Chemistry Survival Guide

How to Study and Ace Any Chemistry Course

Wayne Huang, PhD

2005 Edition

Chemistry Survival Publishing

Disclaimer

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Dedication

My students are my teachers. I have learned and been inspired so much from them. For that, I dedicate this Guide to them.

FOREWORD – THE WINNING EDGE IN CHEMISTRY

Chemistry is the central science; its mastery enables an easy path to physics, biology, geology and other related subjects. To understand chemistry is to understand its principles and then apply them to unfamiliar context. It does not require extensive memorization like biology yet it can't derive everything from a few fundamental laws like physics. Chemistry really lies in between owing to its multi-disciplinary nature.

In chemistry, you are required to memorize a bit, and understand a few basic principles. Many find it is particularly hard because of the hybrid nature of learning. Learning chemistry is about mastering problem solving skills by understanding the concepts and becoming familiar with the rules. Chemistry is a "why" science; its concepts and principles explain many of the "why" questions in daily life.

Don't be intimidated. In reality, you don't need to spend more time studying chemistry than other subject if you use a smart study system to understand all the important concepts, principles and reactions. The key to effective learning in chemistry is to memorize the least and apply this knowledge to the fullest.

Many of you apply the same study methods from non-science subjects to science classes, and have difficulty in these classes. Even within the science disciplines, you might get yourself in trouble by studying the same way in chemistry as in biology. At one end of science, biology and geology are information intensive subjects. You can read through the text and memorize the content, and you will do fine. At the other end, physics and calculus are fundamental sciences. If you master a few basic concepts and principles, and learn to derive from these fundamentals, you will survive.

If you are looking for an effective, high-yield way to study chemistry, this Guide is for you. Forget about plowing through many weighty textbooks and overwhelming yourself with unnecessary information. Our goal here is to spend minimum effort to achieve maximum results. Bring your chemistry learning into focus – you'll learn what you need to learn.

As most of you have experienced, at first chemistry seems difficult, yet it is very learnable if you know how. The very issue of how to study chemistry is the focus of this Guide. The survival skills you learn will accelerate your mastery of chemistry and improve your grade quickly. Ignoring them will guarantee that you stay stuck in a rut of inefficiency, which might lead to failure. If you follow the 5-stage systematic method outlined in this Guide, you will significantly improve your learning and achieve a better grade with less study time.

Let's crack on. Get the winning edge today.

> *"Perhaps the most valuable result of education is the ability to make yourself do the thing you have to do, when it ought to be done, whether you want to or not. It is the first lesson that must be learned."*
>
> *--Thomas Huxley*

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WHY READ THIS GUIDE?

Simple! You want to have a winning edge! Would you fight a machine gun with a knife? This Guide will give you the survival skills to succeed in chemistry.

"A moment's insight is sometimes worth a life's experience."

--Oliver Wendell Holmes, the Professor at the Breakfast Table

The End </Old>

At the beginning of this Guide, I would like to put an end to something that stops you from being successful in chemistry. That something is what I call "Hop-and-Drop Learning" - aimless study without a systematic method and well-defined goal. I have seen many students, even those in college, who still have not learned the study skills necessary to survive. More often, I have observed others who apply the same study methods for art, literature, or business courses to chemistry courses, and then stumble and fail. Chemistry, for the most part, is a quantitative subject, so the mind-mapping technique used in creative literature does not apply at all. Learning needs to be adjusted. This Guide will walk you through the learning process step-by-step. The skills you learn now will last you a lifetime.

There is really only one thing you need to be academically successful, and the good news is that it is under your control – YOUR ATTITUDE:

- ✓ Attitude One: The desire to learn
- ✓ Attitude Two: The willingness to change

Since you have made the first step and committed yourself to this book, you are already qualified. The rest is downhill from here – just follow the signs and you will get to the finish line.

"When the student is ready, the teacher will appear."

Stop! Don't Read This Guide.

If you are sailing through the course effortlessly with minimum study time and an A+ grade, you should stop reading this now and continue doing what you have been doing.

If you are not willing to put forth the effort to learn an effective way to study chemistry and follow the system of success, you should also stop now.

However, if you are struggling with chemistry or spending too much time studying this darn course, something must be changed! The definition of insanity is doing the same thing over and over and expecting a different result.

My suggestion is to read this survival Guide, follow the 5-stage system closely, and use the templates provided with the Kit. This ensures you will survive the class with a top grade, and with minimum time studying. Make a commitment to this system, or else don't waste your time reading this Guide.

Success is a choice, not an inner quality of one's self. Unless you decide that you are going to be successful in chemistry, and willing to learn and to adapt a learning method specifically designed for chemistry, you will waste your time with this Guide. Just reading this Guide is not going to improve your grade; following a system that works will.

WIIFM

You might ask: "What's in it for me?" If you are taking chemistry and feeling lost or spending a too much time studying, this book is for you. I will hold you by the hands and walk you to the finish line.

The goal of this Guide is not to make you into chemistry major. Most of you are taking chemistry because you have to and find yourself frustrated with the course, but unfortunately, you cannot fail the course. Failing chemistry will prevent you from achieving your academic success. The good news is that you have already overcome the first hurdle by acquiring this Guide, which means that you have decided to master the survival skills and conquer this beast.

There are two aims in studying chemistry: (1) Acquire a wealth of chemistry knowledge; (2) Acquire the problem solving abilities.

The ChemMastery™ system is about how to best study to achieve the two goals. You just follow the system; the system will take care of you. It's that simple!

Who Are You?

Feeling no chemistry in chemistry?

Having a problem with problems?

