CHEM 220L – Fundamentals of Analytical Chemistry Lab – Fall 2021

Section 01  
Meeting Time  
Mon. 1:00–7:00 pm, SSMB 323  
Instructor Information  
Dr. Wendy Cory  
coryw@cofc.edu, SSMB 314  
Office Hours:  
Wednesdays 1-2 on Zoom  
Thursdays 1-2 on Zoom  
https://cofc.zoom.us/j/88513223114

Section 02  
Meeting Time  
Tues. 12:30–6:30 pm, SSMB 323  
Instructor Information  
Dr. Jay Forsythe (he/him)  
forsythejg@cofc.edu, SSMB 112  
843-953-5052  
Office Hrs: Th 10-12 or Zoom appt

Description  
Analytical Chemistry Lab (also called Quantitative Analysis Lab) is your opportunity to learn and perfect laboratory skills that will serve as the foundation for techniques you will use in upper-level laboratory experiences and laboratory research. This quantitative chemistry lab course complements the CHEM 220 lecture, which is a co-requisite for this course. You cannot drop one course without dropping the other. At every lab meeting, you will need to bring the required materials listed below and arrive safely attired.

Required Materials  
1) Face mask  
2) Safety glasses or goggles  
3) Lab coat  
4) Nitrile gloves (not latex)  
5) Bound composition notebook to serve as a laboratory notebook  
6) Ballpoint pen for all lab notebook recording  
7) CHEM 220L Fundamentals of Analytical Chemistry Laboratory Manual, version 16, Fall 2021 (available in the bookstore)  
8) Calculator

Safety  
Please review the departmental Lab Safety Policy (available in the Lab Manual and on the departmental website). You are responsible for your own safety and the safety of those around you. This responsibility includes reading the procedures before arriving in lab to identify and anticipate safety hazards as well as speaking up if you observe someone doing something unsafe. If you do not wear appropriate safety gear, you will not be allowed to work in the lab. This includes face masks. Please note:

1) Safety glasses or goggles are mandatory at all times in the lab,
2) Proper footwear, long pants, long sleeves, and lab coats are required to minimize your skin exposure to chemicals and other hazards, and
3) Nitrile gloves must be worn when handling chemicals.
4) Face masks must cover your mouth and nose and should fit snug. N95 or KN95 masks are recommended.

Student Learning Outcomes
- To perform quantitative analytical methods including titrations, pH measurements, spectrophotometry, and chromatography.
- To demonstrate quantitative laboratory skills capable of obtaining precise and accurate results including:
  - to prevent the contamination of reagents, glassware, and instrumentation,
  - to dispense a known mass of a substance,
  - to perform quantitative transfers of liquids and make dilutions of solutions.
- To demonstrate proper use of volumetric glassware, including the pipet, buret, and volumetric flask and to understand when the use of each is warranted.
- To determine and communicate experimental results appropriately using safe laboratory practices, calculations, significant figures, units, graphs, and laboratory notebook use.

Lab Stations and Glassware
Each student will be assigned a laboratory drawer containing glassware and other tools needed to perform the lab exercises. Each student is responsible for the contents of their assigned drawer and for returning all glassware (clean) and tools at the end of each lab period to the appropriate drawer. The assigned work area, the balance areas, and the areas for reagents are to be kept neat and clean. All spills are to be cleaned up immediately.

Laboratory Procedures
The CHEM 220L Fundamentals of Analytical Chemistry Laboratory Manual contains all procedures for this course. It is your responsibility to read each week’s procedure and complete all preparations contained in the procedure before arriving in lab. Preparing yourself before class is critical to completing each exercise in a safe and timely manner. Each student is to work independently on the laboratory exercises. Exceptions are some instrumental procedures when group exercises are conducted.

Results Submission
Results sheets (which you can detach from the lab manual) are to be turned in at the end of lab each day before you leave. No late lab reports will be accepted. Your final results should always be clearly labeled on the report sheet in pen with the correct number of significant figures.

Lab Notebook
Your laboratory notebook should provide a full record of what was performed during the experiment. Most importantly, all data must be recorded in your notebook in pen as soon as they are generated. All calculations should be shown in the laboratory notebook such that both
you and the instructor may follow your logic and see your complete calculations. You must get in the habit of labeling all measurements with proper units and cancelling those units in calculations. At the end of each experiment, do not leave the lab until your notebook has been checked, initialed, and dated by the instructor. At the end of the semester, your notebook will be a valuable resource to you during the final exam, and it will also be graded, so it is to your benefit to be as complete and organized in your record-keeping as possible.

