

## Chemistry 375 and 376: Chemistry Research

The chemistry department strives to maintain high quality teaching and scholarship for the benefit of our students. The department has adopted the philosophy that students must not only be exposed to the most current happenings in at least one chemical research field, but they must also immerse themselves in the field by participation. Thus, our department feels research is an important component of undergraduate education. Through this experience, students not only participate in research, they also learn to search the literature on-line, to write scientifically with a special emphasis on creative thought, and to prepare and deliver effective oral presentations. As effective research requires a certain skill level, we highly recommend that students begin early, preferably in their first or second year and take advantage of as many summer research opportunities as possible.

It must be understood that research, as well as being a valuable learning experience for the undergraduate student, must also be carried out in the spirit that the work being done will contribute to the advancement of knowledge in the field, ideally leading to a publication. Therefore, the Chemistry Department encourages students to engage in research with a faculty mentor\* and to become an active member of their research group. As a member of a research team, each student has certain required responsibilities. Each must:

- work a minimum number of hours in the lab (see below),
- spend time in lab productively (performing experiments, analyzing data, documenting lab work in notebook, literature searching and reading the literature),
- write a complete research report each semester,
- work collaboratively with each other (more experienced students are expected to help train younger members of the lab in techniques, lab etiquette, and ethics),
- attend a specified number of departmental colloquia.

*There are different levels of participation in chemistry research and we encourage all students to participate at the level with which they feel most comfortable. Some students may elect to work on research activities without enrolling in CHEM 375/376.*

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\* Please realize that all labs have a limited capacity. If you are interested in research, we recommend that you interview with several potential faculty mentors.

## REQUIREMENTS FOR CHEMICAL RESEARCH (CHEM 375 / 376)

Each semester, one member of the Chemistry Department faculty serves as the Research Coordinator for all students. You need their signature to enroll in CHEM 375 or 376. Prior to that, you should meet with your individual faculty research mentor to discuss your research project and expectations. The Chemical Research courses are categorized as level 1 and level 2, with differing credit and departmental expectations:

### Chemical Research level 1 (0.25 units)

1<sup>st</sup> and 2<sup>nd</sup> year students; an option for upper-class students beginning their first semester of research

- working a minimum of one afternoon (3 hr.) in the laboratory per week
- participating in regular meetings with your group or faculty mentor (consult your mentor)
- submitting all research results at the end of the semester (consult your mentor)
- writing a full research report in the style of a journal article describing your accomplishments during the semester; this documents can be expanded in subsequent semesters of research
- presenting a 10 min talk or a poster (except for students in their first semester of research)
- attending Chemistry Department colloquia is encouraged

### Chemical Research level 2 (0.5 units)

3<sup>rd</sup> and 4<sup>th</sup> year students only. [Juniors: this is a prerequisite for the Senior Honors program.]

- working a minimum of 6-8 hr. in the laboratory per week
- participating in regular meetings with your group or faculty mentor (consult your mentor)
- regularly searching and reading the primary chemistry literature related to your project.
- writing a full research report in the style of a journal article describing your accomplishments during the semester; this documents can be expanded in subsequent semesters of research and serve as the basis of an Honors thesis.
- attending Chemistry Department colloquia is expected (at least three is required)

Grades in CHEM 375/376 are determined by the faculty mentor and the Research Coordinator, based on effort laboratory effort, productivity, creativity and commitment and the quality of your research report and/or oral presentation.

## SUCCESS IN THIS COURSE DEPENDS ON:

**A. Time Commitment.** There is a specific weekly time requirement for your experimental work, which the faculty mentor will clearly establish at the beginning of the course. Time spent in the laboratory must be documented in your lab notebook, and notebook pages submitted to the faculty mentor. At the beginning of the semester, a schedule of specific and regular lab times should be agreed to by the student and faculty mentor. Students are also expected to attend and participate in a weekly meetings with faculty mentors and other group members. The faculty member is expected to provide time weekly for mentoring student progress and for running group meetings.

**B. Safety.** All research students must take a safety training workshop from the Director of Environmental Health and Safety, if they have not already done so. Also, the faculty mentor will train the student to conduct research safely. Students are expected to learn and follow safety guidelines, even at times when the faculty mentor is not present. This includes using eye protection and gloves. These guidelines are not negotiable. If there are any questions regarding safety, the student must ask before beginning an experiment. Consult the document *SAFETY IN CHEMISTRY DEPARTMENT LABORATORIES* for detailed safety policies.

**C. Data.** Data collected during research must be properly recorded and saved. Laboratory notebooks must be maintained correctly, with dates and sufficient detail for your work to be reproducible. All instrumental data files must be properly recorded and saved on a storage disk; file names should be included in the lab notebook. All data must be submitted to the faculty mentor before the student will receive a grade for the course. The faculty mentor will describe good laboratory notebook practices.

**D. Learning about your project.** Students should strive to learn about the project they are working on by reading background material (textbooks or treatises) and primary literature articles regularly. Discuss and analyze what you read with your faculty mentor and lab mates. By keeping notes on this reading, you can assemble a review of your research project topic that could serve as an introduction to a report, thesis or presentation.

*A note about public presentations: Students are encouraged to present their research results at conferences and meetings. However, collaborative research represents not only the student, but also the faculty mentor, the Chemistry Department and Kenyon College. The faculty mentor reserves the right to allow only presentations of acceptable quality to be presented to the public at any time.*