

Strategies for Earning an A (or B...) in Organic Chemistry

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“Miriam, a freshman calculus student at Louisiana State University (LSU), made 37.5% on her first exam but 83% and 93% on the next two exams. Robert, a first-year general chemistry student at LSU, made 42% on his first exam and followed that up with three 100% in a row. Matt, a first-year general chemistry student at the University of Utah, scored 65% and 55% on his first two exams and 95% on his third exam. I could go on. I could tell you scores of stories like this from the last 15 years of my teaching career. Something happened to all of the students between their last failing grade and their first good grade. They learned something new. **No Miracles, Just Strategies**”

Saundra McGuire, author of *Teach Students How to Learn*

And one more story to share: Laurie, a first-year graduate student at UCLA, scored 12% on her first Organic Synthesis midterm...but then she succeeded in the course, earned her Ph.D. in Organic Chemistry, developed a rewarding teaching career, and even wrote a textbook on Organic Synthesis! So if you are not yet having success in Organic Chemistry, the good news – the GREAT news – is that you can still improve by learning how to learn. Let’s explore various strategies that can help you learn Organic Chemistry and reach your desired goal. **Formative Assessment** is the feedback you get while learning and studying. It comes from *writing down* an answer and checking to see if it is right. **Summative Assessment** is what you do at the end of a unit – taking a quiz or exam for a grade. Formative assessment provides *evidence of your learning*...it helps you steer in the right direction and positions you to do well on summative assessments.

1. **Attend Lecture** - Come to class, take good notes and be engaged (ask questions, answer clicker questions, try problems presented in class...don’t just wait for answer to be given).
2. **Read the Book** - As soon as possible after lecture, READ the relevant sections in the textbook and closely look through any examples that are provided. Examples will include the various types of problems you will encounter on exams...name/draw a given compound, predict the major product, compare two compounds (e.g., Higher bp? Stronger acid? Better leaving group? etc.), provide a mechanism, explain something (e.g., regiochemistry, stereochemistry, faster/slower reaction), etc.
3. **Work on In-Chapter Problems** - After reading a given section and making sense of the provided examples (sometimes there are also Solved Problems to explore), try to *immediately apply* your newly learned skills to the problem(s) in that section. Have blank notebook paper available, copy the problem down onto the page and *write down your solution to the problem*. Committing to an answer is the only way to practice and *provide evidence of your learning*. At first, you may need to refer to the book and/or lecture notes for help as you work on the problem. Check your answer in the Solutions Manual (or at the back of the book), and make any needed corrections.
 - a. If your answer was perfect, then work on the remaining problems and when you’re done, take a break before moving on to the next section covered in lecture.
 - b. If you made mistakes, do you understand what you did wrong? If so, then move on to the next problem. If there are no more problems to work on, redo the first problem until you get the answer perfect, *without referring to your notes or the book*.
 - c. If you don’t understand the Solutions Manual answer, or you don’t even know how to get started on the problem, then go back to your class lecture notes. Read through your notes and try to work on the example(s) we did in class (i.e., copy it down on a blank page and attempt the problem on your own). Next, re-read or skim through the textbook again and work on the example(s) provided in that section. The goal here is to take “baby steps” – work on problems that you have guided solutions available, before moving on to new problems that you have to

work on independently. Discussing the material with students in your study group can be a tremendous help! After gaining confidence by working with the provided examples, you should be ready to attempt the in-chapter problems for that section.

- d. If you've done everything above and you still don't know what's going on or you consistently get the answers wrong, it's time to seek help! There may be problems with your background knowledge or some underlying misconceptions that are creating a barrier to learning this new material. Talk it over with students in your study group. Flag it with a Post-It note and see your instructor in office hours (or snap a picture and send an email with a quick question). Do NOT start searching YouTube for answers! You will be wasting time and sorting through a lot of junk. There is also a lot of Organic Chemistry material out there that we are NOT covering, so it is always best to stick to the resources provided by (or approved by) your instructor.
 - e. When am I "done" with a particular section of the book? You are ready for more advanced and integrated problems when you are able to do every problem in the section efficiently (within a few minutes), independently (without referring to notes, book solutions manual or a study partner), and correctly (perfectly or with minimal mistakes).
4. **Work on End-of-Chapter Problems** - Once you have finished all of the covered sections in the chapter, you should be ready to work on EVERY suggested problem at the end of the chapter. These offer excellent preparation for an exam for several reasons:
- a. Many more opportunities to practice new skills! Remember, "Practice makes permanent!" so be sure to reinforce good habits. After checking your answers to each problem, you are gaining critical formative assessment and gaining efficiency in your problem-solving.
 - b. Problems are randomized, similar to an exam experience. The in-chapter problems are easier because your attention is already focused on one specific topic/skill. At the end of the chapter, you need to make exam-like decisions (e.g., What is being asked for? How do I approach this problem? What information do I need to solve this problem?).
 - c. Problems are likely to be more diverse and more advanced, and different concepts may be integrated into a single problem. Again, this is moving away from the "training wheels" you had on for the in-chapter problems to being able to navigate rockier terrain – the types of problems you may encounter on an exam. By challenging yourself, you deepen your knowledge and sharpen your skills.
5. **Work on Supplemental Materials** - The instructor may provide additional problems sets, homework assignments, online homework, practice problems, etc. After getting back a graded homework, quiz, or exam, print out a blank copy and work on it again – can you correct the mistakes you made? Can you get it right when you try it again? Make flashcards to organize and test yourself on the reactions and reagents covered in this class. Use any and all resources to get as much practice as possible!
6. **Work on Organic Chemistry Every Day** - We are covering a lot of material and there many new skills to learn. Reading the book and working on textbook problems takes many hours a week outside of class (9-10 hours every week gives you the best chance at success), and this is best done in small chunks rather than marathon session.
7. **Repeat!** Keep returning to previous sections to review and try a few problems here and there. This is the best way to keep up on the material, keep it fresh in your mind and prepare for a multi-chapter exam and a cumulative final exam. Try writing down several problems from various sections and/or chapters and time yourself as you try to solve them. This is a great way to simulate an exam situation.