You have come to the right place! Granted, most of you don't want to become chemists and this may be the last chemistry course you will ever have to take. However, chemistry is in the way of your academic success and you are simply looking for a way to survive the class. To some extent, chemistry is a difficult topic to study. I have taught thousands of students and after observing the patterns of smart students who do well in chemistry, I've found they have one thing in common – they have mastered the chemistry study skills.

If You're Taking High School Chemistry ...

Congratulations! You are about to learn a simple system to chemistry mastery. High school chemistry is the baseline of this book. You should feel right at home with the format of the book and the information presented. Everything is in a step-by-step format with easy to follow instructions. It is designed to work with your introductory chemistry textbook.

You should be very proud of yourself for taking a big step - committing to follow through with a proven system. You are already ahead of many of your classmates with the competitive edge the information you are about to learn gives you.

If You're Taking College Chemistry ...

I have written this book for you - the college student who is struggling with chemistry, whether it is general chemistry, organic chemistry, biochemistry, or any other course for that matter. College chemistry is one big step higher than what you have learned in high school, with 3x more topics to cover. It is a challenge for freshmen when the stakes are raised and you have to study more than you have before – unless you develop the study skills quickly. You cannot afford to fail this class because it will ruin your college career.

The good news is that you can be in control by following this simple and proven system. You will tackle the study skills you failed to master in high school, which will enable you to sail through this course. Your academic success will follow.

If You're Taking Advanced Chemistry ...

If you are a chemistry major or a graduate student taking chemistry courses this guide is a must-read. It will build the foundation for you to become a great chemist with much needed instincts and scientific qualities. The system I've developed comes from taking, or teaching over 50 different chemistry courses – from introductory chemistry to advanced quantum chemistry. You will take many of these classes in your chemistry education. Using this simple system will save you from frustration and allow your academic success.

If You're a Non-Traditional Student ...

If you are going back to school at age 25, 35, or even 45, you should refresh your study skills and rebuild your chemistry sense. This is a great book to start with before delving into a weighty textbook and getting lost. You will master very basic skills and learn to think like a chemist. You will spend less time studying and only have to memorize half as much.

If You're Preparing for a Test ...

If you are studying for a test – whether it is a standardized or classroom test - this book provides many tips and tricks on how to prepare for, and take the test, with a focus specifically on chemistry.

If You're an Educator ...

As chemistry teachers, we have never been taught or required as part of the curriculum to show our students how to study chemistry effectively. Our job is to deliver the chemistry content and hope the students can master it somehow. We have tried hard to make the subject fun and learnable, but often found students struggling with the course until the end.

This book will empower you to teach your students how to master chemistry step-by-step as you share the 5-stage ChemMastery™ system, memory techniques, quick math review, problem solving template, and 101 chemistry study tips in this extensive, how-to-study guide for chemistry. It works with any chemistry textbook and teaching curriculum. Spend a session or two on the topic How to Study Chemistry and prepare your students for the ride. This will stimulate the students' interest in the subject and significantly improve their performance. It will also make your experience as a teacher more rewarding.

If You're a Parent ...

As a parent, you want to help your children through difficult times. Chemistry is not an easy course for most young adults, and many labor hard just to survive. You no longer have to watch your children struggle helplessly. This survival guide will coach your children step-by-step in how to study chemistry effortlessly. It is the system used by many smart chemistry students to ace many chemistry courses. It is a how-to book used by chemists, and written by a chemist.

How to Use this Guide?

This book is for anyone who is currently taking any chemistry course; from introductory high school chemistry to college general chemistry, from organic chemistry to any other chemistry related or advanced course. It is designed for students, although instructors can use the information, methods, and templates presented for lecture materials.

The material is presented in an easy-to-follow way and will be most effective when read from beginning to end. After that, one can pick up the guide and start reading anywhere, jumping straight to a specific topic, e.g., read the Exam Prep section if you are getting ready for an exam.

I encourage you to learn and adapt the ChemMastery™ system presented here. It is best to follow the 5-stage system and not skip any parts. The system is designed to work synergistically and progressively, which allows you to use minimum study time and obtain maximum results.

What is Not in this Guide?

This book focuses on a no nonsense approach, with many specifics for chemistry courses. It is an "all meat, no filler" book. Unlike other generic how-to study books, I will not discuss how your brain works, how you should get your mind and body in shape, how you can set goals and get motivated, how to write long essays or do speed reading. You can read about these very important issues elsewhere. I will not cover study skills used for non-science classes. Most study skill books are written by literature or business educators. Very few, if any, how-to study books are written by chemists (or scientists for that matter). For the first time, a chemist has written a chemistry study skill book with a step-by-step simple system designed for students who are taking chemistry courses.

CHAPTER 1: THE SURVIVAL BASICS

This is the first part of the Survival Guide, which outlines the basics of mastering chemistry. What you learn in this part will build the solid foundation for your chemistry success. Learn to think like a chemist. Do not skip any section and be sure you understand each key point before moving onto learning the ChemMastery™ system.

The Chemistry Survival Mindset

Success is about positive attitude. First you believe, then act, and finally achieve – the result is success. You have control of every step toward your own success. It sounds like a crusade; you might have heard this before. Make a positive attitude part of your thinking now.

Mindset #1 - Take Control

There are two choices you can make every day to better your grade and they are totally under your control:

- ✓ Take control of your attitude – What to tell yourself about you.
- ✓ Take control of your time – How to spend your time.

Make the decision that you will be controlling your own destiny. Follow the system, make the plan, and execute it persistently - Success will follow!

Mindset #2 - Be Curious

Observe things in everyday life and start noticing their chemistry association. Ask yourself questions. Why does dough raise when heated? It has to do with the baking soda reacting with an acid. The spongy bakery products come from the carbon dioxide bubbles of the baking soda. Chemists are keen observers. Observation invites explanation and triggers imagination. Train yourself in the chemist's mindset and you will not only survive, you will excel!

