



## **CHEM 2305 Analytical Chemistry section name section credit hours Credits** **Syllabus**

### Course Information

**Meeting times and location:** section meeting\_times section location

**Catalog description:** Fundamentals of instrumental chemical analysis. Topics include: statistical methods, digital control and data acquisition, gas/liquid chromatography, emission/absorption spectroscopy, capillary electrophoresis, volumetric, gravimetric, and electrochemical analysis. For chemistry and some pre-professional majors.

**Prerequisites:** CHEM-1225/1225L(CHEM-112)

**Terms offered:** Spring Only

**Section-specific Course Description:**

### Course Level Objectives

Upon successful completion of the course, the student will be able to...

1. Prepare solutions of desired molarity.
2. Interconvert between molarity, weight percent, parts per million, and parts per billion.
3. Perform equilibrium constant calculations, manipulations, and apply towards Le Chatelier's principle.
4. Use the buoyancy equation and correct for buoyancy.
5. Correctly use volumetric glassware such as burets, flasks, and pipets.
6. Calibrate volumetric glassware.
7. Describe and perform filtration, and drying procedures.

8. Describe and perform dissolution, fusion, digestion, and extraction sample prep procedures
9. Use correct significant figures in calculations.
10. Describe and distinguish systematic and random errors.
11. Compute absolute and relative uncertainty.
12. Propagate errors in calculations.
13. Properly set up, annotate, and use spreadsheets.
14. Use spreadsheets for graphing.
15. Calculate mean, standard deviation, and relative standard deviation.
16. Compute and use the F test to determine if two sets of measurements are statistically different.
17. Use student's t to compute the confidence interval of replicate measurements.
18. Compare means with student's t test to determine if they are statistically different.
19. Set up a spread sheet for the t test.
20. Use Grubbs test for determining outliers.
21. Construct a calibration curve including error bars using a spread sheet.
22. Set up a spreadsheet to compute slope and intercept with errors using least squares analysis.
23. Outline quality assurance procedures and methods.
24. Perform analysis by standard addition.
25. Set up and use a spreadsheet for standard addition.
26. Perform analysis using internal standards.
27. Perform a back titration.28.Perform a blank titration.
29. Perform a direct titration.
30. Perform a standardization.
31. Perform Volhard and Fajans argentometric titrations.

32. Perform gravimetric analysis.
33. Calculate pH and concentrations involved in acid base equilibria
33. Calculate pH and concentrations involved in acid base equilibria.
34. Prepare buffer solutions.
35. Use pH electrode and spreadsheet to find the endpoint numerically in an acid base titration.
36. Perform a Kjeldahl nitrogen analysis.
37. Compute ionic strength of solutions.
38. Compute activity coefficients.
39. Compute activities of species in solution.
40. Perform an EDTA titration.
41. Analyze and diagram an electrochemical cell.
42. Compute electrode and cell potentials.
43. Describe and use reference electrodes.
44. Describe how a AgCl electrode works.
45. Describe how a calomel electrode works.
46. Interconvert potentials between different reference electrodes.
47. Describe and use a silver indicator electrode.
48. Describe and use ion selective electrodes.
49. Describe and use pH electrodes.50. Describe and use amperometry and voltammetry techniques.
51. Perform cyclic voltammetry in chemical analysis.
52. Describe and calculate properties and quantities involving light.
53. Use Beer's law.
54. Describe single and double beam spectrophotometers.

55. Describe photo-detection schemes including diode array and photo-multiplier-tubes.
56. Describe fluorescence and phosphorescence physical processes.
57. Describe absorbance and luminescence instrumentation.
58. Describe processes and components of an atomic absorption spectrophotometer.
59. Describe processes and components of an inductively coupled plasma spectrophotometer.
60. Perform analysis using an inductively coupled plasma spectrophotometer
61. Describe gas/liquid chromatographic theory, equipment, and techniques.
62. Describe capillary electrophoresis theory, equipment, and techniques.
63. Calculate theoretical plates and resolution of columns.
64. Describe band dynamics.
65. Perform quantitative analysis using Gas Chromatography Mass Spectroscopy.

