

Chemistry Comps 2023-24

Link to Comps Proposal Google Form:
<https://forms.gle/XFcbfWMMZZDoYFtm9>

Some Important Points

1. **Types/Timing of Comps.** You may fulfill your requirements for comps either by writing an individual paper (either research- or literature-based), or by working in one of three groups. Groups will meet over winter and spring terms next year; the individual paper allows more flexibility in the timing of your comps but generally also takes place over two terms.
2. **Term Enrollment Requirements.** Special circumstances may limit your choice (and timing) of comps project, such as intent to graduate early, off-campus study during the senior year, your status as a double major, etc. You must get approval from the Chair of the Chemistry Dept. to do comps before your senior year. **Of special note:** you **must** be a registered student (minimum of 12 credits) while you are doing comps. For paper writers, this means you **must be registered the term you complete your comps**. For group comps, **you must be registered both winter and spring terms**. For instance, if you intend to complete your course work by the end of the winter term next year, then an individual paper **must** be completed at the end of winter term, as well. Similarly, you **may not** participate in a comps group if you plan not to enroll in classes next spring.
3. **Seminar Attendance Requirement.** It is expected that **all comps students attend all comps-related talks** (given by students and visitors) as part of your work in comps. **Plan accordingly!** [In addition, as part of comps you are required to attend **10 seminars** *between declaration of your major and the end of winter term your senior year.*]
4. **Comps Proposals.** You must submit a proposal to apply to participate in comps in any form. Proposals will be submitted via [Google form](#), with more details provided below. Regardless, you **must submit your proposal by one of the deadlines below:**
 - i. Individual paper writers who wish to begin work in fall term: 5:00 pm, Wed May 31, 2023 (last day of classes).
 - ii. Individual paper writers who wish to begin work in winter term: 5:00 pm, Fri October 13, 2023 (Fri before Midterm Break).
 - iii. Group comps proposals: 5:00 pm, Fri October 13, 2023 (Fri before Midterm Break).

Option I: The Individual Paper – Register for section 400.01

You may write an individual paper either focusing on a literature topic of your choosing, or by expanding on research you have performed on- or off-campus. An individual paper involves considerable independent work at all stages, including becoming familiar with the primary literature of your topic. Typical papers might have 5-10 primary literature articles that you have analyzed in great detail. The paper is not merely a library report but is designed to involve you in the topic as a critical scientist. Personal judgments, criticisms, and suggestions for future directions will play important roles in creating an excellent paper. Expect that the paper will go

through multiple revisions, with significant effort required after the completion of the first draft. Typically, you will meet weekly with your advisor until the paper is complete.

Literature-Based Individual Paper. Those of you choosing this option will select a topic of personal interest on which you will write a paper of 20 to 30 pages in length (with an absolute limit of 40 pages, which includes all figures, illustrations, footnotes, endnotes, references, acknowledgements, etc.). Most importantly, you must find a faculty advisor who agrees to work with you. You may consult with any of the faculty for advice about selecting a topic and advisor. The table below lists faculty who are available to serve as advisors on literature-topic individual papers. Note that you are not limited by the faculty listed; you may consult with any of the faculty for advice about selecting a topic and advisor.

Research-Based Individual Paper. This option is available to those who have been involved in a research project either at Carleton or elsewhere. It is intended to provide an opportunity for you to *extend* the scope of your necessarily limited laboratory work to a broader perspective, quite like that of the “Literature-Based Individual Paper” option. The research paper is not just a very large lab report. It requires that you explore in depth a topic that you have become familiar with through your research, incorporating your work into a larger picture.

Occasionally, Carleton faculty will offer a research opportunity for seniors that will constitute a portion of their comps project. The table below lists faculty available to offer a research opportunity plus advise students on a follow-up individual paper. If you’re interested in this option, you should contact the faculty member and discuss the topic, time commitment, credit distribution options, expectations for regular meetings, and the final paper.