Mindset #3 - Be Consistent and Be Persistent

Chemistry may not be your favorite subject. You really have to be consistent with your efforts day-in-and-day-out, leading to the final exam. This eliminates last minute panic and loss of confidence before the exam.

Chemistry is about problem solving. You will encounter difficulty from time-to-time. You must be persistent in completing the required assignments, and follow the steps according to the system.

"While motivation is essential to begin the path to success, only persistence will keep you on the path."

-- Anonymous

The little extra effort you make could be the difference between an A grade and a B grade. A winner only has to be a little better. Don't dabble, stay focused!

Mindset #4 - Be A Professional

Treat studying as a professional job. A professional has to show up at work and be productive in order to get paid. The same applies to taking courses. Students must attend lectures and complete the course work and then they are rewarded with good grades. Be a competent, responsible student and handle each study task professionally.

The Chemistry Survival Instincts

No one is born a chemist. There is no such a thing as a "chemistry gene" in the human genome. Chemists develop their instincts via active learning and experimenting.

One of the most difficult aspects of learning chemistry is to be intuitive about the subject. Unlike biology, physics, and other science disciplines, you simply can't relate your daily experiences with what you are taught in chemistry class. Your common sense usually does not work very well in chemistry. In this section you will learn how to build the basic instincts that will enable you to look at chemistry from a whole new angle and understand the content covered in lectures with a new dimension of imagination. For some situations in chemistry, imagination is the only way to get you where you want to go.

Instinct #1 - Think Chemistry at the Molecular Level

Chemistry is mostly invisible and must be imagined. Foremost, thinking chemistry at the molecular level is the No.1 key to unlock your passage to the chemistry world. Chemists operate in two worlds – macroscopic and microscopic. The macroscopic world is what we can see, feel, and touch – what non-chemists called the "real world". To "see" chemistry, you need to build a microscopic instinct – be able to visualize matter molecularly. By learning to envision things microscopically, you add a whole new degree of appreciation to the world around you.

Here is a simple example. When someone mentions water, rather than thinking of a raindrop or a blue sea, you should first picture H_2O; an oxygen atom bonded to two hydrogen atoms – the building blocks of water.

Physical Level

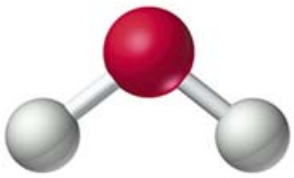
Molecular Level

With this mindset you will look at things around you in a whole new way. Next time you look at a food label, think about the ingredients by their molecular formulas and structures. What is the structure of alcohol or caffeine? Why is vinegar a magic household cleaner? Start asking yourself questions chemically. Now you are thinking like a level-1 chemist! That wasn't so hard, but don't stop here! Remember to scale your thinking to the: **Molecular** level.

Instinct #2 - "See" Molecules in 3D

Molecules are NOT flat, so while you are at the molecular level picture molecules in 3D. See things in the 3D viewpoint. For many, it is not your second nature. What makes it worse is that all textbooks and lecture materials are using 2D structure drawings. It is not hard to train yourself in 3D – constantly remind yourself while reading the textbook and listening to the lectures.

How? In print, you see water presented as H_2O or H-O-H. To see it in 3D, use a 3D model. Here is a commonly used Spoke-and-Ball model.


H_2O in 3D Model

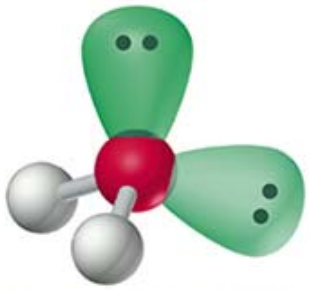
A water molecule is not linear, but bent. Next time you draw a structure on paper, try to picture it in 3D. So far, so good. Now that you can think in 3D, let's promote you to the next level. Remember: Draw in 2D and imagine in **3D**.

2D structure drawing is how chemists communicate. Chemists have adapted to representing the 3D structure in the 2D plane in order to convey chemistry clearly and consistently. Your pencil is an indispensable learning tool. Train your hand to draw. Precision in drawing leads to the precision in thinking. Knowing how to draw a structure will give you insight into the solution of the problem.

Note: There is a branch of organic chemistry called stereochemistry, which is the study of the 3D structure of molecules. Even with 3D understanding, chemists still like to project 3D structures into 2D plane, such as Fischer Projection or Newman Projection. Do not ever lose sight of the fact that all structures (geometrical and electronic) are three-dimensional.

Instinct #3 - Visualize Molecules in Electronic Structures

Is there something smaller than an atom? Yes, there are three subatomic particles – protons, neutrons, and electrons, and this is generally as far as chemists go. Chemists have long believed that electrons (especially the outer-shell valence electrons where electrons are gained, lost or shared) govern the chemical properties of matters – living on the edge! To understand chemistry, you must have a full grasp of electronic structures and go beyond the geometrical orientation in 3D.



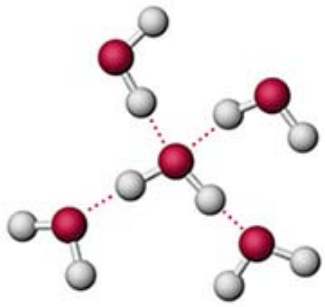
H_2O in Valence Bond Model

In the case of water, to visualize the electronic structure of the H_2O molecule with a simple Valence Bond approach, you need to draw out its two lone pairs of electrons. Once you do that, you can easily understand why the H-O-H bond angle is not linear (180°), not trigonal planar (120°), not even tetrahedron (109°), but bent 105°due to the strong lone-pair/lone-pair repulsion from the central atom, O. If you can understand electronic structures, you will understand most everything in chemistry! If your understanding gets this far, you are head and shoulder smarter than 95% of the students out there! Remember, electrons govern chemistry properties: **Electronic** Structure.

