# Chemistry of the Elements Laboratory
# CHEM 2141
# Summer, 2021

*We fully recognize it is difficult to teach laboratory techniques on a computer. The things we will do this quarter are by no means a substitute for actual hands-on chemistry. What we will attempt to do is provide an environment where you are free to make decisions and observations that are similar to what you might experience in an actual laboratory setting. More emphasis will be placed on developing the skills to make these observations as well as analyzing and interpreting data. We will also learn to better interleave the theoretical and conceptual aspects of chemistry with its experimental side.*

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**Teaching Assistants:** There will be a Graduate Teaching Assistant (GTA) for each lab section.

**Laboratory Manual** – Available on the CHEM 2141 CANVAS website.

**Lab Notebook** – It is a good idea to record all observations, data, and calculations in a notebook just as you would if you were attending an actual lab. You will be supplied representative data at times during the quarter. This data will be uploaded on to Canvas and will be easily accessible.

CHEM 2131, Chemistry of the Elements, (the lecture course) is a co-requisite for CHEM 2141 (the lab course) and students who register for 2141 are also expected to register for 2131.

| Week | Experiment | Type* |
|---|---|---|
| 1 | Introduction to Elements Online Lab | |
| 1 | Introduction to Computational Chemistry | CL |
| 1 | Introduction to Computational Chemistry Continued | CL |
| 2 | Synthesis of Werner Cobalt Ammine Complexes | AL |
| 2 | Exploring Optical Isomers and Crystal Field Theory Using Molecular Modelling | CL |
| 2 | Synthesis and Characterization of $Al(acac)_3$ and $Co(acac)_3$ | AL |
| 3 | Synthesis and Titration of Aquapentaamminecobalt(III) Nitrate | AL |
| 3 | Metals in Biochemistry – What do these results mean to you? | LL |
| 3 | Voltaic and Concentration Cells | AL |

***Lab Types**

**CL – Computational Lab:** Here you will explore chemically related problems and model the structure and behavior of molecules using mathematical calculations and predictions. For the purposes of this laboratory course we will not be concerned with how the calculations are done. The software we use will do that for us. We will focus on understanding the structure of molecules and how that connects to their experimental behavior.

**AL – Adventure Lab:** These adventure labs or "choose your own adventure labs" will be built around experiments done as demonstrations. However, you will not simply watch the experiment being performed from start to finish. You will have to make decisions (answer questions). What you choose will change how the experiment unfolds. It will be critical that you watch the videos carefully and record any data and observations. Use what you see and the data you are given to make your decisions and ultimately to shape the results of the experiment.

**VL – Virtual Lab:** A learning experience that attempts to simulate an authentic laboratory. The software/websites allow you to complete laboratory experiments and explore concepts and theories in a virtual setting. Sorry, this won't be super cool virtual reality.

**Computers** - You will be using your laptop in the laboratory ☺ or you could say your laptop is the laboratory.

**Safety Rules** ☺

- Always let your wrists rest on the desk in a neutral position. Use a comfortable pad to avoid flexing or extending your wrist for too long. Keep your shoulders and back relaxed. But, do not slouch. Carpal tunnel syndrome can be a debilitating condition that prevents you from gripping your smartphone.
- Use proper lighting and minimize glare to prevent eye strain. If working in a room with fluorescent lights consider using a desk lamp instead or wear blue light blocking glasses.
- Viruses, malware and other malicious software can wreak destruction and gain access to your sensitive information. But do not spray your computer with a 10% bleach solution…Internet security programs must be used at all times.
- Fashion changes faster than safety guidelines can be rewritten. Think…clothing!! When using Zoom, you are beaming video of yourself out for all the world to see.
- Perform and preserve backups of your computer files. Disasters do happen with computers! Like when you spill an Arnold Palmer on your laptop.

**Working together** – I encourage you to collaborate with your classmates. Maybe now more than ever we will need to reach out for help. We may not be able to get together in one of the Olin labs or over in the SEC, but we can still help each other. Use Zoom or some other video conferencing platform. Worse-case scenario take a picture of what you are working on and email or text it to a friend. I helped my niece understand algebra using text messages.

**If you miss a lab –** We are going to try and maintain some degree of normalcy. There is a lab scheduled for each week. The report sheet will be due the following week, just like we have done it the last two quarters. I realize you are not actually coming to lab each week, but I am also aware that illness and other life events can keep you from completing the work on time. It is your responsibility to contact me or your TA to make us aware that you need extra time. We will do our best to accommodate you.

**Deadlines -** It is important that you complete you report sheets while information is fresh in your mind. They due during the week following when the lab itself is scheduled. The GTA's will grade and return your assignments at least 24 hours before your next one is due. This will give you time to make any last minutes corrections based on feedback from the GTA's. **Late work will receive a deduction of 10% per day and will not be accepted after 4 days.**

**Prelabs:** There will be no prelab exercises this quarter.

**Reports Sheets:** The focus of the report sheets will (1) Communicate your observations, (2) Show how you analyzed the data including relevant calculations, (3) Interpret that data, and (3) Discuss what it means. All report sheets will be submitted through Canvas.

**Lab Reports:** We will be having you do writing as part of completing the report sheets. However, you will not be writing full lab reports this quarter.

**Course Grading**

| | |
|---|---|
| Adventure Labs 4 x 80 pts | 400 pts |
| Literature Lab 1 x 80 pts | 80 pts |
| Computational Labs 2 x 80 | 160 pts |
| Total Points | **640 pts** |