

# Study Tips for Chemistry Students

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The following is a bit of information that I have found helpful both to myself and to my students. I hope that it helps you.

Getting good grades in Chemistry is really based on having good performances on exams and assignments. Everything that you learned about performing well in athletics or music applies to having a good performance in chemistry. As in music or athletics, you must practice regularly and develop a lifestyle that does not get in the way of your performance. Here are a few examples of how to obtain better performance skills in your courses. Remember that each person learns a little differently. What works for others may not necessarily work for you. You need to find out how to maximize your performance. The tips below should help most students.

## WRITE EVERYTHING OUT.

It would be foolish for a musician to watch someone else play a piece or to glance at a piece of music and say "that doesn't look too hard, I can do that". The concert would be a very bad place to realize that they couldn't play it. You don't really know how hard it is until you try it yourself. In chemistry, you must work it out for yourself in writing. Solve the problem on paper or write out your explanation before you are being tested. What you think you know and what you can successfully write down may not be the same. The test is a terrible place to find this out.

## PRACTICE DAILY.

Wouldn't it seem ridiculous for an athlete to put off practicing until the night before the competition and then stay up all night "cramming" for the event? Not only is there insufficient preparation but the problem is compounded by not getting enough sleep. Several shorter practices spread out over a period of time will do much more good than a marathon session where your progress is impaired by fatigue. When studying, don't be afraid to take a short break and then return to your work.

Don't forget that the quality of your study time is as important as the quantity of your studies. If athletes put on their gear and spend two hours standing around drinking Gatorade, they should not claim to have practiced for two hours. Likewise, a student sitting in the library with the book open but socializing should not kid themselves into thinking that they are studying. Find a place where you can work without being interrupted. Being a full time college student is a full time job with lots of overtime involved. (And that does not even include the extracurricular activities). It takes a lot of effort, but the rewards are enormous.

## DO YOUR BEST WORK.

Have you ever heard the expression "how you practice is how you will play the game"? Just as sloppy play will often lose the game, and sloppy playing will ruin the best piece of music, sloppy work habits will ruin a good academic performance. The only way to avoid a sloppy performance is to practice not being sloppy. When working a problem, neatly and clearly write out your answer. Be sure your drawings and figures are clear and labeled. Write out explanations in clear and complete sentences. Check to make sure you chose the best words and that they say what you really intended them to say. Being close to

the right answer may not get credit just as being close to the basket will not score the points. Indeed, many points have been sacrificed for inexact or unclear answers.

#### THINK ABOUT THE MATERIAL ALL THE TIME.

Loving what you do and being good at it often go hand in hand. People who love what they do think about it all the time and relate it to their everyday lives. Good athletes seem to talk about their sport all the time and always seem to be looking for a way to do it better. Even when you are not formally studying, think about the concepts in the course. While going for a walk, showering, or before you fall asleep, think about the concepts and how you might explain it to someone else. Relate the concept to what you see in life. This can be done formally by thinking about phenomena in your daily life such as the fizzing of a glass of soda and thinking about what gas pressure and solubility properties give rise to it. This can also be done less formally by relating some abstract concept to a silly analogy such as relating the concept of limiting reagent to making sandwiches. Don't forget that underneath the details is a topic that you used to find interesting.

#### LEARN THE MATERIAL IN SMALL CHUNKS.

There may seem to be an overwhelming amount of material and students have a tendency to go over all the material many times. With so much information, very little is really learned even after several repetitions. When learning a complicated piece of music, it is fruitless to struggle all the way through a song day after day. Instead, break the material into little pieces that you can concentrate on until they are mastered. You may feel like you are spending a lot of time to learn a small amount, but if the material is really learned you will know it the next time you see it, and then, more can be added to it. You may also find that once you really know a few concepts well, the rest is easier to learn because it is related to what you already know well. Athletes do not learn every play by running through all of them quickly day after day. The plays are best learned one at a time, step by step, until they become second nature. Don't be afraid to invest the time to learn it right. Take it one day at a time.

#### CONCENTRATE ON YOUR WORK AND LET THE GRADE TAKE CARE OF ITSELF.

The best performances in music or athletics require total concentration. Paying attention to the score of the game or what the audience is thinking takes away from you doing your best job. When studying or taking a test, give it your complete attention. There will be plenty of time later to think about the grade. The students who seem to do the best in class give their full attention to learning the material and, in the end, are often surprised by how good a grade they get.

