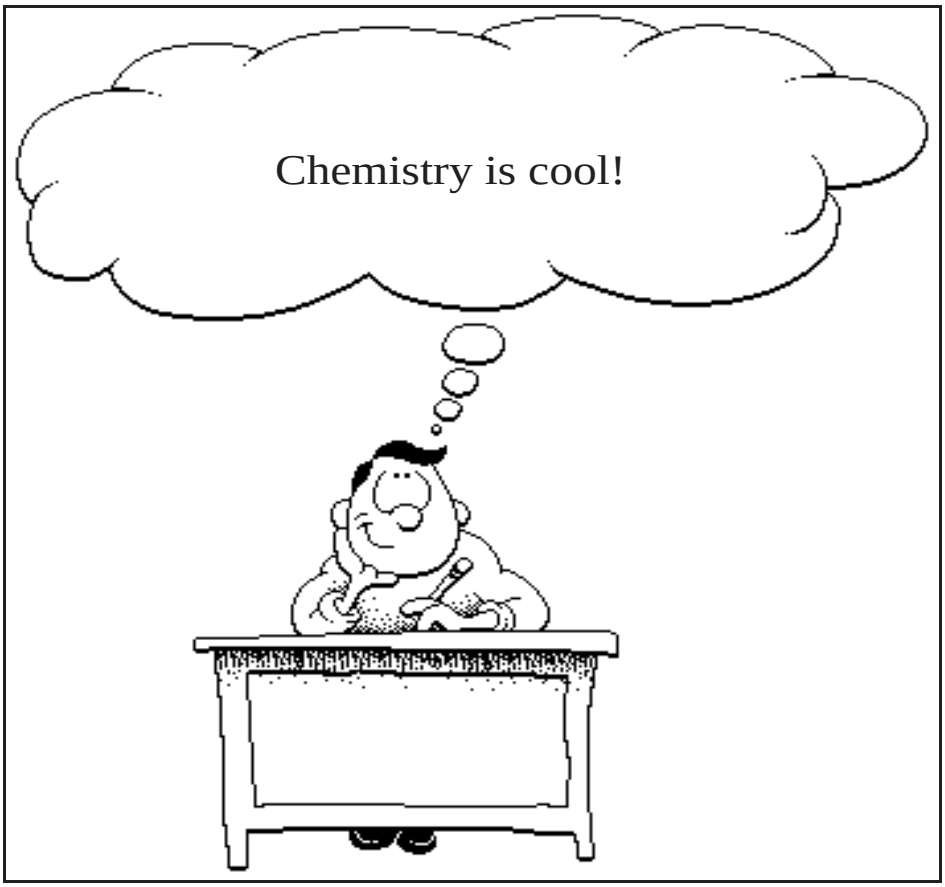
Chemistry
Study Suggestions



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Suggested Study Habits
or
How to Set Yourself Up to Succeed in Chemistry

One of the hardest things about adjusting to college after high school is that most of us did not need to study very much in high school to do well, so we enter college without good study habits. If you find that is the case for you, I have compiled some suggestions for studying to point you in the right direction. Even after you have several semesters of college under your belt, it cannot hurt to think about ways to improve the study habits you have developed.

(1) **Read the related sections in the textbook – before the lecture or soon afterwards.**

Breaking the material up into smaller sections makes it easier to digest than large chunks. Most of us seem to like to wait until the end of a chapter to study it; which means that there are many concepts to think about instead of just a few. By then, you also have likely forgotten much of the material covered in lecture. You will find that it is typical in chemistry for later sections in a chapter to build upon previous concepts learned earlier in the chapter. Thus, in lecture it is assumed that the previous material is understood, and will be built upon without re-explaining the earlier concepts. If you are not caught up, you will start to find that lecture becomes less clear and more frustrating for this reason. Reading the relevant textbook sections before lecture means that you will get more out of lecture.

In addition, if you make a one or two page summary of each chapter as you study that chapter, it will be much easier to review for hour exams and especially the final exam (or MCAT, or GRE…). Plus, by forcing yourself to think about what is new and important and how to condense it all down, you will more likely pay closer attention to the topics to be able to make it into a much more manageable amount of material.