Instinct #4 - Imagine Molecules in Ensemble

A molecule never stays alone, and molecules are held together by interacting with each other. These inter-molecular interactions are the key to understanding many chemicals, especially the biological properties of molecules. A molecule is simple, but groups of them can be very complex. The key to understanding this is energy, thermodynamics specifically - the subject area linking chemistry with biology.

Water molecules are bonded together by hydrogen bonds. This explains many physical observations we come to know in life, i.e. water (2xH-bonds/molecule) has a higher boiling point than alcohols (1xH-Bond/molecule). Remember, molecules in a group: **Intermolecular** interaction.



Hydrogen Bonds in Water

Always consider molecules in ensemble. Molecules are not independent of each other. An ideal theory assuming no interaction among molecules is flawed. That is why the ideal gas law is not true: $PV \neq nRT$, since ideal gases (no interaction) are assumed for this equation.

Instinct #5 - Picture Energy-Energy-Energy

Chemistry is the study of matter and its change. Energy is the ability to produce change. Energy is THE most important property of any molecule. You can draw the parallel that energy is to molecules as money is to finance. Most of what chemists study is the structure-energy relationship at the molecular level, and the energy impact of scaling up a single molecule to a group of molecules.

Energy is quite tricky. It is hard to picture and difficult to describe. It can even hide and change its form.

There are four important things you need to know about energy:

Lowest: Molecules always want to be in their most stable form (ground-state) with the lowest energy. To find the geometry of any given molecule, you need to minimize its structure.

Discrete: Energy at atomic levels has only discrete values (or quantized by Bohr model), that is, electrons can have one energy level or another, but nothing in between (like a stair not a slide). Next time you look at a molecule, consider its energy.

Relative: Relative energy counts, not absolute energy. Whether you are considering the ionization potential of atoms, conformational energy of molecules, or activation energy of reactions, relative energy is important.

Conserved: Energy is conserved since the total energy of the universe is constant. Contrary to common understanding, you do not consume energy; you simply change its form.

Remember these four keys for energy: **Lowest**, **Discrete**, **Relative**, and **Conserved**.

Instinct #6 - Reshuffle Atoms

Always keep this in mind: Chemistry is about shuffling atoms from molecule to molecule – called reactions. If you ever get stuck in any particular lesson, ask yourself two questions:

- ✓ What does this lesson have to do with how molecules can be taken apart?
- ✓ Is this lesson related to atoms or parts of molecules being brought together to form new molecules?

The answers to these two questions usually capture the central concepts of any particular lesson.

Instinct #7 - Learn to Relate

This is one of the harder skills to master. Bear in mind, chemistry is built upon many basic concepts and principles that are tightly interrelated. Be attuned to the cumulative nature of chemistry and understand the continuity of the subject. The periodic table shows clearly how each element is connected with the others, in terms of periodicity. Individual facts may seem pointless on their own, but as they are seen as part of a greater whole their value becomes apparent. With this skill, you will not have to put yourself into a memorization mode of study by trying to remember hundreds independent pieces of information. You just have to memorize a few general principles and facts, and relate them together to solve problems.

A chemistry course is logically organized and progressive. You must use what you learned previously to understand the current content. The easiest way to build this instinct is to always ask yourself, whenever a new concept is introduced,– "How does this relate to what I have already learned?"

Instinct #8 – Speak the Language

Learning chemistry is like learning a new language. Learn and practice the terminology and the symbols of chemistry. When you start to speak like a chemist, you will pick up a good sense of chemistry.

Sum it Up

There you've got them all – Seven keys to chemistry intuition. Remember; always think **3D electronic structure with minimized energy**. This will give you the killer instinct to master chemistry – learning to think and talk like a chemist.

Before I wrap up this section, let me ask you this …

In the world of crime solving, investigators always ask the most important question – "Where is the money?" By following the money trail, they can usually find the motive, evidence, or the pattern of any given crime.

The same applies to chemistry!

Do you know ***what the most important question in chemistry is***?

The answer to this question will ultimately solve your structure and bonding problems in introductory and general chemistry, and most problems in organic chemistry.

Are you ready? Imprint this into your thinking throughout the course:

The most important question in chemistry is: "**Where are the electrons**?"

The Survival Tricks – Learning Chemistry Anytime Anywhere

To survive chemistry you have to be creative and make the best use of your time, even the "in-between" time. These survival tricks, exclusively from this Guide, are unique ways to enhance your chemistry learning anytime and anywhere.

iPod Chemistry

About 30% of us are auditory learners. Some remember better by listening, not to mention the drive-time convenience. With the increasing popularity of MP3 players a new learning method is emerging – learning on the go.

Chemistry lectures in MP3 are available on the web for free download (see the Survival Resource section). You can download these audio learning materials into your iPod and listen to them on the go – on the road, exercising, or pretty much anytime. Learn to multi-task and be creative in using your iPod for more than just music.

Since you are not usually using your "focused mind" when you are listening to your iPod, you should not use audio media as the prime source for learning core materials. It should be a supplement to your core learning activities – the 5-stage process.

Another use of iPod is with the trend of PodCasting over the web – MP3-based blogs that educators start using these audio methods to communicate with students.

Lastly, chemistry software is now also available for iPod, allowing you to access chemical information such as the periodic table and atomic properties while on the go. Now you can really become a ChemGeek!

Bathroom Chemistry

Forget about Uncle John's Bathroom Reader series!

Print a copy of the Periodic Table of Elements from this survival kit. Post the Periodic Table on the wall of your bathroom and familiarize yourself with it one group, or one period at a time. You'll be amazed that your brain functions quite well while you are getting relief!

