	W 2/24	Polyprotic acid-base equilibria
10	6	M 3/1	Polyprotic acid-base equilibria, activities vs concentration WS4 due
11	6	W 3/3	Buffers and the Henderson-Hasselbalch equation
12	7	M 3/8	Midterm Exam 1
13	7	W 3/10	Buffers
14	8	M 3/15	Acid-base titrations WS5 due
15	8	W 3/17	Acid-base titrations
16	8	M 3/22	Complex titrations WS6 due
17	9	W 3/24	Complex titrations
Spring Break March 29– April 2			
18	11	M 4/5	Relative vs absolute measurements WS7 due
19	11	W 4/7	Calibration curves and standardization

20	12	M 4/12	Spectroscopy WS8 due
21	12	W 4/14	Spectroscopy
22	13	M 4/19	Midterm Exam 2
23	13	W 4/21	Atomic spectroscopy
24	14	M 4/26	Atomic spectroscopy WS9 due
25	14	W 4/28	Analytical separations
26	15	M 5/3	Gas Chromatography WS10 due
27	15	W 5/5	Liquid Chromatography
28		M 5/10	Mass spectrometry WS11 due
29		W 5/12	
30	16	5/17	Last Day of Class

Note: In your general chemistry courses (Chem 1A and 1B), you covered a range of topics that are essential to this course including, but not limited to, significant figures, SI units, stoichiometry, calculating concentrations, acid-base equilibria, buffers, and titrations. We will review some aspects of these topics and we will use them as a foundation for describing more complicated (and exciting) topics. Please review your general chemistry notes and do not hesitate to ask questions as they come up during lecture, office hours, workshop, or at CoSAC.