Formal Requirements for Individual Papers

1. **Proposal & Advisor.** Use the comps [Google form](#) to indicate your selection of the individual paper option and provide the name of the chemistry faculty member who has already agreed to serve as your advisor. You and your advisor will arrange a regular weekly meeting time to discuss your topic and to monitor your progress.
2. **Second Reader.** One other faculty member must read your paper. You should think about whom this second reader should be (with advice from your advisor) and select him or her early in the process. After the project has been outlined and has some focus, you should plan to meet with the two faculty readers, so that both are familiar with your plan and topic. The second reader should be provided with drafts of your paper-in-progress on a schedule you have arranged with your advisor.
3. **Oral Defense.** Your project will conclude with a 45-60 minute closed discussion with your two faculty advisors and will cover the material discussed in your paper. You also have the option of presenting a public seminar on your topic (30 minutes is a reasonable timeframe for your talk). If you do choose to give a general public talk, then you will also have the choice on whether to include the public talk as part of the evaluation in Comps. Please talk to your advisor about how to make these choices.
4. **Revisions/Archiving.** After completing your defense, you will make any final revisions of your paper and then archive this final draft at the library digital archive web site (<https://www.carleton.edu/library/help/services/comps/>). Instructions for archiving are available on the web site.

Faculty Available for Individual Papers

The following chemistry faculty are most available to serve as primary advisers for individual comps projects because they are not leading comps group. However, you may also ask faculty who are leading comps discussion groups –depending on their commitments, they may take on a long paper. *You must consult with your potential individual comps adviser before applying for the individual comps option.* You will work with your primary comps advisor to set a time table for your work and decide on a distribution of credits over 1-3 terms.

Paper Type	Faculty (Terms Available)	Topics Covered
<i>Literature-Based</i>	Trish Ferrett (F, W, S)	Physical, Environmental, Nanochem, Materials, Biophysical
	Steve Drew (F, W, S)	Analytical, Bioanalytical, Materials
	Will Hollingsworth (F, W, S)	Physical, Environmental
<i>Research-Based</i>	Steve Drew (F, W, S)	Electrochemical deposition of semiconductor thin films for application in photoelectrochemical production of hydrogen

Timeline for Completing Individual Papers

There are distinct steps each student must follow to complete an individual comps project. These non-negotiable steps are highlighted below. If you do not meet these expectations within an appropriate time frame, the department will require you to complete your comps through other means (such as taking and passing a set of comprehensive exams).

Literature-based Individual Papers

- Gather interesting literature papers from the library/online, available in the Gould collection and through interlibrary loan (start when proposing a topic to your potential comps advisor).
- Set up a regular meeting with your advisor.
- Read papers in depth.
- Refine your topic and create an outline.
- Expand outline and identify topics about which more needs to be learned.
- Start to expand the outline with text (introduction, etc...).
- Assemble a first draft (normally completed at the halfway point of taking your six credits of comps).
- Submit a reasonably complete draft with figures, references, etc. to your advisor (normally completed after two-thirds of your 6-credits of comps are completed).
- Discuss the draft with your advisor and identify areas for more work.
- Revise until you and your advisor agree you're close to a draft that can be read by a second reader (normally completed in the last two weeks of taking comps credits).
- Schedule date for oral defense with advisor and second reader (normally completed in the last three weeks of taking comps credits).
- A defensible draft is due at least one week before your defense date.
- The oral defense must take place before completion of your final term with comps credits or

- before final comps grades are due at the end of the academic year (usually early-mid May).
- Submit your final draft to the library digital archives:
(<https://www.carleton.edu/library/help/services/comps/>).

Research-based Individual Papers

- If you have been involved with research performed elsewhere, consult with a chemistry faculty member to determine who the best faculty advisor will be and whether a research-type comps is possible.
- If you have been involved with research on campus in the Chemistry Department, consult with your research advisor to determine if a research-type comps is possible.
- If you wish to perform research during your senior year in order to complete a research-type comps project, consult the table above and contact the faculty listed for more information. In this case, comps credits will be dedicated to lab work and the preparation of a final product describing your work and its context.
- Regardless of when or where your research was performed, you will need to have regular meetings with your advisor and produce a paper/presentation describing the context for the research and the contribution you have made including experimental details. The timeline for the actual writing of the paper/preparation of the presentation will be similar to that described for literature-based research papers above.
- The final paper or final presentation must be completed before the end of your final term with comps credits or before final comps grades are due at the end of the academic year.
- Submit a final draft of your presentation or your written paper to the library digital archives (<https://www.carleton.edu/library/help/services/comps/>).

