

Winter 1986 Chem 21 UCLA  
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### HOW TO LEARN

This review is designed to refresh the science student in skills a student is supposed to have. The emphasis is on learn, not study.

The main theme is self-discipline. How easy it is to commit one's self totally to skiing, to a date, or to any other form of fun while engaging in that activity! An athlete has total devotion to his/her sport while participating in that sport. What would be the result if a student isolated that portion of life that is spent being a student and threw him or herself 100% into that activity? Consider finding learning techniques that yield the maximum amount of learning in the minimum amount of time, learning at absolutely peak efficiency. The rewards for such an approach are improved learning, better grades, and more time for fun and games.

Throughout this discussion another idea that is repeated again and again is: LEARN IT NOW! Take ten extra minutes to learn it now, instead of thirty minutes it will take to learn it later. Next, let's talk about how to learn it now.

### THE STUDY AREA

The first topic to consider is the learning environment, where you study, where you practice the craft of learning. This can be examined in the form of a graph of learning minutes versus minutes of what a student calls "study." Ideally it has a slope of 1: one minute of learning for every one minute of study. It is not possible to reach this ideal over a study period of more than an hour or so. Fatigue sets in. So you must minimize fatigue by including study breaks, by rotating study subjects or by splitting up study time into shorter sessions, all routine items that can be found in any "how to study" book.

Next our attention must go to those things that would flatten the learning curve over which you can exercise some control. First is radio. When you stop to analyze the minutes per hour a student's attention may be distracted from learning by response to music, DJ chatter, commercials and perhaps news, radio is clearly a most criminal time bandit and the most easily corrected. There is also a price paid in minutes

of study-without-learning because of telephone interruptions, refreshments, socializing, cigarettes, pictures, daydreaming, planning, and, second only to the radio, distracting noise. "uninteresting" radio music, with headphones, is a way to counter noise distraction.

Uncontrolled, such obstacles to study introduce enough flat spots in the curve to yield a slope of less than 0.5; less than 50% of the minutes spent studying are spent learning.

### HOW TO LEARN FROM A LECTURE

Next are learning techniques. "How to Learn from a Lecture" includes the art of taking good lecture notes. Your notebook should be divided, with half a page, or facing pages, left to revise, condense and summarize the notes taken in class, or to express them more precisely. Identifying main ideas is essential. Examples and demonstrations are important only in the concepts they illustrate, and it is the concepts that should be recorded in the notebooks. Particular attention should be paid to graphs, which say so much in so few words.

Probably what is done before and after the lecture is as important as what is done during the lecture, and maybe more so. There is considerable evidence that ten minutes spent looking at the textbook coverage of the lecture topic before the lecture prepares you to learn during the lecture. Otherwise the lecture prepares you to reach a comparable level of learning in about thirty minutes of study after the lecture. That thirty minutes presume the lecture notes will be reviewed immediately after it is over. Any delay beyond the same evening easily doubles or triples that half hour. In fact, immediate review of a lecture is the best time bargain a student will find anywhere. According to a source quoted by O'Conner there is a 46% loss of lecture material if it is not reviewed until 24 hours later, whereas the student who reviews immediately has about 98% retention. Furthermore, after three weeks the 24 hour later reviewer drops to about 40% retention, while the immediate reviewer is still at the 90% level.

### HOW TO LEARN FROM A TEXTBOOK

Next in the area of technique is "How to Learn from a textbook." At the beginning of the term you should get acquainted with text. What learning aids are present? If there is a "To the

Student" section at the beginning, read it. Are chapters summarized? Are new terms grouped at any place? Is there a glossary? Do the appendices contain useful information? How are the ends of chapters organized? Find out what the book has to offer and use what is there to greatest advantage.

A quick preview of a textbook assignment is said to shorten the time required for a given amount of learning from the assignment. Zero in on section titles, boldface and italicized words, illustrations, summaries. This prepares you to learn while reading, rather than later, much as previewing a lecture prepares you to learn during a lecture. Then, while studying, take notes. This means pencil-and-paper notes, not highlighting the text. Grotz has written about the inadequacy of highlighting, which surely is true. By taking notes, by condensing material into fewer words, the student must think through the material to the point of some understanding in order to compose those words. The student learns NOW. By highlighting, the student simply makes a date with the book to learn later. Later is usually right before a test, and by then there are so many dates it is impossible to keep them all. Learn it NOW. Never again will it be easier than it is NOW, and never again will it take less time.