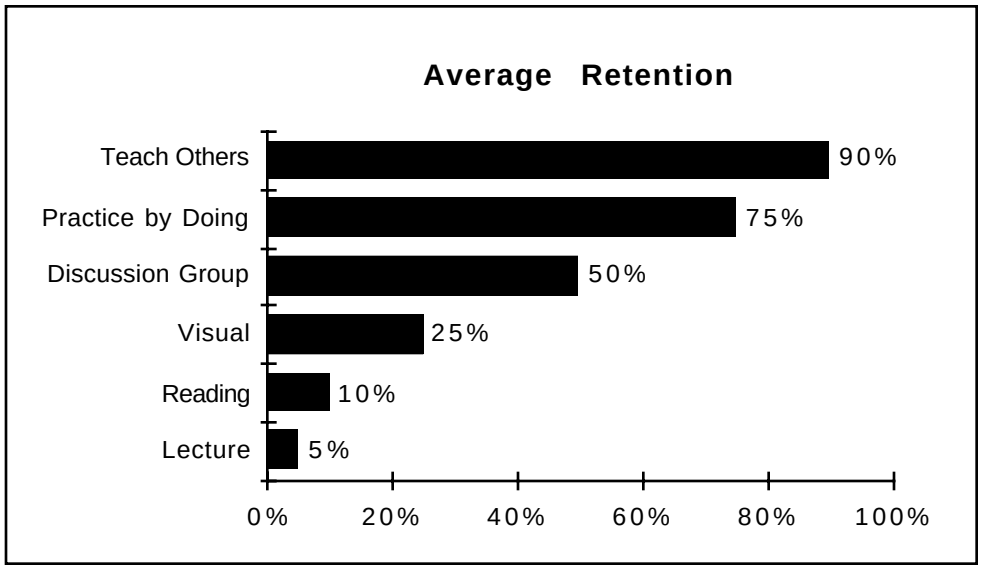
(2) **Attend the lecture.**

The more times you are exposed to the material, the better chance you have of understanding it.

(3) **Practice, practice, practice – by doing the relevant homework problems soon after the lecture on the material**

Notice on the chart on the next page, from educational research, that in order to retain material you have to be more active and less passive in the learning activity. Think of learning to play a musical instrument or participate in a sport. Unfortunately, watching a gifted pianist or professional athlete for hours and hours will not develop your skill to play. This is why there are many homework problems, to give you the practice you need to really learn the material. If you do several problems a day, it doesn't take much time, but if you wait until the day before the exam you will be overwhelmed! Also notice that a discussion group helps retention; the discussion group in this study was a small group (like with a couple of your classmates) talking about and doing the material together, rather than this bigger, less interactive group, but every bit helps!

Mark the problems you had difficulty with for review. This ensures that you have had enough practice to master that kind of problem unassisted and helps to keep you from reviewing what you know more than what you don't (see #9 below).



Use answers wisely. Try not to always work backwards from the answer, or frequently just look over how the answer was arrived at without completing the problem unassisted. It is perfectly okay to do this with the first problem of its kind, but be sure to do more of the same kind of problem without using the answer before the exam since the answer isn't given on the exam.

Mix up homework problems. One strength/weakness of every textbook is that the material is divided into sections. This is nice because there is only a couple of concepts per section so that you have an idea what the problems are asking for to get you more easily started solving them. This is also a weakness, because there is only a couple of concepts to have to choose from to do the problems. This means that if you do not dissociate the problems from the sections, that on exams you may have difficulties knowing what concept to apply because there are many more concepts to choose from. I suggest that you use note cards (such as 3" x 5" ones) to put representative problems on. For instance, if you see an example done in class, an example in the book, and one or more homework problems required on one type of question then there is a good chance one like it may end up on the exam. On the front of the card, put the problem and on the back the problem number so you can refer back to the section if needed. Now, to study for an exam, shuffle the cards and give the problems a try! It will also help if you ask yourself on each homework problem questions like "what is this question asking about?" and "how can I tell I needed to apply this concept or equation?"

Learn to perform a "reality check." When you finish a problem, ask yourself if the answer and units are reasonable. If you train yourself to do this on homework, so that it comes automatically (thus quickly), you will catch some errors on exams. Suppose the question was to convert units from metric to miles per hour for how fast a person's hair grows. If you ended up with several miles per hour (impossible), you likely did something wrong!