## Required Technology and Software

- Canvas
- Chrome, Safari, or Firefox

## Technical Support

Technical support is available through the San Juan College Help Desk 24/7/365. The help desk can be reached at 505-566-3266 or by creating a ticket at [San Juan College Help Desk](#).

For tickets and password reset: [San Juan College Help Desk](#)

For Canvas support information: [Canvas Support](#)

## Accessibility/Privacy Policies for all Technology Tools

# Used

[Accessibility/Privacy Policies for all Technology Tools Used](#)

## Course Requirements

Students will do the following activities:

## COVID Safe Practices for Being on Campus

Masks / cloth face coverings must be worn while on campus in accordance with the New Mexico public health order. If you feel that you cannot wear a mask due to health complications, please contact Disabilities Services:

[disabilityservices@sanjuancollege.edu](mailto:disabilityservices@sanjuancollege.edu) or call (505) 566-3271. Hand sanitizer stations are at all building entrances, please “wash in, wash out”--clean your hands when you enter and before you leave. Classrooms and labs have been arranged to allow for social distancing; please respect your classmates and instructors by staying 6 feet away from everyone. You will be expected to disinfect your table or area prior to class and after class, cleaning products will be provided for this purpose. Check with your instructor for specific policies for their course. Please do not congregate in hallways or common areas, instead utilize our beautiful outside spaces and weather to visit with your friends and colleagues from a safe distance.

If you have been in contact with anyone who has tested positive for COVID-19, has symptoms, or is waiting on test results, contact your instructor and DO NOT come to class. If you have tested positive, have symptoms or are waiting on test results, contact your instructor and DO NOT come to class. Your health care provider or the assigned contact tracer will let you know when it is safe for you to be around others.

## Student Support

### **Student Services and Support**

The Student Support webpage provides information on counseling, tutoring, technical support, and many other support services available to San Juan College students.

[Student Support](#)

### **Academic Support**

Academic Support webpage provides information on academic advising, the library, Testing Center, and the honors program.

[Academic Support](#)

## Other Classroom Policies and Expectations

This course is an integrated lecture and laboratory course with the laboratory experience being a required component.

Participation and Completion of the laboratory component at a C level is required to pass both lecture and laboratory courses.

## Grading

Final grades are calculated based on the following...

## Key Dates to Remember

[Full Academic Calendar](#)

## College Policies

The following information also applies to your work in this class. If you have special needs for campus emergency situations, please inform me immediately.

### 1. **Academic Accommodations - American with Disabilities Act (ADA)**

If you believe you need academic accommodations due to physical or learning disabilities, you are encouraged to inform them as soon as possible. The coordinator can work with you in verifying your disabilities and developing accommodation strategies. Please go to [Disability Services Office](#), click the button for "Request for Services" and complete all the steps.

You can also contact the college's disability coordinator in the Advising/Counseling Center at 566-3271 or [disabilityservices@sanjuancollege.edu](mailto:disabilityservices@sanjuancollege.edu). More information is available on the website listed above.

### 2. **The Family Educational Rights and Privacy Act (FERPA)**

Your personal information and grade are confidential. Aside from routine reporting to the college required for this course, I will not share such information with anyone unless I have your permission.

### **3. Academic Honesty Rules**

San Juan College expects all students to adhere to the [Academic Honesty Rules](#) as posted online. These are the official guidelines for all classes at San Juan College (July 2006).

### **4. Student Conduct Statement**

College is preparation for professional opportunities, and professional conduct is expected in courses, including online classes, as well as any written communications, and interactions with members of the college community. As part of our learning community, students are expected to interact and communicate in a mature, respectful, thoughtful, and supportive manner. Students who demonstrate disrespectful, hostile, belittling, bullying or other disruptive behavior will be subject to potential consequences and possible dismissal from the college. The college will take appropriate action when students demonstrate threatening behavior (to others or self). Students should refer to the Code of Conduct in the Student Handbook for additional information.

### **5. Student Safety**

Keeping students safe is a priority, and part of that is ensuring that we have the ability to communicate emergency messages – whether for school closures due to weather or for more or urgent situations. Rave is San Juan College’s emergency messaging system. Through your SJC student email, you will automatically receive email messages, however, it is also vital that you receive text messages. In order to receive the messages, you must register in a simple process with [Rave](#). When registering, please make sure that your mobile status is “confirmed.”

