

CHEM 1605L: Synthesis and Characterization of Polymers Lab

Spring 2019

At a Glance

Labs Th 1pm-4:50pm in Chevron 410

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Corequisite Students enrolled in CHEM 1605L must currently be enrolled in CHEM 1600/2600, or have taken it in the past

Required Materials For this course, you must purchase:

- Lab-approved safety goggles:**
Encon 500 Goggle; ANSI Z87.1-2010 High Impact; CSA Z97.3-2007
- these may be purchased from the University Store on Fifth.
**SAFETY GOOGLES MUST BE WORN BY ALL STUDENTS,
AT ALL TIMES, IN THE LAB – NO EXCEPTIONS!**
- Student Laboratory Notebook:**
Carbonless copies notebook by Hayden-McNeil
- available at the University Store on Fifth

Course Overview

Course Goals CHEM 1605, Synthesis and Characterization of Polymers Laboratory, is an advanced elective course paired with the lecture course CHEM 1600, Synthesis and Characterization of Polymers. The lab is generally taken by a small number of senior chemistry and chemical engineering majors. The course uses various synthetic and analytical methods to illustrate and solve typical problems in polymer science.

In this course you will prepare a number of polymers of both commercial and research interest using several polymerization methods including: bulk, solution, suspension, radical, anionic, ring-opening, condensation, and metathesis. These synthesized polymers will be characterized using an array of analytical techniques including: nuclear magnetic resonance spectroscopy (NMR), size-exclusion chromatography (SEC), differential

scanning calorimetry (DSC), dynamic light scattering (DLS), and a variety of other spectroscopy and microscopy methods.

Assignments and Grading

You will be graded on your work on four types of assignments in this course:

1. **Pre-Labs (7 x 15 pts. each)** – Every experiment but the first has a pre-lab assignment. These assignments are a series of questions designed to prepare the students for the upcoming lab experiment. These assignments should be completed on a separate sheet of paper and are due at the beginning of the lab period on the day the experiment starts.
2. **Post-Lab assignments (7 x 40 pts.)** – Post-lab assignments involve a combination of answering questions, doing calculations, making graphs and tables, writing, and constructing ChemDraw schemes. Students are expected to allot 2-5 hrs. per post-lab assignment. These assignments should be written with attention to grammar and formatting and should always be done on a computer. In most of these assignments the student will work on creating one or more components of a full lab report. The formatting for each section should be structured like an ACS manuscript for submission to a journal such as *Macromolecules*. The post-lab answer keys and grading rubrics will be provided as a separate handout.
3. **Lab Reports (1 x 70 pts.)** – There is one full lab report. The lab report should be structured as a manuscript for submission to an ACS journal such as *Macromolecules*. The expectations and grading rubric will be provided as a separate handout.
4. **Lab Notebook Pages (5 pts.)** – The student is responsible for turning in lab notebook pages for experiments 2-7. For each experiment the student should include reaction schemes with a reagent table, a clearly stated objective, procedure, observations and description of product, and any conclusions. The notebook pages may be turned in at the end of the lab period or at the beginning of the next lab period.

In addition to the graded assignments, there is a **lab performance grade (70 points)**. The lab performance grade factors in each students' general preparation, adherence to safety standards, willingness to engage in discussion, and laboratory technique.

To facilitate efficient marking and return of submitted work, we will use Gradescope for grading of lab assignments. If you are officially registered for this class, you should have received an invitation to Gradescope earlier this week; if not, please contact your instructor for access.

Course Schedule

Experiment & Assignment Schedule

There are 8 experiments over the course of the semester. Some experiments will take more than one lab period, and may include demonstration of a new instrument.

The current schedule for the semester is as follows:

#	Experiment Title	Dates	Pre-Lab	Post-Lab Assignment	Notebook Pages
1	Synthesis of Nylon	1/10	No	Assigned Questions	No
2	Measuring Molecular Weight	1/17	Yes	Calculations & Assigned Questions	Yes
3	Step-Growth Polymerization	1/24, 1/31	Yes	Results & Assigned Questions	Yes
4	Polystyrene: Free Radical and Anionic	2/7, 2/14	Yes	Experimental Section & Assigned Questions	Yes
5	Reactivity Ratios	2/21	Yes	Experimental Section & Calculations	Yes
6	Ring-Opening Metathesis Polymerization	2/28, 3/7	Yes	Introduction & Partial Results & Discussion	Yes
7	Poly lactide	3/21, 3/27, 4/3	Yes	Full Lab Report	Yes
8	Hydrogels	4/11, 4/18	Yes	Assigned Questions	Yes

Course Policies

Safety Many of the labs we will do this semester come with significant associated safety hazards. **The safety rules will be outlined on the first day of lab, and you will be required to sign a copy of these rules certifying that you have read them before you will be permitted to work in the lab.** All policies outlined in these documents must be followed by all students and lab instructors.

To ensure that you are aware of the safety concerns associated with each experiment, you must read and understand the laboratory procedure before you enter the lab each week.

In addition, to maintain a safe lab environment, you must **keep the laboratory clean**. At the end of lab, balances, sinks, hood space and all benchtop space must be wiped clean. All reagents and supplies must be returned to their respective areas. The lab space is utilized by multiple lab courses with multiple sessions so it is extremely important to leave the lab in perfect condition.

Lab Notebooks You will be required to record laboratory procedures, observations, and data collected in this notebook. All information written in your lab notebook should be recorded using a pen, entries using pencil will be omitted. This information will be essential for writing accurate lab reports. The carbonless copies will be handed in and graded for a portion of your overall course grade.

Missed Labs For extenuating circumstances we will accommodate up to ONE missed lab period. For a missed lab, you will still need to submit both the pre- and post-lab assignment for the lab; please contact your TA for data to use in the post-lab assignment. Your notebook page score for the lab period will be replaced by the average of all of your other notebook scores.

Further missed lab periods will result in a zero on both the post-lab assignment and notebook pages associated with the missed lab.

Office Hours Your lab TA will discuss their weekly office hour times during the first day of lab. These are typically one hour sessions where you may get help or advice on a particular assignment. Additional help may be obtained via email where you can set up a meeting with your TA or get a quick answer to a question.

Academic Integrity **Cheating/plagiarism will not be tolerated.** Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, from the February 1974 Senate Committee on Tenure and Academic Freedom reported to the Senate Council, will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score for the assignment will be imposed. For more information, visit www.cfo.pitt.edu/policies/policy/02/02-03-02.html.

Disabilities If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 140 William Pitt Union, 412-648-7890 or 412-624-3346 (Fax), as early as possible in the term. Disability Resources and Services will verify your disability and determine reasonable accommodations for this course. For more information, visit www.studentaffairs.pitt.edu/drsabout.