Fundamentals of Analytical Chemistry  
CHEM 220  Fall 2020

**Note:** The syllabus is subject to change by the instructor.

**Meeting Time and Classroom**  
TR 8:00 am – 9:15 am, SSMB 129 or via Zoom (see OAKS for link)

**Instructor:**  
Dr. Wendy Cory  
Office: SSMB 314  
Phone: 843-953-1405  
Email: coryw@cofc.edu

**Office Hours:** via Zoom, Monday 1-2, Wednesday 12-1, or by appointment

**Co- or pre-requisite:** CHEM 220L  
**Pre-requisites:** CHEM 112, 112L, Math 111 or equivalents

**Required Materials:**  
*Exploring Chemical Analysis*, 5th edition, by Daniel C. Harris  
Scientific calculator with logarithmic and exponential functions

**Optional Materials:**  

**OAKS:** OAKS, including Gradebook, will be used for this course throughout the semester to provide the syllabus and class materials and grades for each assignment, which will be regularly posted. Class material such as handouts for notes will also be posted on our class OAKS website. Videos of lectures will be available after class to to students who must miss class due to illness, quarantine, or other reasons. It is recommended that you attend class if you are not ill or under quarantine.

**Zoom:** I will use Zoom synchronously so that the material of our class will be available to students who are sick or quarantining. Asynchronous Zoom lectures may be used in the case of inclement weather, although my goal will be to always deliver lectures asynchronously. Links to Zoom lectures will be made available via OAKS.

If we to fully online, we will use Zoom synchronously and extensively. Make sure you are signed into your licensed CoF C Zoom account when you join the class Zoom meetings:
- Please use your first and last name as your display name.
- Please be prepared to turn your video on, as we will be using breakout rooms.

**Recording of Classes (via Zoom):** Class sessions will be recorded via both voice and video recording. By attending and remaining in this class, the student consents to being recorded. Recorded class sessions are for instructional use only and may not be shared with anyone who is not enrolled in the class.

**Student Learning Outcomes:**
- To carry out concentration, titrimetric, equilibrium, and statistical calculations.
- To explain and apply the theory behind quantitative methods and modern instrumentation
- To construct and apply calibration curves used in chemical analysis
- To assess the quality of laboratory data and identify any sources of error
- To select the most appropriate method for a given chemical analysis
- To explain the principles of equilibrium and its applications
- To demonstrate problem-solving abilities in the area of chemical analysis

**Attendance/Participation:** Unless you are sick or quarantined, you are expected to attend all lectures. If you must miss a class, a video of the lecture will be provided to you. It is recommended that you keep up with class, following our class schedule as closely as possible.
Disability Services: The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.

Homework: Homework will be assigned for each chapter. It will not be collected or graded. However, it is necessary to complete homework successfully in order to perform well on quizzes and tests. You may work together with other students on homework problems; these assignments are considered quiz and test preparation.

Writing Assignments: Documents should be ≤1 page, single spaced. These will be graded as follows:
- Content / accuracy / clarity 24 pts
- Grammar and spelling 3 pts
- Citations 3 pts (see http://library.williams.edu/citing/styles/acs.php)
- Total: 30 pts

Assignment 1: Due September 8. Find a news article in the popular press (newspaper, magazine, internet) that involves analytical or environmental chemistry. Do NOT use a technical journal. Your first assignment will be edited by Dr. Cory. You will then re-submit the final version to be graded. This editing will only occur for the first writing assignment – the purpose of this process is to learn how to write clearly and effectively.
1. Summarize the article in one paragraph.
2. Make three lists of terms and concepts:
   a. terms you understand well
   b. terms that you are reasonably sure about
   c. terms that you don't understand
3. Write a list of questions, technical or otherwise, that the article raises in your mind.
4. Critique the article by addressing the validity of the data/arguments that the other uses. Be sure to include a proper bibliographic citation of your article.

Assignment 2: Due October 6. Find an article in Chemical and Engineering News of interest to you that involves analytical or environmental chemistry (examples: a new innovation, a real-world problem to be solved, employment opportunities, or government regulations).
1. Briefly summarize the article.
2. What new chemistry concepts did you learn or if you did not learn new chemistry what was reinforced for you?
3. Do you agree or disagree with any ascertain made by the author and why?
4. Discuss why you selected the article and include a proper bibliographic citation.