Little-by-little, day-in-and-day-out, you will be able to recite the periodic table just like the multiplication table when you were little.

A health warning: Staying in the bathroom too long is not a good health habit.

Jacuzzi Chemistry

You can do "outline reading" while you are enjoying a Jacuzzi bath. The relaxed state of mind can stimulate your thinking and memorization. You will learn how to create your own chemistry cheat

sheets later. Once you have them, laminate them at your local Kinko's. You then have a set of waterproof reading materials (skip the 3-hole punch on this one)!

It's a good time to connect the dots by looking at the course materials as a whole and learning to relate all the concepts together.

Palmtop Chemistry

I am not talking about Palm Pilot or PocketPC. I am talking about your bare hands. Write a key formula, equation, or organic reaction on the palm of your hands for your daily study. Read it over 10-15 times whenever you get a moment. You will be surprised how effective this is – before you know it, a long list gradually becomes a short list.

Poker Chemistry

Buy a deck of paper-based poker cards with blank spaces on one side. Come up with a list of keys – things you need to know in your chemistry course such as key concepts, equations, reaction types, etc.

This will work better for you than the regular 3x5 index cards. The Poker deck has some unique advantages as a study aid.

First, it limits you to 54 cards – 54 keys to remember. It also forces you to write the concise keys because of the limited space on each card. I've seen the overuse of flash cards, cramming everything into the 3x5 space and making a textbook on the cards, which defeats the real purpose of flash cards – a condensed list of your memory keys.

Secondly, the poker card has a natural priority order built-in already. Write the keys on each card. Use the face cards (10, J, Q, and K) cards and Aces for more important or harder keys and the rest for less important or easier keys, in order.

Moreover, you can associate a poker picture to a given concept. For example, a Jack of Diamonds may be for "Ideal Gas Laws: PV=nRT". You can recall this key term by relating the poker picture to it. This approach is based on the memory technique called the Method of Loci.

Finally, here is my favorite part – the smaller and round-cornered poker deck is much easier to put in your pocket than the bigger, sharp-edged 3x5 cards.

Recite the deck daily. Separate them into two piles, A and B, with rubber bands – "A" contains the keys that you have mastered and memorized, "B" keeps the keys that you need to work on more. Over time, your A pile will get bigger as the B pile shrinks as you master all the keys. Believe me, it will be a major boost to your confidence when you walk into the final exam.

Bedtime Chemistry

Get comfortable and do all your reading in bed… NO! I have tried time and time again but reading in bed is like a sleeping pill. As soon as you hit that mattress, your brain is signaled to sleeping mode. You definitely don't want to do your core study there.

So what is "Bedtime Chemistry"? The last things you read before you go to sleep actually get into your long-term memory bank faster. Read your cheat sheet items or flash cards for memory keys. Even after you fall asleep, your brain is still processing this information and you might even dream about it. You should read no more than three items per night.

I want to stress that all the above are NOT essential study tools. Your survival in chemistry class depends on how effective you are in applying the **5-Stage System**: pre-lecture, in-lecture, post-lecture, test preparation, and test-taking, which are the focus of this Guide. Remember, other than these core study steps, anything else is just icing on the cake.

CHAPTER 2: THE SURVIVAL GEAR

You should keep a separate notebook for each course you take, and chemistry is no exception. Use 8½x11-inch pages in a three-ring binder. This will allow you to revise and insert notes and handouts while still preserving the sequential lecture order. All templates presented here are designed to output printables that are organized with a three-ring binder. Get yourself a three-hole punch as well.

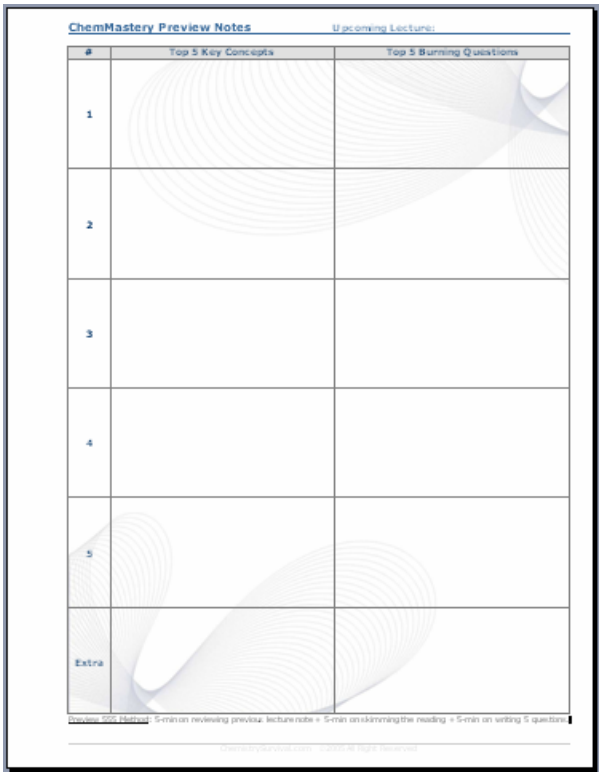
All templates below are part of the **Chemistry Survival Kit** and designed to be printer friendly.

ChemMastery Preview Template

This is a two-column worksheet designed for a 15-minute exercise to prepare for any upcoming lecture. This is a fill-in-the-blank activity, one sheet per lecture. The single-page worksheet is divided into two areas:

Key Concepts: Jot down the key terms in this column, including new terms, concepts, formulas, equations, and any other unfamiliar content.

Important Questions: Write down five main questions you have – the questions that cover the important terms, yet are difficult to understand. The easiest approach is to ask one question per each heading. These questions are the ones you would like to have answered during the lectures.