#### HOW TO LEARN PROBLEM SOLVING

Be sure to understand the principles and relationships behind a problem, definitions that may be involved, and any mathematical operations required. Develop the ability to read a problem critically, to identify what is given or implied, and what is wanted. Select a method, algebraic, dimensional analysis, or whatever, and then solve the problem. If working a problem from the back of a chapter, don't use a two finger approach--one finger at the problem and another finger at an example that is like the problem, and then flip from one to another to get the answer. If stuck, go to the example and learn from it without looking at the end-of-chapter problem. Then go to the problem and solve it without looking at an example.

With both textbook study and problem solving, the objective is to learn. Homework is not finished when the assignment has been

read or the correct answer calculated. It is finished only when the reading material is understood and when similar and even different problems can be solved without reference to notes or books. The assignment is finished only when learning has been accomplished--NOW, not planned for some future time.

#### HOW TO LEARN FROM THE LABORATORY.

The student who learns NOW is the student who is prepared to learn. In the laboratory, "prepared" means having read the experiment before the period begins, knowing what is to be done, and having prepared a laboratory notebook for data entries, if such are required. Advance Study Assignments, if any, should be completed before the class. A student fully prepared for an experiment can often complete the entire experiment, including the writeup, during the laboratory period. That student will learn what the experiment is to teach DURING the laboratory period. If the write up cannot be completed during the period, it should be finished as soon thereafter as possible, surely by that evening. It takes less time then, and more is learned, than at any later time. If the report is not written until six nights later, just before it must be turned in, a price will be paid in both time and learning.

#### HOW TO PREPARE FOR AND TAKE A TEST

This is where the payoff comes. The student who has, each day, learned NOW is nearly prepared already. All that student must do is to review the material to be tested. This material is neatly condensed into compact lecture and textbook review notes and solved problems. It is not necessary to reread the textbook, a monstrous and impossible task. Instead, the textbook becomes a reference book to clarify those items that need clarification when studying notes.

Reviewing for a test is broken into parts. In the long range, you must anticipate the test, and make sure study time is available. Conflicting demands must be taken care of in advance. You must be constantly alert to hints in lecture that a topic may appear on the exam. In the intermediate range, about a week before the test, you must begin a daily review of a portion of the test material. If objectives are available, use them, and be sure you can do

what each one says. If they are not available, you might write what you think they might be. A concept list might be prepared, or a practice exam written and taken by the student. Face up to and face down the "little foxes" that would spoil the vine, things like worry, lack of confidence, and anxiety. What O'Conner calls "read and destroy notes," things to be memorized should be written. Physical necessities, pencils, erasers, and a calculator that will last through the test must be assembled. And one other thing: enough sleep is recommended.

In close range, just before the test, you must concentrate on the basics and troublesome areas, and must master them. Review the concept list. Just before the test, read and destroy the read and destroy notes. Get into the test room early, and consciously relax a few moments before the test begins.

Test taking techniques, for the greater part, are the usual suggestions, such as scanning the entire test, setting up a rough schedule, approaching first the questions whose answers are known, or the high point questions, and not lingering on a problem that is proving difficult. Consider the possibility of "freezing," or blocking," and ways to break loose from it.

The more you take practice tests before the actual exam, the more skillful and relaxed you will be for the real thing.

Take these hints and ideas and use them and watch your grades improve.

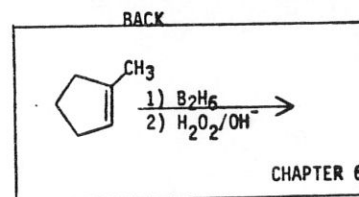
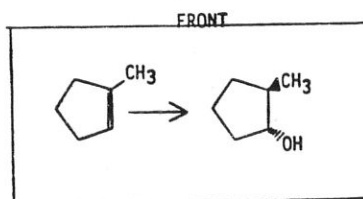
## Helpful Hints for Studying Chemistry 21

1. It is crucial that you primarily understand as well as memorize the course material. You will be expected to synthesize your knowledge on problem sets, quizzes and exams. Molecular models are an invaluable aid to understanding.

2. Working problems is the key to success if you can work the assigned problems, you will be able to work the problems on quizzes and exams. Use the following method for problem solving.

- Work the problem using paper and pencil.
- If stuck, reread pertinent sections of the text or lecture notes.
- Try the problem again - think about it.
- If still stuck, look up the answer. Analyze the solution to find out precisely where you went off track.
- If you are still at all confused, ask for help from your TA or the instructor.
- If you have had to look up an answer, work similar problems until you can do them confidently and successfully solve them on your own.

3. Make up a set of **flashcards** to help you remember reactions and molecular structures and names of compounds. While this is not substitute for understanding the reactions, it will help you in working synthesis problems.



Look at one side of the card and write out what is on the other before turning the card over.

OR

