

Organic Division Cumulative Exam Policy

Spring 2009

The goal of the Organic Chemistry Faculty is to help you become professional chemists, with all the privileges and responsibilities that that entails. As early stage chemistry graduate students, many of your learning experiences thus far have been passive — i.e., your organic chemistry knowledge has been assimilated from lectures and readings on subjects that have been selected for you because of their importance to the field. Your knowledge was then tested by examination within the boundaries of those classes.

As someone who now aspires to become a professional chemist, *your learning must now be active, cumulative (hence the name of the examinations), and lifelong*. There are many reasons for this, but the most basic one is that it is expected that a professional chemist is knowledgeable about the latest advances in his/her field. It is also the starting point for other skills that you will eventually need to develop to become a successful Ph.D. candidate such as:

- Learning how to frame questions that will lead to important scientific discoveries;
- Taking ownership of your research project by
 - Designing experiments to produce data that enable you to develop clear interpretations and conclusions;
 - Anticipate difficulties that will be encountered in your research plan and develop strategies to work around them; and
 - Having the courage, determination and resourcefulness to solve the inevitable unanticipated problems that do arise.
- Developing effective presentation skills to convince a critical audience of the veracity of your scientific findings & conclusions;
- Participating in presentations made by other scientists through active listening, critical analysis and thoughtful questioning; and
- Writing and defending an original body of scientific work in the form of a Ph.D. thesis.

The cumulative exams are intended to serve as a mechanism to encourage and assess your progress toward the development of active & cumulative learning skills that are key to the process of becoming a creative, productive, critically thinking and independent scientist. The Organic Faculty have determined that these skills are most readily honed by thoughtful and regular reading of primary sources that publish articles on organic chemistry-related topics.

ORGANIC CUMULATIVE EXAMINATION TOPICS

Organic cumulative examinations typically select one or more of the following question styles to probe your accumulated knowledge of organic chemistry and evaluate your capacity for creative problem solving:

- Predict the products of important organic, organometallic, photochemical and biochemical transformations;
- Apply structural, electronic and relative energetics principles to propose plausible reaction mechanisms;
- Interpret experimental data (e.g., spectral analysis problems, interpretation of kinetic data, qualitative analysis problems, deduction of reaction mechanism based on tables of reaction outcomes, etc);
- Solve problems utilizing principles of self-assembly and templated synthesis;
- Solve “road map” problems using deductive reasoning;
- Encyclopedic knowledge of bedrock chemical quantities such as bond lengths, bond angles, bond dissociation energies, chemical shift ranges, etc.;
- Queries related to recent departmental seminar presentations.

To promote the goal of active and cumulative learning, *Organic Cumulative Examinations will be predominantly based on material concerning contemporary research topics and practices. In many cases, questions will be derived from primary organic chemistry-relevant research articles that have appeared within one year of the cume exam date.* You are not expected to memorize the details of all the articles published during that period to prepare for a cume exam. Rather, *the task for you is to apply your accumulated knowledge of organic reaction principles and analysis to the articles you read each week and to self-teach* in areas where your knowledge is deficient.* Continuous cultivation of these good learning habits will deepen your understanding of chemistry, aid in your understanding of seminars (where you often encounter new material that you must analyze in real time using your understanding of organic chemistry principles), and help you develop thoughtful responses to cume exam questions based on this accumulated and growing knowledge base.

To help students with their preparations for these exams, the cume examiner may elect to announce (two weeks before the exam) one or more of the following:

- specific topics;
- selected journals; or
- recent seminar subjects.

* Self-teach means proactive learning behavior such as reading a book on the topic, studying your class notes, searching the literature, or consulting a more knowledgeable person (e.g., faculty member, postdoctoral fellow or student colleague) to build your knowledge of the subject.