ChemMastery Preview Notes

Upcoming Lecture:

#	Top 5 Key Concepts	Top 5 Burning Questions
1		
2		
3		
4		
5		
Extra		

Preview 15 Method: 5-min on reviewing previous lecture note + 5-min on skimming the reading + 5-min on writing 5 questions

ChemMastery™ Preview Template

Bring this to the lecture and check off each of the items listed as they are covered.

Lecture/Reading Note Template

ChemMastery™ Note Template is designed for chemistry lecture and reading note-taking. It is basically a lined paper with three main areas. The working order goes from left to right and top to bottom, so it takes three steps to finish the notes. The completed notes can be your handwritten textbook. You are the only reader of your book. If you learn to take good notes, your entire course will become a breeze.

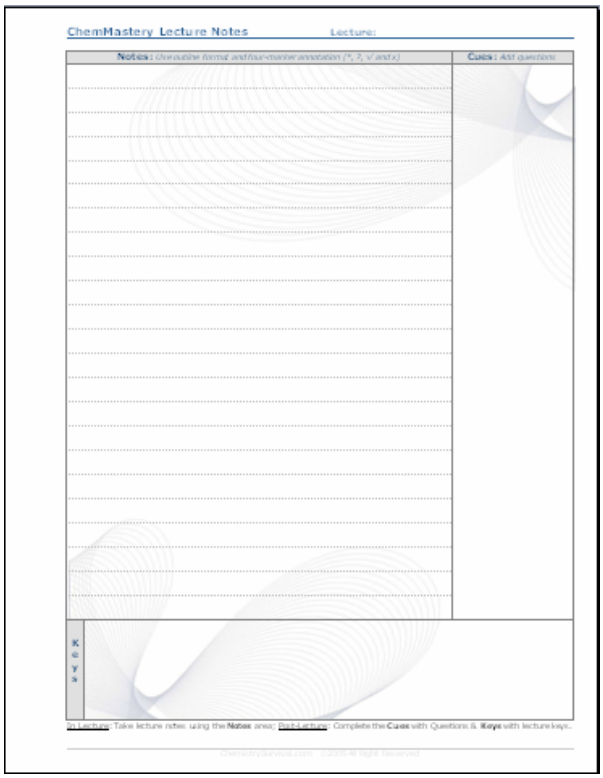
Left pane (Notes): This is the **Notes** area where the lecture notes are being written. The notes should be in the outline format. Try to record 60% of the lecture content in a concise form. Use annotation markers (*, √, and X) as needed for selected terms.

Right pane (Cues): This is the **Cues** area where the questions are constructed from the material on the left side. The questions should allow you to recite the main content from the notes (like "Jeopardy") and serve as possible test problem candidates. The process of writing down the cues forces you to think about the lecture in a way that clarifies the concepts, relates the terms, builds continuity, and most importantly improves your memory.

Bottom pane (Keys): This is the memory **Keys** area, which is the condensed outline of the notes on the same page. It is NOT a summary area. Avoid simply rephrasing or summarizing the notes. Instead, write down each memory key – key terms and their definitions, equations, and formulas. Simple examples or drawings might also be added to help the recall of the key terms. Rather than a laundry list, select the important and hard-to-remember keys.

Refer to the Stage 2 instruction in the system for a step-by-step guide in using this template. Below is the snapshot of the template, where the Notes area is on the left, the Cues area on the right, and Keys area at the bottom. The Notes area should be filled in during the lecture, and the Cues and Keys sections should be completed post lecture.

The Reading Notes template has the same format. Jot down the notes while reading the text and complete the Cues and Keys in the same reading session.



ChemMastery™ Lecture Notes Template

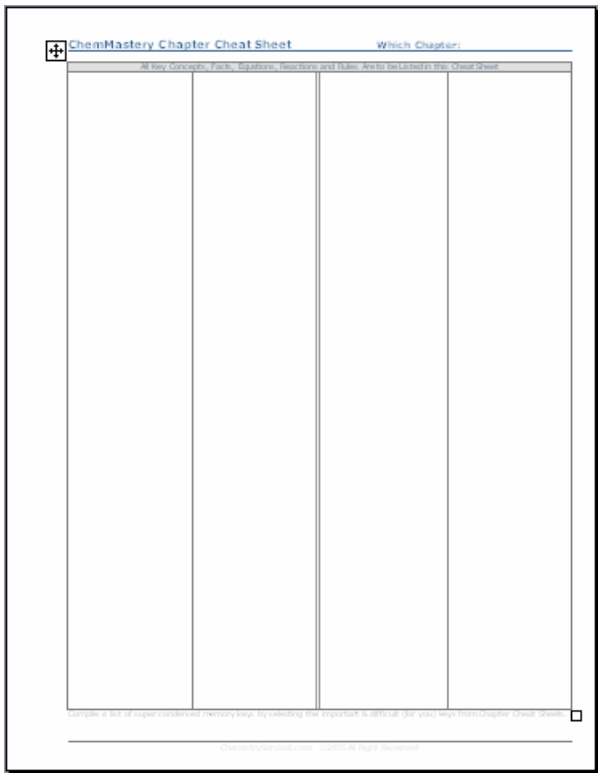
A three-ring binder has several advantages over notebooks. First, extra pages can be added as you need them, and taken out so you can spread them out for review. Second, you can insert class handouts, weekly planner, preview notes, etc., with an 8.5x11 format. Lastly, you can add your own out-of-class notes in the correct order for addition, correction, and revision. All the ChemMastery™ sheets are designed for a three-ring binder.

Cheat Sheet Templates

Cheat sheets are NOT created for cheating. Cheating is a serious academic dishonesty with serious consequences, and is totally unacceptable. However, having a cheat sheet (i.e. concise study notes) for your test preparation is an effective way to study with less time and better results; just don't bring it to the exam.