#### PREPARE FOR CLASS.

Before coming to class, it is important to adequately prepare. You should read the material several times if necessary. It may be helpful to quickly scan the chapter to get an overview and to get a feel for how the material will be presented and then go back and read more carefully. Don't forget to read the assigned questions as well. It is always helpful to see what kind of skills you will be expected to have so you can pay attention to the most important information. The reading may be difficult and you may feel that you don't get much out of it. Remember that a chemistry book is not a novel that can be read briskly but must be read slowly, several times, and digested as you go. One of the most important skills that you will get from your college education is to learn how to teach yourself. That is what you will take with you when you forget most of the course material. By reading technically difficult material and struggling through it, you improve your reading skills and your ability to learn on your own.

#### TAKE AN ACTIVE PART IN CLASS.

Coming to class overly tired can be quite costly, especially if you remember that this is probably the only time you will have to devote yourself completely to academic pursuits. If you are able to convince yourself that this is important to you, being involved will be easier. You should be involved enough that you have an answer for each question posed during a lecture; even if it is a wrong answer it is better than no answer at all. You should be relating the lecture to the material that you read in the book and thinking about whether it is consistent. You could also be asking yourself the questions "does this make sense with what I know from everyday life?" If you are really tuned in to a lecture, you will often anticipate the next step of what is being presented.

#### RE-READ THE MATERIAL.

Now that you have gone to class and have some familiarity with the material, it is important to re-read the chapter. This gives your brain another chance to go over the material and it develops your ability to read technically difficult material. Remember that your reading skills are one of the most important things you will take with you when you leave college. A musician's ability to read music is enhanced by reading through a piece which is known well so that the brain can make connections between the symbols and the ideas behind them. This helps you to think in terms of those symbols. The material must be read again when it will make sense. You are learning the language; you need to practice reading it.

#### WRITE OUT EVERYTHING YOU KNOW.

Reading and working problems are an important part of learning chemistry. It is also important to take a blank piece of paper and write out what you know about the topic as if you had to teach it to someone else. This will force you to sift through the mountain of material and pull out the most important parts. Write out what you think are the most important parts of the material and give examples, draw pictures, make up a problem or think of an analogy to some other topic. This is a great learning exercise as well as a confidence builder. You need to practice facing a blank page so that you are familiar with doing it before you get to the exam.

#### WORK THE PROBLEMS WITHOUT LOOKING BACK AT THE CHAPTER.

Many students have a tendency to read a problem, find the relevant section in the book, take the approach the author used and apply it to their problem, quickly write down an answer and think that they are done. Working problems in this manner gets students good at finding answers in the book and perhaps recalling key words or recognizing correct answers when they see them. The problem is that exams do not usually ask you to find a section in the book or relate a few key words. You need to be able to generate the answers on your own. Again, "how you practice is how you will play the game". Being able to play the chemistry game well, means a student can generate correct answers without assistance. This skill is required on an exam, so you will need to practice it. When you read a problem and you do not immediately know the answer, resist the temptation to look back in the book. Close the book, take a blank piece of paper and write out anything you know about the problem. Try any way you can think of to solve the problem. Many ways may not work, but try something. Some people who are perfectionists have a very difficult time with this. They do not want to write down wrong answers so they don't write down anything at all. By not writing anything down they cannot solve the problem so they get stuck. When you get stuck, start writing. When you first try this you may feel like a rat crawling through a maze and you will make a lot of wrong mental turns and bump into a lot of walls. But after going through this maze several times you will be able to travel it rapidly and get back on track even after making a wrong

turn. This maze that I am referring to is your thought process and it is different for everyone. Only you can figure out how to get through yours. The sooner you do this the better you will perform.

#### STUDY OFFENSIVELY RATHER THAN DEFENSIVELY.

In sports, it is often said that the best defense is a good offense. If you are only concerned about defending yourself on an exam, you will make very little forward progress in your education. Many students look at the material and say "I better go over this in case it is on the test". With this attitude the student has already determined that the only value this material has to them is that it may be on the exam. The chances that the material will truly be learned, much less retained, is small. Instead, try studying offensively. Say "I am going to master this topic because it is important (and maybe even interesting) to me. If I see it on the exam I will know it". See the exam as a challenge and an opportunity to score some points, not as a defensive play in which you may lose the game. It is important to be balanced here because being too confident may also be detrimental; don't celebrate until after you are in the end zone because you may still drop the ball. In short, attack the material and avoid overconfidence.