**Grading Policy**

In this lab, you are graded on the accuracy of your quantitative results, which is dependent on your laboratory technique and skill. Your experimental results for each unknown will be compared to the expected results, and your grade will be calculated based upon the difference between the two. Regardless of your percent error, if you have completed the laboratory exercise and submitted a complete report, the lowest grade you will receive is 65%. Note that you can receive lower than 65% if you have safety violations, fail to properly clean the lab, or submit an incomplete lab report. Results that are incorrect due to calculation errors may be re-submitted for an improved grade, with a loss of 5 points. Resubmission must occur within one week of receiving your graded report.

**Lab Cleanliness**

Keeping the lab clean is essential for a safe and productive working environment. You are responsible for keeping your own station and glassware clean. Additionally, everyone in the lab is responsible for ensuring shared areas are not left messy at the end of the lab period. Your instructor will occasionally ask you to clean shared areas around the balances and in the fume hoods before leaving lab.

**Grading Scheme and Scale:**

<table>
<thead>
<tr>
<th>Lab Notebook</th>
<th>8%</th>
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<tbody>
<tr>
<td>Cleanliness and Safety</td>
<td>2%</td>
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<tr>
<td>Weekly Lab Results</td>
<td>80%</td>
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<tr>
<td>Lab Practical Final Exam</td>
<td>10%</td>
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<thead>
<tr>
<th>Letter</th>
<th>%</th>
<th>GP</th>
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<tbody>
<tr>
<td>A</td>
<td>93-100</td>
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<tr>
<td>A-</td>
<td>90-92</td>
<td>3.7</td>
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<tr>
<td>B+</td>
<td>87-89</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td>80-82</td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>77-79</td>
<td>2.3</td>
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<tr>
<td>C</td>
<td>73-76</td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td>70-72</td>
<td>1.7</td>
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<tr>
<td>D+</td>
<td>67-69</td>
<td>1.3</td>
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<tr>
<td>D</td>
<td>63-66</td>
<td>1.0</td>
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<tr>
<td>D-</td>
<td>61-62</td>
<td>0.7</td>
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<tr>
<td>F</td>
<td>Below 60</td>
<td>0.0</td>
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**Final Exam**

The final exam is a lab practical exam, which will test your ability to perform and apply the skills you will develop in lab this semester. Your success on the practical exam will be aided by keeping a good lab notebook and by making sure you understand the procedures and calculations used throughout the term.
Attendance Policy

Labs are experiential learning courses that emphasize the scientific method and data interpretation and they provide training in essential technical skills for chemists and other scientists. Furthermore, the technical lab skills presented in one course are assumed to have been mastered in subsequent chemistry courses. Thus, attendance in all lab periods is mandatory.

That being said, do not attend lab if you are sick or under quarantine. If you have to miss lab, you must notify your professor before the beginning of the scheduled lab period to be eligible for an excused absence and to possibly do an alternative assignment for the lab. If you do not alert your instructor before lab begins, you will be assigned a grade of zero for all items due that week. Likewise, if a makeup assignment is not completed within the time allowed by the instructor, you will be assigned a zero for that assignment.

Because excessive (>2 missed lab periods) absences from lab will diminish your lab experience and are a significant strain on your instructor, please do not request these accommodations unless absolutely necessary. If you miss more than two weeks of lab for any reason, you must talk to your professor about your options, including potential withdrawing and retaking it in a future semester when you are able to fully participate in the class. An alternative assignment due to illness or quarantine is only guaranteed for a maximum of two weeks during the semester.

Academic/Scientific Integrity

Students must adhere to the College of Charleston Honor Code and Code of Conduct (available at http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php). Each student is expected to observe the College of Charleston Policy on Scientific Integrity (available in the Lab Manual and on the departmental website). For this course, please be cognizant of how honesty and scientific integrity apply to the specific actions of working individually to perform the experimental procedure and calculations, accurately recording data in your lab notebook as the primary record, and completing your results sheets.

Using Excel for spreadsheets and graphing will be necessary throughout this course. It is your responsibility to make your own graphs. Sharing graphs (even if you collected data with a partner) is considered academic dishonesty.