The Department of Public Safety is available 24 hours per day. In an emergency, they can be accessed by calling 215-3091 or 566-3333.

In the event of an emergency, a Rave message will be sent, and depending on the situation, you will be instructed to do one of the following:

- Evacuate the building
- Shelter in place (Campus doors are locked, and operations continue as normal. During this situation, no one other than law enforcement is allowed in or out of the campus.)
- Lockdown (Campus doors are locked. All operations cease, and you should take cover in your immediate area. No one other than law enforcement is allowed in or out of the campus.)

### **6. Non-Discrimination, Sexual Harassment, and Retaliation.**

San Juan College does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender identity, national origin, disability, age, genetic, veteran’s status, or on the basis of any other category protected under federal, state and local laws. If you have experienced sexual harassment, sexual assault, or any other form of protected class discrimination, we encourage you to make a

report. If you report to a faculty member, she/he/they are obligated by policy to share knowledge, notice, and/or reports of harassment, discrimination, and/or retaliation with the Title IX Coordinator. These disclosures include but are not limited to reports of sexual assault, dating/domestic violence, and stalking. You may also make a confidential report to a SJC Counselor. Please refer to San Juan College's [Title IX](#) site for further details.

San Juan College's Title IX Coordinator is Stacey Allen, Assistant Director of Human Resources/Equity, Diversity, and Inclusion Officer. The office is located at the Educational Services Center Building, 2nd Floor, Human Resources, Room 4243 at (505) 566-3515 or [allens@sanjuancollege.edu](mailto:allens@sanjuancollege.edu).

## **7. Drop for Non-Attendance and/or Non-Participation**

### **Class Attendance and Participation Expectation:**

Face-to-Face -- Students are expected to attend and participate in class regularly. Any student missing more than 10% of consecutive class time, (For example, in a regular 15-week class that meets twice a week, this equates to the student missing 3 consecutive classes) without consultation with the instructor may be considered as having abandoned the course.

On-line -- Students are expected to participate regularly and submit all course assignments, based on the course guide definition. A student who does not submit any assignments during a consecutive 10% of the course (1.5 weeks of a 15-week semester) without consulting the instructor, may be considered as having abandoned the course. Logging in does not meet the attendance standard.

Competency-Based Education Classes -- Students are expected to have regular and substantive interactions with their instructor and to actively work on course content. A student who has not submitted coursework, nor had substantive interactions with the instructor over a consecutive 10% of the term, without the instructor's prior approval, will be considered to have abandoned the competency progression. Last date of attendance will be recorded as the last date that coursework was submitted or that the student met with the instructor. For on-line learners, logging in does not meet the attendance standard.

## **8. Failure to Meet Class Participation Expectation:**

Students who fail to meet participation expectations will have their last date of attendance recorded. This date will be used to recalculate any financial aid



received/veteran's benefits received, and the student may be required to repay the institution/government. If the student does not drop the course, an 'X' grade will be recorded. An 'X' grade impacts the grade point average the same as an 'F'.

## 9. Grading Policies

### **Incomplete: Incomplete Grade Assignment** ([Incomplete Grades Information](#))

The grade of I (Incomplete) is given for passing work that could not be completed during the semester because of circumstances beyond the student's control. Ordinarily, the assignment of an I is given by the course instructor at the time final grades are due

In no case is an I grade to be used to avoid assignment of D or F grades for marginal or failing work or to require a student to enroll in the class the next semester because work was not completed on time. Circumstances warranting the issuance of an I grade must be beyond the student's control and must be documented on the appropriate form prior to approval.

I grades can be removed only during the subsequent 16 weeks from the end of term, or within the time limit set by the instructor. Removal of an I is accomplished by completing the work in a manner acceptable to the instructor. Re-enrollment in the course under the repeat option does not remove the prior grade of I. Students should not re-enroll for the course. An I not made up within 16 weeks or within the time limit set by the instructor will change to an F grade thereafter and cannot be changed by work completion.

## 10. Grade Appeals

The policy for grade appeals is in the Academic Catalog. ([Grade Appeal Policy](#))

# Student Handbook

The Student Handbook provides information on Student support, student organizations, and San Juan College policies.

[Student Handbook](#)