#### CHECK YOUR ANSWERS.

Many people think that they can sing quite well, until they listen to a recording of themselves. It is only then that they hear what they sound like to others. You can't sing well unless you learn to listen to yourself. The same is true in academics. Many times, students think that they have a good performance on an exam and put down answers that make sense to them at the time. After getting the exam back they realize that their answers didn't make sense. Each student needs to learn to be critical of their own work. Again, this takes practice. When working the problems, before you check your answers with the book, take a minute and ask yourself "does this make sense?" "Is this as complete as I could make it?" Double check your answers and make sure they are perfect. It is important for you to be more critical of your own work than the grader will be. Also go back and make sure that you answer the question which was asked. Get in the habit of correcting arithmetic, punctuation, spelling, grammar, and clarity since these elements are essential for good communication (i.e. full credit).

#### RELAX ON THE TEST.

The superstar athletes are the ones who perform the best under pressure. Those who become anxious, go down in flames. Anxiety destroys your concentration and detracts from you showing what you can really do. And when you think about it, what good does worrying do anyway? Remember that in a few million years the sun will blow up and the Earth will be destroyed and then it won't really matter how you did on one little exam. Seriously though, instead of worrying, take the attitude that you have worked your hardest to prepare and that you will just concentrate on doing your best and that you will accept what you get on the exam. Just do your best and stop worrying that you are not good enough. You wouldn't be here if you weren't.

#### LEARN FROM YOUR MISTAKES.

Many students have a tendency to get back an exam, look at their score, get upset and use that energy to make them more nervous on the next exam. This is missing a very important opportunity to do some serious learning. When you get an exam back and after you have gotten over the shock of the grade, it is time to look at your mistakes and ask yourself what went wrong. Were you concentrating? Were you nervous? Were you clueless about the material? Did you know the answer but have trouble writing what you thought you knew? Did you think that all your answers were correct until you got the exam back? Would you give the same answers if you took the exam again? Most of these situations can be remedied with the advice above. A bad exam score is trying to tell you something, stop and listen to what it is. If

you can truly say that you did your best, then you need to change the way you study. This is a golden opportunity to improve your performance next time.

#### GET HELP WHEN YOU NEED IT.

The responsibility for learning the material is yours and no one else's. Talk to the instructor, or find a tutor. If you are having trouble understanding the material from the reading, find another source such as a different textbook that may present the material in a different style. Find a student who has had the course in the past. There is a tremendous amount of assistance out there, but it won't help you unless you ask for it. This is your education, you should care enough to take the initiative.

#### DECIDE IF YOU ARE WILLING TO "PAY THE PRICE".

Getting a superior grade is like winning an athletic or musical competition, it takes some talent and a lot of hard work. Very often, this comes at a price and those who do the best are typically the ones who consistently work the hardest. Each student needs to determine the importance of their academic performance and make the necessary adjustments in their life. I point this out so that you at least become aware of the importance of your studies in your life. If you are honest with yourself about the importance of your academic career and make the necessary lifestyle adjustments, your life will be much less stressful. Think about your long term goals and decide what value your academic performance, extracurricular activities, and social life will have in the long run. Make the necessary adjustments in your schedule. Balance does not necessarily mean equal time for all. Remember, there is no room on your transcript for excuses.

#### REMEMBER THAT YOU ARE HERE FOR MORE THAN A GRADE.

One of the most important things that you can learn in college is to learn how to teach yourself. Most of the material from the course will eventually be forgotten unless it is regularly reviewed. What you will take with you will be your education; the ability to independently gather and analyze information, make informed decisions and communicate them clearly. The course material is the medium by which we exercise these abilities. The course material is important and interesting on its own, but it is also a vital part of a liberal education. Learning the material is important but not as important as the process of learning how to learn.

Finally, don't forget that you are training for the real world. It is important to practice things which are valued in the real world, such as showing up on time, doing consistent work, getting along with others, taking initiative, working independently, being motivated, mature, and responsible. These skills are so important to future employers, as well as graduate and medical schools, that they are the main concern in letters of recommendation. You are being evaluated on far more qualities than just your academic grades. You are taking far more than a diploma, a transcript, and a sizable debt with you when you leave.