Option II: The Group Discussion (“Group Comps”)

In this Comps option, groups of 6-10 students meet with one or two faculty members for in-depth discussions that are mostly student-led on specific topics from the recent scientific literature. Groups typically form around one scientist’s research. The projects usually culminate with two important events: (1) a public seminar prepared and delivered by the comps group, followed by (2) a campus visit by the comps “subject” for lengthy discussions with group. The details as they are currently known for the specific groups forming for next year are given on the last pages of this document (details will be updated in Fall 2023 prior to your application for group comps).

In spite of being the more popular option, joining a comps group is not for everyone. Group comps is an intense team learning experience – so it is a good fit if you like learning with your peers. You must commit to participating at *every* meeting *and* to working on your own and with other group members outside of the regular meetings. Comps must take a high priority among your various activities. Group Comps is not a good option if you have other inflexible commitments on your time or if you prefer working and learning on your own. Under these circumstances, it would be better to opt for an Individual Paper.

Comps groups meet during 5a Mon/Wed/Fri in Winter term, with additional meetings (to be determined by the group) during spring term in preparation for the group public talk and discussion meetings (4-5 hours total) with your Comps Chemist. Students in a group will decide on the direction of the readings, the discussion topics, and the nature of the written and oral assignments during the term. The faculty advisor is meant to be a facilitator who, if things succeed, will remain in the background and will be a discussion peer. Each member is required to participate actively.

Active participation includes keeping up with reading assignments selected by the group, preparing presentations or handouts on various topics for the group, actively engaging in discussion (as leader and/or participant) and decision-making at *each* meeting, as well as other assignments (e.g. discussion summaries, pre-meeting docs, short papers, preparing the public seminar, and supplemental library work).

Applying for Group Comps

Participation in group comps starts with a formal proposal to participate submitted via the [Google form](#). Your proposal should be a carefully prepared statement concerning your motivation for doing group comps that convinces the faculty of your commitment to be an active group member. Provide any evidence you can offer indicating that you possess the ability and determination to be a *fully active participant of the team* throughout the process. Also, your past record as a chemistry major and “citizen” of the Chemistry Department will be considered in the selection process.

Participation in a group is not assured; the Department reserves the right NOT to select a student for Group Comps if we are not convinced that the student will contribute to the process in an active and positive manner with regular collaboration with peers. Be aware that selection to Group Comps is made by the entire Chemistry Department and is decided before particular group assignments are made. *In your proposal, no discussion of the specific science of any of the group topics should be included.* This is a statement of your intent, desire, and ability to participate in a student-motivated, student-driven, group-learning collaborative endeavor. This need not be a lengthy statement and should be kept to no more than one page of text.

As part of your proposal submission, you will be asked to rank your group preferences. Feel free to provide additional information about *how strongly you feel about your preferences or if you would be equally happy to join either of two or more groups*. We will strive to place you in either your first or second choice group, but keep in mind that the group sizes need to be reasonably balanced. Once you are assigned to a group, it will not be possible to switch groups.

Departmental Policy on Earning Distinction in Comps

As a preamble to comments about the Department’s policy on distinction, please keep in mind that distinction in comps does not really matter much when it comes to your future plans. Whether your plans include joining the work force, graduate school, medical school, or a service or volunteer job, distinction in comps will have little impact. What matters most is your overall record at Carleton and your recommendation letters. In fact, many decisions about your future may be made before anyone knows who got distinction. Nonetheless, you may decide to make it a personal goal to strive for distinction, and we support this goal.

Distinction in Comps is a difficult issue for chemistry majors and faculty, particularly with our Department’s group comps option. This issue is less sticky if you do an individual paper involving library work or research. Since an individual paper is an individual effort, a comps advisor who sees a quality paper and oral presentation can more easily recognize and recommend distinction. In the group format, however, these decisions may not be as clear-cut. Of course, distinction in group comps, like distinction on an individual paper, requires an unusual and deep understanding of the material and the demonstrated ability to communicate your knowledge and understanding to others. The group experience particularly focuses on communication. Some attributes which make a group work well include cooperation, collaboration, teaching, listening, planning together, and celebrating achievements of understanding or, in other words, being a good colleague. Some of these characteristics, in some circumstances, may be odds with the attributes that could lead to

individual accomplishment. In addition, faculty advisors do not always have a complete understanding of how the group truly operates, especially as the group becomes more independent and does a lot of work outside of the scheduled meeting times. In this case, a student who is perhaps less verbal during discussions with the faculty member but is actually the “backbone” of the group outside the formal discussions may be overlooked by the advisor when deciding whom to recommend for distinction. These complications in awarding distinction to members of a discussion group tend to lead to fewer distinctions compared to individual options.