(4) **Keep up–the material continually builds on itself. Chemistry cannot easily be 'crammed'**

Do yourself a favor and avoid cramming. It is too stressful and not a very successful strategy and a sure way to make yourself miserable. I know that if chemistry is not your favorite subject

it is tough to study it sometimes. However, if you want to survive you might as well work to be successful instead of setting yourself up to fail (which will only lengthen your time in chemistry if you need it for your program). Think of it as good practice for any job, as there are always some aspects to every job that are no fun and we would rather not do, but have to. You might even find that chemistry really isn't as bad as you think if you work to be successful doing it!

The main time in college that I found myself getting test anxiety was when I was not confident with material for the test; when I tried to stuff it all in at the last minute. If there was some little thing I did not understand in that study session, there was no time to get help or to figure it out; it would send me into a panic and I would do poorly on the exam (but this was preventable). I also notice that few people come into office hours and other help sessions until the few days before the exam; to get more undivided attention, come earlier.

(5) **For the few things that have to be memorized, make flash cards or use mnemonics**

Flash cards are great for memorization because they take up little space, so they can be easily reviewed most anywhere and for even short periods of time (e.g., 5 minutes). Plus, they can be turned over to reverse the question. Use them only for things that have to be memorized (element symbols and names; polyatomic ion names and formulas, etc.). Mnemonics can also work well for memorization. However, these approaches work poorly, if at all, for things that have to be understood and for problem solving; in other words, much of the class.

(6) **Aim for understanding of topics instead of memorization**

Homework problems will often be slightly changed for exams, but always to something you should have learned how to do. There may also be conceptual problems, that to get right you have to understand the material. It is really the understanding of concepts and the learning how to approach problems that are important to being successful in science classes, not having a few kinds of problems memorized. If you memorize a problem and the problem is changed, you are easily lost; plus, one forgets things that are memorized more quickly that things that are understood (e.g., for the final exam). Try to relate new concepts (or come up with analogies) to things you already know to help you understand that concept.

(7) **Make sure each person in a group actively participates**

Again this is the active/passive learning difference (#3 above). The person that participates the least is most likely to earn the lower scores on exams, which is frustrating. Avoid a group that calls socializing studying, it may be more fun then, but it will haunt you come exam time.

(8) **Get help on concepts/problems you do not understand right away**

Getting help does not mean that you are intelligence challenged. Not everyone has the aptitude and experience in every subject to do well without outside help. In addition, not every concept is crystal-clear to everyone immediately. Instead of leaving uncertainties as frustrations; take care of them right away and your confidence with chemistry in general will grow.

Do not waste too much time in fruitless study

Some answers in the book & solutions manual are wrong or there are typos in them. In addition, beating your head against the proverbial brick wall until it is bloody only increases your frustration. Give each problem an honest try, if you get stuck come back later and try again. If

you are still stumped, get help with it. Spending more than a half an hour on one problem is a waste of time; skip it and come ask about it.

(9) **Study the most important material first; focus on what you have not yet mastered**
It is natural to like being successful. In doing so, we often redo the same kinds of problems that we already know how to do (success) and neglect those we don't know how to do (less chance of success) until time has run out. Occasionally monitor your studying to be sure you cover all the types of problems and get help on others that are frustrating you (of course, you know that if you skip a problem, the chance of that problem or one like it appearing on the exam increases substantially). You can do it!

(10) **Expect to spend whatever amount of time it takes to earn the grade you want (8 hrs/wk?).**
If you have a natural aptitude for this subject or have already had extensive experience it will take you less time than others. If not, it will take you a good amount of time each week. Remember to evaluate the amount of time you are spending on each course as the semester progresses to reallocate time to reach the grades you desire. Asking your fellow classmates to see how much time they spend, and then blindly following their lead (like a lemming) does YOU little good (besides some people don't want to admit they study as much as they do as they may think it makes them seem geeky or less smart). You need to put in the time that it takes for YOU to succeed, whatever amount of time that you find it needs to be for you.

Treat the class as a job–schedule study time and stick to that schedule.
The pay in this class is points (not money) in this investment in your future called college. Make out a reasonable schedule including work, classes, studying, and fun time (we all need a good balance between these). If you cannot find at least the eight hours a week or so in your schedule for this class, ask yourself how you will change your schedule so that you can. Just as you do not expect to get paid when you are not at work, you should not expect to make many points if you do not study to earn them.

