San José State University

Department of Chemistry Quantitative Analysis, Chem 55 Section 01, Fall 2022

Instructor: Griff Freeman

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Office Hours   Monday and Wednesday 12:30 - 2:00 PM

Additional office hours: TBD

Class Days/Time: TR 9:00 am – 9:50 am

This is an in-person course. Attendance is required.

Classroom: DH 351

Prerequisite: CHEM 1B (with a grade of "C" or better; "C-" not accepted)

First class, Tuesday August 23. As I write this on July 13, San Jose State University is still requiring masks when indoors. With the current surge in new COVID variants I expect that will continue.

If you would like to do some work to better prepare for the semester, please review the correct use of significant figures, limiting reagents, and acid-base equilibria, all of which should have been taught in your previous General Chemistry course.

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 [CanvasLinks to an external site.](https://sjsu.instructure.com/)(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 Achieve 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 Achieve at http://achieve.macmillanlearning.com. You will register for Achieve 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.

Exams

Exams will be in person on a date that will be announced well in advance. If you know that you are going to miss an exam during the semester, please let me know in advance.

iClicker Reef and iClicker Cloud

In this course clicker questions will be employed at least once during class periods 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. iClicker is part of the Achieve package and you should not need to purchase it separately.

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:

Classroom Protocol

Be on time to class; class starts at 9:00 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 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 (Links to an external site.) *(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 (Links to an external site.)](#) 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 below 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.

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.

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 ≠ 80 % of the clicker questions .

- iClicker is part of your Achieve subscription. You should not have to pay for it separately.
- If you have any technical issues, you must notify me by 6 pm of that class day.
- I will occasionally check attendance in class.

Worksheets

Worksheets will be passed out during class nearly every week (11total). 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 number of significant figures and units to Canvas for grading. Your lowest worksheet score will be dropped.

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 acc e p t a b l e excuse is provided, then the grade will be the average of your other grades in that assignment category. In no case will a mak e - 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.

Course Calendar

Tentative Course Schedule Class	Week	Date	Topics, Readings, Assignments, Deadlines
1	1	T 8/23	**First day of classes** *I*ntroduction to course. Read Chapter 0 and Chapter 1 of Harris.
2	1	TR 8/25	Concentration Units, Dimensional Analysis and Dilution of Solutions - Practice Homework and Homework 1 due on 8/27
3	2	T 8/30	Dilution, Errors in Measurement - **Worksheet 1 due**
4	2	TR 9/1	Propagation of Error, Intro to Statistics - Homework 2 due 9/3
5	3	T 9/6	Normal Distribution - **Worksheet 2 due**
6	3	TR 9/8	Using t values - Homework 3 due 9/10
7	4	T 9/13	T values and outliers - **Worksheet 3 due**
8	4	TR 9/15	Review of Equilibrium - Homework 4 due 9/17
9	5	T 9/22	**Midterm Exam 1**
10	5	TR 9/24	More on Equilibrium
11	6	T 9/27	Acids and Bases 1 - **Worksheet 4 due**
12	6	TR 9/29	Acids and Bases 2 - Homework 5 due 10/1
13	7	T 10/4	Buffers - **Worksheet 5 due**

14	7	TR 10/6	Systematic Treatment of Equilibrium - Homework 6 due 10/8
15	8	T 10/11	Titrations Side by Side - **Worksheet 6 due**
16	8	TR 10/13	EDTA Complexes and Titrations - Homework 7 due 10/15
17	9	T 10/18	EDTA 2 - **Worksheet 7 due**
18	9	TR 10/20	Activity - Homework 8 due 10/22
19	10	T 10/25	Midterm Exam 2
20	10	TR 10/27	Activity 2
21	11	T 11/1	Absorption of Light and Beer's Law - **Worksheet 8 due**
22	11	TR 11/3	Calibration Curves and Spectrophotometric Titrations - Homework 9 due 11/5
23	12	T 11/8	Sensitivity and Limits of detection - **Worksheet 9 due**
24	12	TR 11/10	Spectroscopy **WS8 due**
25	13	T 11/15	Atomic Spectroscopy - **Worksheet 10 due**
26	13	TR 11/17	Separations 1 - Homework 10 due 11/19
27	14	T 11/22	Separations 2 - Worksheet 11 due
	14	TR 11/24	No Class - Thanksgiving Holiday - Homework 11 due 11/27
28	15	T 11/29	**Midterm Exam**
29	15	TR 12/1	Chromatography Wrap up

| 30 | 15 | T 12/6 | Last Day of Lecture - TBD |