Assignment 3: Due November 4. You will be given a journal article and will address the following points:
1. Summarize the article, as with previous ones.
2. Find and discuss terms and concepts in the paper that we have gone over in class this semester.
3. Discuss strengths and weaknesses of the paper / research.
4. Include a proper bibliographic citation.

Assignment 4: Due December 1. Find an article in one of the following journals that describes a new chemical analysis: Analytical Chemistry or Environmental Science and Technology.
NOTE: You will likely need to be on campus internet to access these journals. Be sure to include a proper bibliographic citation.
1. Summarize the method employed and the results that were found.
2. Describe how well you understood the article (or not).
3. What would you do as an analytical chemist to improve the procedure?
   Anal. Chem. link: http://pubs.acs.org/journal/ancham
   Environ. Sci. & Tech. link: http://pubs.acs.org/journal/esthag
Tests and quizzes: Tests and quizzes will be given periodically throughout the semester. A schedule of tests will be provided the week of August 31. These tests may require online proctoring, either by Zoom or using the CoFC-sanctioned proctoring vendor. Students may be required to this exam proctoring service for the course exams. If so, students are responsible for registering, scheduling, and the cost of the service prior to each exam. Instructions and additional information on proctoring can be found at https://academicaffairs.cofc.edu/distance-education/online-proctoring/index.php. More information on tests will be provided the week of August 31.

If you know that you will miss class for a school-sponsored event, you must contact me as soon as possible if there is a test so that you can take the test early. If you are sick, do not come to class. You are expected to alert me by email about your illness as soon as possible so that alternative arrangements can be made for you. If you are too ill to send an email, ask a roommate or family member to do it for you.

Final Exam: The final exam is cumulative and will cover lecture material from the entire semester. The final exam will be Tuesday, December 8, 10:30 am-12:30 am. It will consist of 70 multiple-choice questions. If you miss a test (ONLY for illness or unavoidable, documented emergency), your final exam grade will also count as the missing test score. Online proctoring, as described above, may also be used for the final exam.

Class/Professor Communication: It is your responsibility to check your g.cofc.edu email account daily.

Inclement Weather, Pandemic, or Substantial Interruption of Instruction: If in-person classes are suspended, faculty will announce to their students a detailed plan for a change in modality to ensure the continuity of learning. All students must have access to a computer equipped with a web camera, microphone, and Internet access. Resources are available to provide students with these essential tools. If the College of Charleston closes and members of the community are evacuated due to inclement weather, students are responsible for taking course materials with them in order to continue with course assignments consistent with instructions provided by faculty. We will go to online instructing during this time if necessary, including in cases of extended periods of institution-wide closure where students have relocated.


"Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when suspected, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are related more to misunderstanding and confusion will be handled by the instructor. The instructor designs an intervention or assigns a grade reduction to help prevent the student from repeating the error. The response is recorded on a form and signed both by the instructor and the student. It is forwarded to the Office of the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This status indicator will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent.

Students can find the complete Honor Code and all related processes in the Student Handbook at: http://deanofstudents.cofc.edu/honor-system/studenthandbook/.

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Grading:

Tests, quizzes 70%
Writing assignments 15%
Final Exam 15%

100%

Grading Scheme

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
<th>D</th>
<th>D-</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>94.0-100</td>
<td>90.0-93.9</td>
<td>87.0-89.9</td>
<td>84.0-86.9</td>
<td>80.0-77.0</td>
<td>74.0-76.9</td>
<td>70.0-73.9</td>
<td>67.0-69.9</td>
<td>64.0-66.9</td>
<td>60.0-63.9</td>
<td>≤ 59.9</td>
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</tbody>
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Final Exam schedule: The Final Exam for this class is on Tuesday, December 8 at 10:30 am – 12:30 pm.

Lecture Topics: An approximate schedule of topics covered in this class is given below. It is recommended that you read ahead in the book before each class.