To achieve distinction in comps, whether it be for work done in a discussion group or an individual project, keep in mind the following the sage advice of an esteemed retired faculty member: *A lot of hard work does not distinction make.* In other words, creativity, synthesis, unusual understanding, presentation of new proposals, and integration of disciplines are some of the hallmarks of an outstanding comps effort. Students who get distinction are often not trying for distinction; instead, they are just interested in learning due to their own intellectual satisfaction. A faculty member can recognize when these qualities are coming together to create an outstanding comps product. If a comps advisor sees these qualities in your project, they will recommend you to the department for distinction in comps. A discussion of all the candidates for distinction will follow in a department meeting until a consensus is reached.

If you have decided to set the personal goal of achieving distinction on your comps, please talk to us and especially to your comps advisor to get a better feeling as to how we think about distinction. We are certainly happy to discuss this topic with you now so that there will be no misunderstandings at the end of the comps process next spring.

Topics & Key Dates for Group Comps: 2023-24

Registration section details below. Dates for the comps chemist visit/talk and group comps talk are final unless noted.

400.02. Organometallic Chemistry & Sustainable Catalysis - led by Matt Whited & Gretchen Hofmeister

Visiting Scientist: Karen Goldberg (Chemistry, University of Pennsylvania)

Research Website: <https://web.sas.upenn.edu/goldberggroup/>

Dates of visit: May 9-10, 2024

Group Comps Talk: Fri April 26, 3:30 pm

Visitor Talk: Fri May 10, 3:30 pm

The Goldberg group seeks to develop new catalytic systems to produce chemicals and fuels from a range of available feedstocks via environmentally responsible and economically viable processes. Current projects involve selective C-H oxidations, use of molecular oxygen as a green oxidant, and conversion of carbon dioxide to liquid fuels.

400.03 Biophysical Chemistry of RNA & Proteins – led by Joe Chihade

Visiting Scientist: Dan Herschlag (Biochemistry, Stanford University)

Research Website: <http://herschlaglab.stanford.edu/>

Dates of Visit: Thurs-Fri May 2-3, 2024

Group Comps Talk: April 22 or 24 (Mon or Wed) at 3:30 pm (TBA)

Visitor Talk: Fri May 3, 3:30 pm

The Herschlag group uses an interdisciplinary approach to advance our understanding of the fundamental behavior of RNA and proteins. He is well known for his application of rigorous kinetic and mechanistic approaches to RNA and protein systems. His lab focuses on focus on: how enzymes work, how RNA folds, how proteins recognize RNA, RNA/protein interactions in regulation and control and, the evolution of molecules and molecular interactions. Tools used include structural biology, thermodynamic analyses, and enzyme kinetics.

400.04 New Synthetic Methods Guided by Physical Organic Chemistry Insight - led by Dani Kohen & Kaz Skubi

Visiting Scientist: Igor Alabugin (Chemistry & Biochemistry, Florida State University)

Research Website: <https://www.chem.fsu.edu/~alabugin/>

Dates of Visit: Thurs-Fri April 18-19, 2024 (tentative)

Group Comps Talk: Fri April 5, 3:30 pm (tentative)

Visitor Talk: Fri April 19, 3:30 pm (tentative)

The Alabugin group focuses on discovering new connections between structure and reactivity. They combine experiments and computations in order to develop new reactions and to design challenging molecules with unusual properties. In their current research, they use hidden features of alkyne functionality for making carbon-rich materials, test the conceptually new “three-electron” way of making C–N bonds via mild C–H activation, develop new approaches to carbo- and heterocycles via aborted pericyclic reactions, expand the limits of electron upconversion, and apply stereoelectronic control to various fields of chemistry.