

RECOMMENDED STUDY HABITS

(Chem. 345, Gellman, Spring 2017)

1. Study regularly and often (every day, if possible). This course covers a large amount of material, and many of the concepts are difficult to master. Students are most likely to succeed if they are methodical in their study habits.

2. Recopy your class notes within 24 hours of the lecture. Many important points slip by during lecture before you can record them, but these points remain in your short-term memory. Recopying gives you the opportunity to set down the full story, and cements your grasp of concepts presented in the lecture. (This technique is not at all obvious; I learned of it from a professor when I was an undergraduate, and it changed my life.)

3. Read each recommended chapter completely (unless sections are omitted). There is not time for all important material to be covered in lecture, and some key points will be left for the text to explain.

4. **Doing problems in the book and on sample exams is the most important element of studying organic chemistry. Problems must be approached in the proper way for students to derive full benefit.** Write out the answers to all recommended problems **before** you look at the printed solutions. It is easy to look at a problem, think for a moment, look at the printed solution, and then tell yourself, "oh yes, I knew that." This is the path to disaster. Doing your best to solve the recommended problems, and then carefully checking your work against the answer key, is crucial for success.

Reviewing lecture notes and the text will make the material familiar, but such familiarity does not guarantee the intellectual mastery that is required to solve new problems (e.g., on exams). The only way to acquire such mastery (i.e., the only way to learn organic chemistry) is by working problems. The only way to know whether you can truly solve the recommended problems is by carefully checking your written answers against the solutions manual (and, as necessary, by identifying the sources of your errors). This process takes time; there is no shortcut to the understanding that is our goal. A student who cannot do the recommended problems in the textbook is likely to have difficulties on exams.

5. Organic Chemistry is a difficult subject because there is a great deal of information that must be committed to memory, and there are broad concepts and principles to be mastered. For the material that must be committed to memory, passive studying (i.e., multiple re-readings of text and lecture notes) has only limited effectiveness. Active studying is preferable; active study techniques for two important types of knowledge are explained below. (Students are encouraged to devise their own active study strategies for other types of knowledge important in this course.)

(i) New reactions. General form of information:



Study approach: two sets of flash cards.

(a) "Question side" has starting material(s) and reagent(s), "answer side" has product(s).

(b) "Question side" has starting material(s) and product(s), "answer side" has reagents(s).

Ideally you already have a set of reaction flash cards for material covered in Chemistry 343. If not, making those flash cards as Chemistry 345 begins is a good way to review prior material. Mastering the reactions in this way is crucial for solving "synthesis" problems, which require students to devise a series of reactions that convert a simple starting material into a more complex product.

(ii) Reaction mechanisms. Study approach: maintain a list of the important mechanisms discussed during lecture, and periodically practice drawing out a complete version of each important mechanism *without looking at your notes*. "Drawing out a mechanism" means proceeding from starting material to product, drawing each intermediate, and showing the flow of electrons (with curved arrows) that occurs in each elementary step of the mechanism. Many mechanisms are also discussed in terms of energy diagrams (energy on vertical scale, reaction coordinate on horizontal scale), in which starting material, product and intermediates are concave up points (minima on the curve), and transition states are concave down points (maxima on the curve). Energy diagrams and "curved arrow" mechanisms are complementary methods of representing a reaction.

6. Make sure that your command of the material from Chemistry 343 is strong; review that material if necessary. Students will need to make regular use of concepts and specific information from Chemistry 343. "Concepts" include stereochemistry, mechanism, bonding and resonance. "Specific information" includes the conditions for particular organic reactions (e.g., to convert an alkene to an alkane, or an alcohol to an ether) and conformational analysis.

7. General Perspective. Each student should be mindful of two main goals in this course: (1) to develop a solid understanding of the foundations of organic chemistry, and (2) to learn how to master a challenging intellectual discipline that requires both understanding of a complex conceptual framework and memorization of specific facts. Intrinsic interest in organic chemistry varies widely among the students, but every student should be attracted to the second goal. If you can master organic chemistry, then you will have developed learning strategies that will serve you well in many other areas. Use this course to hone your learning skills; the strategies that work best for you may differ from those that are most successful for other students.

(Recommended: Review this sheet every two weeks.)