Instrumental Analysis lab will be meeting in the Physical Chemistry lab, Room 325 of the School of Science and Mathematics Building (SSMB). You will need to bring the following supplies with you:

- Safety glasses or goggles
- Lab Coat
- Nitrile Gloves (not latex)
- Composition book to serve as laboratory notebook
- Ballpoint pen, black preferred, for all lab notebook recording

CHEM 421 (lecture) is a pre- or co-requisite for this course.

Always remember, Safety First!

If you do not have the appropriate safety gear, you will not be allowed to work in the lab. No exceptions.

Safety Gear

- You must wear your safety glasses or goggles at all times in the lab.
- **Long pants** are required. You can keep a pair in your lab drawer if you choose.
- **Footwear** must provide adequate protection to the entire foot. Sandals, open toe shoes, mesh top shoes and shoes with extremely high or narrow heels are considered inappropriate for laboratory conditions and will not be permitted. No skin should be visible below the knees.
- You are advised to tie back **long hair** and wear **shirts** that offer full coverage.
- **Lab coats** are required to cover your arms and protect your clothes.
- **Nitrile gloves** must be work when working with solutions and other reagents.

Learning Outcomes

- Given instructions for using a particular instrument model and software, perform instrumental analytical methods including spectrometric and chromatographic methods.
- Demonstrate quantitative laboratory skills capable of obtaining precise and accurate results including:
  - ways to prevent the contamination of reagents, glassware, and instrumentation
  - dispensing a known mass of a substance
  - methods of quantitative transfer and making dilutions
  - reading analog and digital devices
- Demonstrate proper use of volumetric glassware, including the pipet and volumetric flask and when their use is warranted.
- Keep a good laboratory notebook.
- Take data from the instrument and incorporate it into a written report that effectively communicates the analytical results
- Properly communicate results using appropriate calculations, statistical analyses, estimates of precision (significant figures), and units.
- Prepare high quality plots using Excel to visualize and analyze data.
- Apply appropriate methods of safely handling chemicals and performing laboratory procedures, analyze health and safety information from safety data sheets (MSDS or SDS) and chemical labels, and identify chemical safety hazards.
**Lab Procedures**
Handouts outlining the laboratory procedures will be distributed on our course OAKS page. You are expected to read the procedure in advance and be prepared for the experiment each week.

**Lab Notebook**
A laboratory notebook should provide a full record of what was performed during the experiment. Most importantly, all data must be recorded in your notebook as soon as it is generated. Calculations should be done as soon as possible and examples of each should be entered into your notebook when applicable.

Your laboratory instructor will collect lab notebooks at the end of each lab period to check that all information has been entered legibly in a way that can be followed by others. All calculations should be shown in the laboratory notebook such that the instructor may follow your logic and check for calculation errors. Each student is expected to observe the College of Charleston Policy on Scientific Integrity. Lab notebooks will be returned at the start of the next 421 lecture period, or earlier if requested.

**CHEM 421L Experiments**
Throughout this semester you will work in small groups to perform the experiments listed below. All of the handouts and the experimental rotation are available on the OAKS page for each lab section. You should consult the OAKS page to see when your group is performing each lab and to give you plenty of time to read the handout(s) before the lab period.

**List of Experiments:** subject to change depending on sample and instrument availability
- Basic Electronic Components
- GC-MS Determination of Cocaine on Currency
- HPLC Investigation of Drug Degradation
- LC-MS Investigation of Drug Degradation
- ESI-MS of Proteins
- Identification of Structurally Similar Compounds using LC-MS/MS
- Build Your Own Spectrometer to Investigate Emission Lines
- FT-IR Spectrometry of Microplastics
- Raman Spectroscopy for Explosives Detection
- ICP-MS of Trace Metals

**Report Section Submission**
You and your partner(s) will be responsible for writing sections of a lab report for these experiments. Sections will be assigned at the time of the experiment and include Introduction, Experimental, Results and Discussion, and Conclusion. The group is responsible for editing and reviewing all of your group’s sections. You will sign your name to at least one other section to indicate that you have reviewed it and approve of the contents. You will be graded not only on your section but also the other(s) in your group.

Report sections are due during lab the week following the experiment. Slipping it under my door after lab, or turning it in the next day, results in 10 points deducted from your grade. Twenty points will be deducted for every week that the report is late.

**Lab Final Exam**
The lab final will be held during the final lab session of the semester. It will be based on lab procedures, data, and conclusions. This exam will be open notebook (just your lab notebook, not copies of the procedures).

**Grading Policy**
- Lab Notebook 15%
- Report Sections 75%
- Lab Final Exam 10%

100%
**Attendance Policy**
You are expected to attend all laboratory meetings. You are responsible for completing all assigned labs. No exceptions. 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 be mastered in subsequent chemistry courses. Thus, attendance in all lab periods is crucial. In all cases, if a student misses 3 lab periods without making up the lab in another section, **whether these absences are excused or unexcused**, that student will receive a WA for a final grade. Students should recognize that it is not always possible to make up work in another section, so students should make every effort to minimize absence from lab.

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