<table>
<thead>
<tr>
<th>Book Chapters/Sections</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1 (1.3 – 1.5)</td>
<td>Concentration units, dilutions*</td>
</tr>
<tr>
<td>Chapter 2 (2.2 – 2.9)</td>
<td>Tools of the Trade</td>
</tr>
<tr>
<td>Chapter 3 (3.1 – 3.4)</td>
<td>Experimental Error and Uncertainty</td>
</tr>
<tr>
<td>Chapter 4 (4.1 – 4.5)</td>
<td>Statistics</td>
</tr>
<tr>
<td>Chapter 6 (6.1 – 6.4)</td>
<td>Titrations and Solubility*</td>
</tr>
<tr>
<td>Chapter 8 (8.1 – 8.7)</td>
<td>Monoprotic Acids and Bases*</td>
</tr>
<tr>
<td>Chapter 9 (9.1 – 9.6)</td>
<td>Buffers*</td>
</tr>
<tr>
<td>Chapter 10 (10.1 – 10.5)</td>
<td>Acid-base Titrations*</td>
</tr>
<tr>
<td>Chapter 11 (11.1 – 11.3)</td>
<td>Polyprotic Acids and Bases*</td>
</tr>
<tr>
<td>Chapter 12 (12.1 – 12.5)</td>
<td>Activity, systematic treatment of</td>
</tr>
<tr>
<td>Chapter 14 (14.1 – 14.6)</td>
<td>Electrode Potentials*</td>
</tr>
<tr>
<td>Chapter 15 (15.2 – 15.4)</td>
<td>Electrode Measurements</td>
</tr>
<tr>
<td>Chapter 4 (4.6 – 4.8)</td>
<td>Calibration Curves</td>
</tr>
<tr>
<td>Chapter 5 (5.1 – 5.4)</td>
<td>Quality Assurance and Calibration</td>
</tr>
<tr>
<td>Chapter 18 (18.1 – 18.4)</td>
<td>Properties of Light and Beer’s Law</td>
</tr>
<tr>
<td>Chapter 19 (19.1 – 19.5)</td>
<td>Spectrophotometry</td>
</tr>
<tr>
<td>Chapter 20 (20.1 – 20.5)</td>
<td>Atomic Spectroscopy</td>
</tr>
<tr>
<td>Chapter 21 (21.1 – 21.3)</td>
<td>Principles of Chromatography</td>
</tr>
<tr>
<td>Chapter 22 (22.1 – 22.3)</td>
<td>Gas Chromatography (GC) and Liquid Chromatography (HPLC)</td>
</tr>
</tbody>
</table>

*Note these sections overlap significantly with material covered in CHEM 112, a prerequisite for this course.
Mental & Physical Wellbeing: At the college, we take every student’s mental and physical wellbeing seriously. If you find yourself experiencing physical illnesses, please reach out to student health services (843.953.5520). And if you find yourself experiencing any mental health challenges (for example, anxiety, depression, stressful life events, sleep deprivation, and/or loneliness/homesickness) please consider contacting either the Counseling Center (professional counselors at http://counseling.cofc.edu or 843.953.5640 3rd Robert Scott Small Building) or the Students 4 Support (certified volunteers through texting "4support" to 839863, visit http://counseling.cofc.edu/cct/index.php, or meet with them in person 3rd Floor Stern Center). These services are there for you to help you cope with difficulties you may be experiencing and to maintain optimal physical and mental health.

Food & Housing Resources: Many CofC students report experiencing food and housing insecurity. If you are facing challenges in securing food (such as not being able to afford groceries or get sufficient food to eat every day) and housing (such as lacking a safe and stable place to live), please contact the Dean of Students for support (http://studentaffairs.cofc.edu/about/salt.php). Also, you can go to http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php to learn about food and housing assistance that is available to you. In addition, there are several resources on and off campus to help. You can visit the Cougar Pantry in the Stern Center (2nd floor), a student-run food pantry that provides dry-goods and hygiene products at no charge to any student in need. Please also consider reaching out to Professor ABC if you are comfortable in doing so.

Inclusion: The College of Charleston offers many resources for LGBTQ+ students, faculty and staff along with their allies.

- Preferred Name and Pronoun Information
- On Campus Gender Inclusive facilities
- Campus Resources
- College of Charleston Reporting Portals
- National Resources for Faculty & Staff
- GSEC Reports
- Documenting LGBTQ Life in the Lowcountry (CofC Addlestone Library Special Collections Project)
- College of Charleston Quality Enhancement Plan (QEP)
- Articles about CofC and LGBTQ+ Issues