If you have completed the ChemMastery™ notes for both the lectures and textbook reading, creating cheat sheets is a very simple task.

A cheat sheet is a four-column sheet with memory keys. They are extracted from the Keys area of your notes, both from the lectures and readings, and filled in by following the course outline.



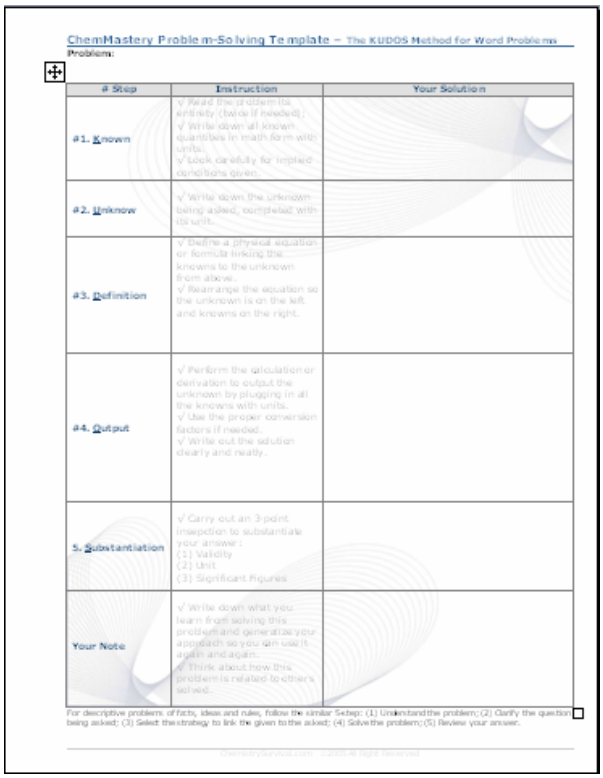
ChemMastery™ Cheat Sheet Template

The success of following this system relies on the fact that you are creating your OWN Cheat Sheets from the notes on lectures you attend and the text you read. It is your own Cliffs Note. Many students, in hope of taking a shortcut to reading, use the purchased Cliffs Notes to substitute the work of studying – attending lectures, taking notes, reading the text, and doing the problems. Even the founder of Cliffs Notes, Cliff Hillegass, always discourages those who bought his guides from using them as a substitute for reading the book. This certainly won't work for science courses.

Problem Solving Worksheet Template

The **KUDOS Method** is designed to simplify the most difficult challenge students face in chemistry – solving problems. It is an easy-to-follow five-step approach. Follow the instructions, fill in the

steps and you can solve chemistry problems systematically. See more instructions in Chapter 7 – The Survival Guide to Homework.



ChemMastery Problem-Solving Template – The KUDOS Method for Word Problems

Problem:

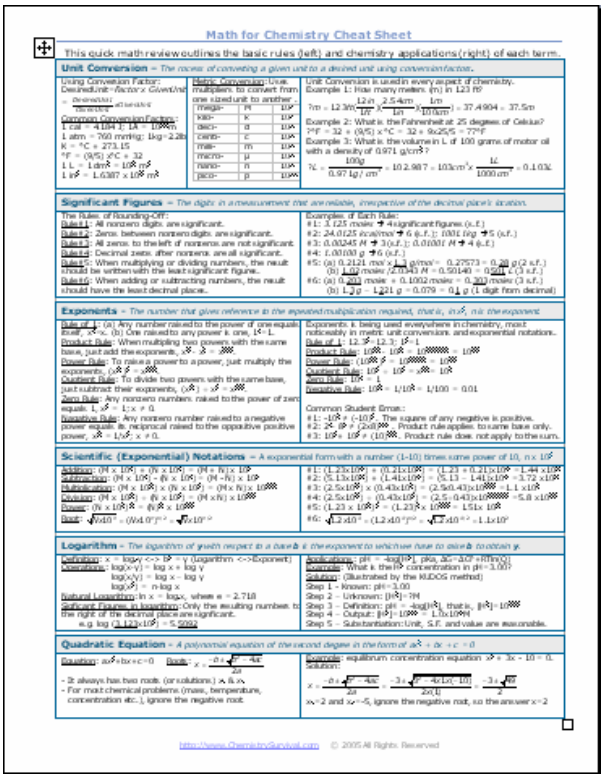
# Step	Instruction	Your Solution
#1. Known	√ Read the problem for entirety (twice if needed). √ Write down all known quantities in math form with units. √ Look carefully for implied conditions given.	
#2. Unknow	√ Write down the unknown being asked, completed with its unit.	
#3. Definition	√ Define a physical equation or formula linking the knowns to the unknown from above. √ Rearrange the equation so the unknown is on the left and knowns on the right.	
#4. Output	√ Perform the calculation or derivation to output the unknown by plugging in all the knowns with units. √ Use the proper conversion factors if needed. √ Write out the solution clearly and neatly.	
5. Substantiation	√ Carry out an 3-point inspection to substantiate your answer: (1) Validity (2) Unit (3) Significant Figures	
Your Note	√ Write down what you learn from solving this problem and generalize your approach so you can use it again and again. √ Think about how this problem is related to others solved.	

For descriptive problems of facts, ideas and rules, follow the similar 5-step: (1) Understand the problem;(2) Clarify the question being asked; (3) Select the strategy to link the given to the asked; (4) Solve the problem;(5) Review your answer.