Center for Disability Services (CDS)

If you have a letter (PNL) from the CDS office and need academic adjustments or accommodations because of a disability, please contact me in a timely manner. If you need accommodations and do not have a PNL letter, please contact the CDS office (http://disabilityservices.cofc.edu/).

Department Social Media

Follow the "Chem and Biochem at the College of Charleston" Facebook page and @CofCChem on Twitter to see announcements of opportunities for chemistry and biochemistry students.
COVID-19 Reminders:

Respect for Others
For the health and safety of yourself and those around you, you are required to wear a face-covering over both your nose and mouth while inside all campus buildings (you should do the same inside other public buildings). This mask should fit well; there should not be gaps anywhere between your face and the mask. Also remember that students, faculty, and staff should not come to campus when they feel unwell.

As this is a laboratory course, please be aware of the distance between you and other students, and do your best to socially distance.

Close Contacts and Infection
Anyone with known contact with someone who is infected with COVID is required to follow CDC and CofC guidance, which states that unvaccinated people quarantine themselves away from others for 10-14 days after the last known contact and additionally get tested (negative test results do not eliminate the need to quarantine), while vaccinated people monitor themselves for symptoms and, if they become symptomatic, begin quarantine and testing. Additionally, per the CDC, fully vaccinated people should get tested 3-5 days after their exposure, even if they don’t have symptoms, and wear a mask indoors in public for 14 days following exposure or until receiving a negative test result.

Students living in the same household as someone infected with COVID will need to consult Student Health on the length of their quarantine. If a new member of the household becomes sick, they will need to restart their quarantine.

Anyone who is sick should be tested for COVID and, upon receiving a positive test result, isolate from others for at least 10 days, regardless of vaccination status. Consult Student Health for whether you can come out of isolation after 10 days.

The CDC’s guidance has changed over the course of the pandemic as new data and new variants have emerged; check the latest info for yourself: https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/quarantine.html and find CofC’s info here: https://cofc.edu/back-on-the-bricks/ The easiest thing to do is to contact Student Health about your particular situation to get their guidance: https://studenthealth.cofc.edu/ If you cannot attend class due to a COVID-related situation, contact your instructors for help in making up assignments.

Resources
CofC Student Health requests that you inform them of positive COVID testing results and any close contact with someone who is COVID-positive, so they can monitor the campus health situation and give you personalized healthcare. CofC holds regular free testing events on campus for anyone in the campus community to get tested for COVID infection. CofC also holds free vaccination events on campus for all students. Vaccination remains the best way to protect yourself, your family, and those around you.
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<thead>
<tr>
<th>Monday-Section 1</th>
<th>Tuesday-Section 2</th>
<th>Experiment</th>
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<tbody>
<tr>
<td>Aug. 30</td>
<td>Aug. 31</td>
<td>1) Lab Safety, Balance Use, Graphing, and MSDS (SDS)</td>
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<tr>
<td>Sept. 6</td>
<td>Sept. 7</td>
<td>2) Balance and Volumetric Glassware Use</td>
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<tr>
<td>Sept. 13</td>
<td>Sept. 14</td>
<td>3) Titrimetric Determination of Sodium Carbonate</td>
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<td>Sept. 20</td>
<td>Sept. 21</td>
<td>4) Iodometric Determination of Copper</td>
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<td>Sept. 27</td>
<td>Sept. 28</td>
<td>5) Determination of Ascorbic Acid in Vitamin C Tablets</td>
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<td>Oct. 4</td>
<td>Oct. 5</td>
<td>6) Determination of the Molar Mass and Ionization Constant of a Weak Acid</td>
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<td>Oct. 18</td>
<td>Oct. 19</td>
<td>NO LAB – Fall Break</td>
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<tr>
<td>Nov. 1</td>
<td>Nov. 2</td>
<td>9) Atomic Emission Spectroscopic Determination of Li</td>
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<td>Nov. 8</td>
<td>Nov. 9</td>
<td>10) Determination of Strontium in Marine Waters by Atomic Absorption Spectroscopy</td>
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<tr>
<td>Nov. 15</td>
<td>Nov. 16</td>
<td>11) Determination of Caffeine, Aspartame and Benzoic Acid in Soft Drinks by HPLC</td>
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<tr>
<td>Nov. 22</td>
<td>Nov. 23</td>
<td>12) Determination of the Equivalent Weight of an Inorganic Salt by Cation Exchange</td>
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<td>Nov. 29</td>
<td>Nov. 30</td>
<td>13) Lab practical final exam</td>
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