SD '02

ADVANCED ANALYTICAL CHEMISTRY
CH 434
COURSE OUTLINE
SPRING SEMESTER 2002

Arthur Mori

Required Textbook: **Skoog, West, Holler, and Crouch,** *Analytical Chemistry: An Introduction,* **Harcourt College Publishers, 7th Ed., 1999.**

Software: Microsoft Excel

Course Objectives:
This is a one-semester course in analytical chemistry, where techniques for separation and quantitative identification of chemical entities will be discussed. The Quantitative techniques will include gravimetric, volumetric, spectrophotometric, and potentiometric analyses. Sampling techniques and statistical treatment of data will also be discussed. During the latter part of the semester instrumental methods will be emphasized.

Analytical chemistry occupies a special place among the subdisciplines of chemistry because almost all experimental chemists make use of analytical procedures in their work. The course will demonstrate the unique yet very familiar nature of the discipline in preparing students for immediate careers as well as for further study and training.

As in all science courses, problem solving is of paramount importance. We'll spend many hours working and reworking problems. Please don't leave home without your calculator.

Woody Allen says that "eighty percent of success is showing up," and Stanley Kaplan has said that "repetition breeds familiarity and familiarity breeds confidence." Not bad advice from two kids from Brooklyn!

Exams and Grading: **There will be four midterms, quizzes, and homework assignments plus a comprehensive final.**

Course Grade:
160 pts (four midterms)
100 pts (quizzes and assignments)
100 pts (final)

Make-up exams will be given only under exceptional circumstances on the basis of a written request accompanied by a written verification.

Office Hours: **MWF 10:00 -11:00, 12:00 -1:00 and/or by arrangement**

Office: **Henry Hall 24** **Home Phone 373-4386**
(Office: leaves message at 735-4858)
Fax: 735-4846
amori@chaminade.edu

Course Outline

1	1/14-1/18	Introduction... Units... Chemical Equilibrium	3,4
2	1/23-1/25	Errors and Statistical Analysis	5,6,7
3	1/28-2/1	Gravimetric Methods of Analysis	8
4	2/4	**FIRST** MIDTERM	9
4	2/5-2/8	Equilibrium **Calculations** with Complex Systems	10
5	2/11-2/15	Equilibrium **Calculations cont.**	10
6	2/20-?./22	Titrations	11
7	2/25-3/1	Acid-base Titrations... Buffers	12
7	2/25	SECOND MIDTERM	
8	3/4-3/8	**Pol ctional** Acids and Bases	13
9	3/11-3/15	**Neutralization** Titrations... **Complexation and** Precipitation	14 15
10	3/18-3/22	Elements of **Electrochemi**	16
11	4/2	Review	
11	4/3	**THIRD** MIDTERM	
11	4/5	Electrodes and Potentiom	17
12	4/8-4/12	Electrodes and Potentiometry (cont.) Redox Titration, Potentiom Calculations	17 18 19
13	4/15-4/19	Spectroscopic Methods Spectroscopy / Spectrometry	21 22
14	**4/22- 4/24**	Atomic Spectroscopy	23
14	4/26	FOURTH MIDTERM	
15	4/29-5/3	Analytical Separations **Gas-Liquid** and High Performance Liquid Chromatography	24 25

FINAL EXAMINATION: WEDNESDAY, MAY **8, 2002, 10:30** AM -12:30 PM

LEARNING CHEMISTRY

Fatigue and how to minimize it

Even if you remove from your study area all the distractions that surround Joe College, you still must overcome fatigue. After long hours at a task, people become physically and mentally tired. YOU WW not be physically tired if you get enough sleep. If your learning efficiency is high, you will have plenty of time to sleep. High learning efficiency and adequate sleep support each other.

Mental fatigue is another matter. After lengthy work periods at the same and similar tasks, you lose sharpness *and* enthusiasm. you must work ***harder*** and ***longer*** for a given amount of learning. You cannot avoid fatigue altogether, but you can minimize it. Try these ideas:

1. If you have several subjects to study, tackle first the most difficult or least interesting. Then, when fatigue begins to appear, you will be at least interested in what you are doing.