ChemMastery™ Problem Solving Template

Math Review Cheat Sheet

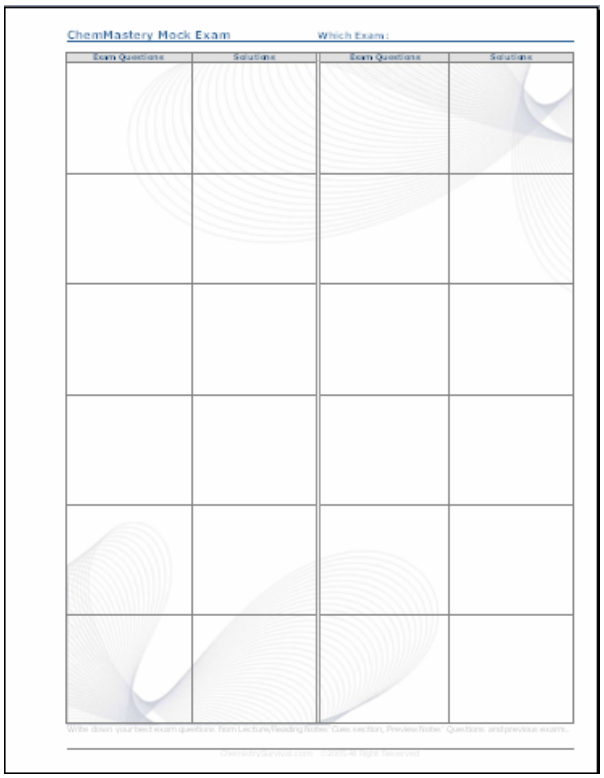
This is a super concise math review of the essential math needed for chemistry. It is designed as an at-a-glance, single sheet, so you can finish the review in one sitting of 12 minutes. Master these math terms before taking any chemistry course.



ChemMastery™ Math Review Cheat Sheet

Mock Exam Template

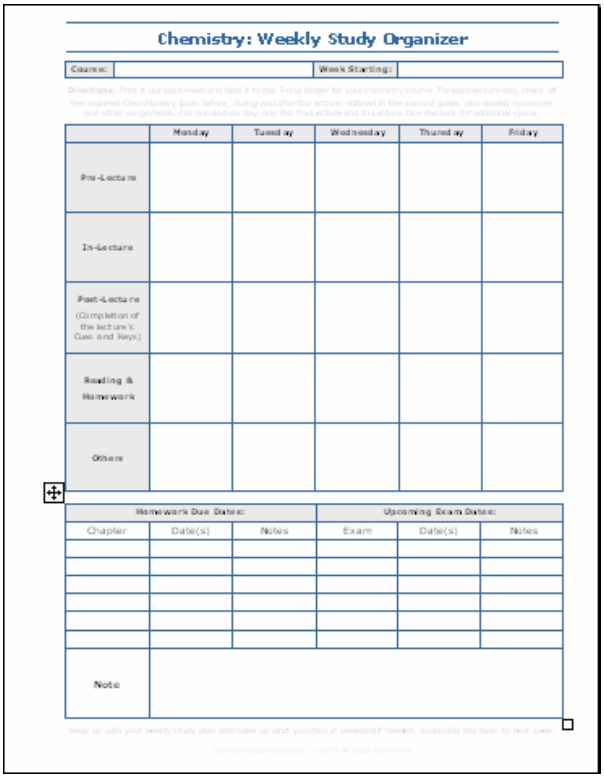
This is an important step in preparing for the big exams. Think like your instructor. Ask yourself how you would write the exam to test the students. Use the template below for this exercise.



ChemMastery™ Mock Exam Template

Weekly Study Organizer Template

Learning to master the skills of organization and time management is an important part of your education. It will have a lasting impact on your success later in life. The weekly study organizer is best suited for busy students since similar activities occur weekly in school. It is designed to simplify this process and help you manage your time effectively and systematically.



Chemistry: Weekly Study Organizer

Course:		Week Starting:	

	Monday	Tuesday	Wednesday	Thursday	Friday
Pre-Lecture					
In-Lecture					
Post-Lecture (Completion of the lecture's Cues and Keys)					
Reading & Homework					
Others					

Homework Due Dates:			Upcoming Exam Dates:		
Chapter	Date(s)	Notes	Exam	Date(s)	Notes

Note	

ChemMastery™ Study Organizer

The Four Rules of Using the Weekly Study Organizer

Follow the rules below when using the Weekly Study Organizer.

Scheduling: Fill in the daily task on your Study Organizer (supplied with this kit) ahead of time. You are making appointments with yourself and are committing to your course. Arrange a fixed daily program of study. Routine makes it easier.

Listing: In addition to blocking out the time slot, you need to also list all the study items needed for each hour.

Subtasking: Try to be specific about each task. Break down each task into smaller subtasks. In instead of writing something like "read the text", list the sections and their headers within the book. It is also helpful to list the number of pages in each section.

Checking Off: When the task is done, be sure to check it off from your daily list and reward yourself.

Seven Ways to Effective Time Management

Use the weekly planner: Organize your study on a weekly basis. Use the printable template to print out copies and add them to a 3-ring binder. Plan your weekly schedule every Sunday evening and adjust it daily.

Book the firm activities first: Block off class time, work time, and any other pre-determined weekly activities. Also schedule the essentials such as sleep, eating, and relaxation (fun and exercise).

Schedule short study sessions before and after lectures: Set aside 20 minutes each to preview the textbook before the lecture and to quickly check your notes after the lecture. This will save hours of study time later on.

Avoid marathon study sessions: Break down your study sessions into one-hour segments with 50 minutes of study and 10-minute breaks. Alternate subjects if you have scheduled consecutive hours.

Use a timer: A countdown timer is a great tool to help you concentrate for intensive study and to trim down your non-productive hours.

Arrange peak hours for core study: In time, you will learn your best study hours of the day. Use them for core study activities that require high concentration, such as reviewing lecture notes and reading the textbook.

Allow flexibility: Leave room for the unexpected and plan for the unplanned. Set aside open time on your planner for this.