Remember—motivation comes from within
This is a basic business principle. In other words, what reasonable things we decide to accomplish and work hard for, we can do. What we decide we do not want to accomplish, we will not work hard for and will find excuses to get out of, and will end up failing at. Which do you want? Make it happen! To make chemistry more interesting, if you need to, look for ways in which chemistry impacts your life, or is relevant to you.

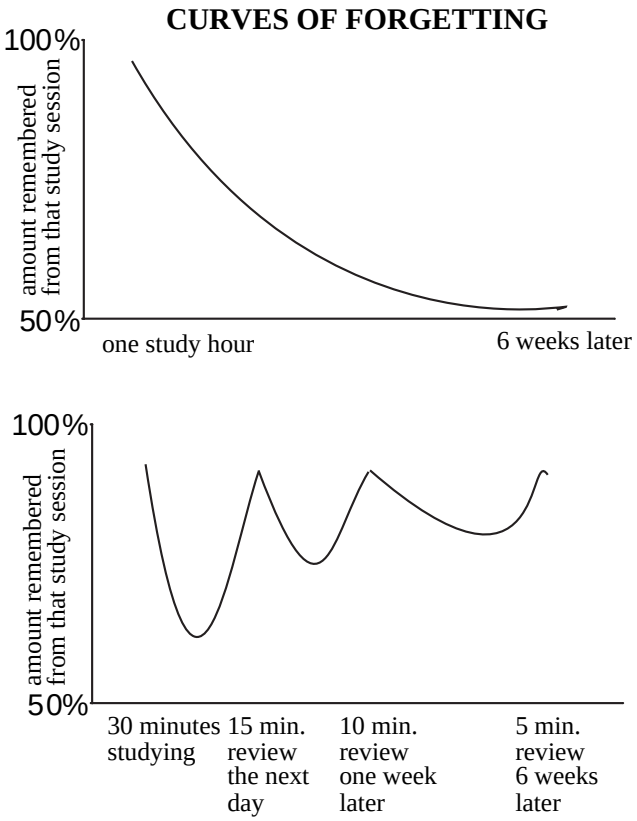
Periodically check your progress and change your schedule as needed.

If you are not earning the grade that you want; ask how to change what you are doing to be more successful. Do you need to use your time more efficiently? Add more study time? Get more help? If you haven't previously been as successful as you would like, look to adopt better habits. To change a habit, you have to have a specific plan to do so and you have to continually work at it–for about three months to make it your new habit. I think about it like getting into good physical condition; it is somewhat unpleasant and takes many weeks if you are out of shape. However, by consistently making the effort over those weeks (and by not giving up!), it gets easier and is more enjoyable and an integral part of your schedule. In order to do this you really have to want to, and have started by making a specific plan. Do not give in to excuses and work at it until it comes more naturally.
"Genius is one percent inspiration and ninety-nine percent perspiration"

Thomas Alva Edison

(11) **Review important material**

Just a little periodic reviewing keeps you from so quickly forgetting what you have worked hard to learn. For example, below I have shown typical amounts of material forgotten over time, so that you can see how useful reviewing is. Summary sheets for each chapter make this much easier (see #1).



(12) **View mistakes as opportunities to learn and improve**

Everyone makes mistakes. It is how one reacts to a mistake that determines the future of the problem. One can choose to be embarrassed, try to hide, and/or blame someone else for that mistake (which is okay to feel as a first reaction to blow off a little steam). However, by sticking to these evasive reactions, one often overreacts and becomes blind the solution, which is simply to fix the mistake, and/or learn from it to avoid a similar mistake in the future. For example, suppose you get an exam back that you didn't perform as well as you would like to on. You can choose to bury that exam in the deepest, darkest corner of your room, for it never to surface again to remind you of the mistakes that were made on it, meanwhile bad mouthing the book, instructor, fellow classmates, etc. (the worst case scenario). Or, you can look over that exam for concepts that you didn't understand, and get help on those concepts to learn them. And, to prevent a repeat performance, you could examine the study habits that didn't work well for that exam and change them, perhaps by doing more homework or attending the discussion group or student help sessions (the best case scenario). One comment: for a silly little exam error on a topic you knew for the exam that was made because of nervousness, ignore it, as everyone makes those kinds of mistakes under pressure (unless you can identify a pattern to check for on future exams). You can bring exam problems to the instructor immediately after the exam for answers (the best time to deal with them, while the concepts are the freshest in your mind).