2. Again if you have several subjects to study, and if they are equal interest and difficult, rotate them, if it can be done without losing continuity. When you feel yourself losing interest in one subject, switch to another. Come back to the first subject when you tire of the second.

3. Take breaks. Study for about 50 minutes, and then take 10 minutes off. Stretch. Walk around. Snack. Watch the time, so you are sure to be back in time to start the second hour at full learning efficiency. Repeat hourly.

4. Work in short sessions. You will experience less fatigue in two two-study hour sessions than in one four-hour period. Try a two hour session in the afternoon and another two period in the evening. Then relax.

Notetaking

Now you have an idea of what your assignment is about, you are ready to learn. Learn now, that is,, not later. As you approach each section that has a performance goal, read it carefully and fix in your thought what to do for as you study. When you come to a point of your reading that is important and should be learn, think about it. Summarize the main ideas and write them into your notebook in your own words. If what you see what your eyes stops over in your mind long enough to be analyzed, revised and summarized, you are learning it at that time. Continue to the entire assignment in this way. When you finish, you will have a compact set of notes covering the main ideas which you have learned already. When test time comes, you will be able to revise them. That is much easier than learning them for the first time.

Most students do not study in a textbook this way. The more common procedure is to sit down with a book and felt a pen. important items are marked, not in condensed form, but in their . full textbook presentation. Many pages wind up half colored. You don't have to think about something to recognize that it is important and highlight it. If you don't think about it, you don't learn it. You have only made a date to learn it later. When test time comes, you have so many dates to keep it is impossible to keep them all. There is too much to read and too much to learn in too little time.

This is not t0 say you should never use a highlighter. Just use it sparingly and intelligently, as a supplement to your handwritten notes. Your notes should have a page reference to the marked materials. And when you highlight something, stop. Think about it. Learn it. Now!

Problem solving

As you begin learning how to solve chemistry problems, it helps to see clearly that your purpose is not to solve the problem, but to learn to solve the problem. You are never finished with an assigned problem until you understand it well enough to solve all other problems like it - or nearly like it.

Here are some general hints on how to solve problem:

1. Be sure you have read and understand the theory or principle behind the problem. Know the definitions if any mathematical relationships you will use, how they are written mathematically, and the units in which they are expressed.

2. As you use the question-and-answer method on an example, be sure you understand each step before going, onto the next. THIS IS THE TIME AND PLACE TO LEARN HOW TO SOLVE PROBLEMS.

3. If you are solving a problem from the end of the chapter, solve the problem without referring to an example in the chapter. . In particular, do not put one finger at the place of the problem and another finger at the page where a similar example is solved and then flip back and forth repeating for your problem each step appears in the example. This technique gets answers, but no understanding. Instead, ifyou get stack, turn from your end-of-the-chapter problem altogether and work through the matching example from start to finish. When you thoroughly understand the example, close that page of the book, go back to the problem, and solve it completely.

4. Once you get an answer, be sure it is reasonable. (Just because an answer came from a calculator does not make it reasonable!

5. Finally the crucial questions: "Did I learn how to solve this problem and others like it?" Even if you have a correct answer, but cannot give a "yes" answer to this question, you have not finished with the problem.

KEEP YOUR OBJECTIVE IN MIND. YOUR PURPOSE IS TO LEARN HOW TO SOLVE PROBLEMS, NOT TO GET A CORRECT ANSWER AND COMPLETE AN ASSIGNMENT.

LEARNING FROM LECTURE

What a student learns from a lecture depends on what the student does before, after, and during the lecture. We will exam all three.

Before the lecture

Just as a preview of a text reading assignment improves learning from reading the text, so a preview ofthe lecture improves learning from the lecture. If you know in advance *what* part of the textbook to be covered in your next lecture, flip through the pages the night before--or even better, the hour before- the lecture. Glance at section headings and illustrations. Make notes on *what you* think the main points will be. Try to guess how these ideas go together. Being right or wrong is not important. The act itself prepare you to learn during lecture, rather than after. This should take about ten minutes, but it can save an hour or more of study after the lecture to accomplish the same amount of learning.

During the lecture

What you learn from a lecture depends largely on the quality of the notes you take. in general, the best lecture notes are brief summaries that list the main ideas presented. Phrases are used rather then sentences. