

Fall 2025

CHEM 491 – Research in Chemistry

INSTRUCTOR and PRINCIPAL INVESTIGATOR (PI): Dr. Keith Reber

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Office Hours: By appointment

OBJECTIVES

After completing this course, students should be able to:

- Design experiments capable of addressing focused research questions.
- Conduct hypothesis-driven experiments in a safe, efficient, and independent manner.
- Effectively communicate research findings via oral presentations, poster presentations, grant proposals, and/or publication-quality reports.

CREDITS

Research hours correspond to research credits as follows:

- 1 credit = **at least** 3 hours of research per week
- 2 credits = **at least** 6 hours of research per week
- 3 credits = **at least** 9 hours of research per week

REQUIRED MATERIALS

- Safety goggles or safety glasses for all laboratory work
- Bound composition book and electronic equivalent (used as a lab notebook)
- Proper attire for all laboratory sessions (see laboratory guidelines below)

EXPECTATIONS

You will need to perform a minimum of three hours of lab work per unit of academic credit. I expect that you will treat the research experience in the same manner as a job. Therefore, be efficient with your time in the lab. While in the lab, I expect that your attention will be fully on research-related activities.

All researchers must follow ethical scientific practices – falsification and/or manipulation of data are academic integrity violations and will be penalized as such. It is imperative that you keep *detailed* records of your research activities by adhering to the following guidelines:

- Keeping an up-to-date lab notebook with all data and observations
- Documenting experimental details for inclusion in grant proposals, manuscripts, and/or a thesis
- Safely archiving all electronic files (e.g., Excel spreadsheets, NMR data files, research proposals etc.).

GRADING

There are five criteria by which students will be evaluated, as described in the table below.

Letter Grade^a	Attendance and Diligence (30%)	Lab Safety and Lab Upkeep (20%)	Technical Communication (memos, proposals, presentations, and/or reports) (20%)^b	Record Keeping (20%)^b	Independence/ Initiative (10%)^b
A	Consistently invests more than the minimum time required for the registered units; punctually attends all meetings	Always practices appropriate lab safety and upkeep tasks	Written works are highly polished and reflect careful attention to detail.	Data are carefully recorded in lab notebook and/or electronically; data are routinely backed up to the shared OneDrive folder; records are well-documented and easy to find	Displays creativity and takes project in directions developed independently
B	Occasionally invests more than the minimum time required for the registered units; attends all meetings	Almost always practices appropriate lab safety and upkeep tasks	Written works are polished and reflect attention to detail.	Data are recorded in lab notebook and electronically; some organizational improvements are needed	Pursues ideas generated with PI
C	Puts in the minimum time required for the registered units and/or one meeting was missed.	Some inconsistency regarding lab safety and upkeep tasks	Written works meet minimum requirements but would benefit from additional revision.	Some data are difficult to find or are missing; electronic files are not backed up	Does what the PI advises
D or F	Periodically puts in less than the minimum time required for the registered units and/or two meetings were missed.	Substantial inconsistency regarding lab safety and upkeep tasks	Written works are incomplete and/or of unsatisfactory quality.	Large amounts of data are missing or are poorly organized	Does less than the PI advises

^a Plus/minus grades will be assigned at the discretion of the instructor. Chronic absenteeism, underperformance, and/or safety violations can result in a grade of "F" for the course and/or revocation of research privileges, regardless of other performance metrics.

^b These criteria will be evaluated based on the amount of experience a student has in lab. For example, my expectations for someone who has already worked with me for two semesters will be greater than my expectations for a new research student. Notice that the success of your experiments is *not* a grading criterion – not all research works in the way we expect; perseverance and diligence are key.

SAFETY

Safety is of the **utmost** importance in the laboratory. Part of your training will include instructions on how to properly assess the hazards associated with all procedures and with the use of any potentially hazardous chemicals. Please observe all applicable safety practices in lab, including:

- Wearing safety glasses/goggles **at all times**.
- Use of additional personal protective equipment when necessary (gloves, lab coats)
- Wearing of appropriate clothing for a chemistry lab when performing research (long pants, closed-toe shoes).
- Proper disposal of waste
- No unauthorized experiments or wasting of materials or supplies.

Laboratory work must be conducted conscientiously. Chemicals, materials, glassware, and equipment all cost our group (or the university) money and must be used with respect and care. It is also very important that the work you put in doesn't go to waste, which is why I insist on good record keeping. Ultimately, I hope to publish all research done in my lab, and publication may happen after you leave Towson. I need to be able to reconstruct what you did and understand the data you collected using your notebook and/or electronic files.

CLASSROOM DIVERSITY AND INCLUSION

The students, faculty, and staff at Towson University represent a diverse and vibrant community of learners and scholars. As a community, we value the unique contributions of each individual and promote active participation in all aspects of the learning process by each community member. Your instructor supports Towson University's goal of fostering a diverse and inclusive educational setting. Your instructor strives to create a classroom environment built upon the principles of mutual respect and support. Toward this end, all participants in this course are expected to demonstrate respect for all other members of the class. If you feel these expectations are not being met, please speak with your instructor or the designated diversity liaison, Dr. Cindy Zeller (czeller@towson.edu). For further information regarding diversity and inclusion policies, please see the [Chemistry Department Diversity Action Plan](#).

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

If you may need an accommodation due to a disability, please contact me privately as soon as possible to discuss your specific needs. A memo from Accessibility & Disability Services is required. It is your responsibility to present this paperwork in a timely fashion and to follow-up regarding accommodations that require my participation (e.g., testing accommodations). If you think accommodations might be appropriate, you are encouraged to contact Accessibility & Disability Services (Phone: 410-704-2638 or <https://www.towson.edu/accessibility-disability-services/>).

SYLLABUS SUBJECT TO CHANGE

Although I make every effort to adhere to the syllabus in its current form, all information, schedules, and policies outlined herein are subject to change.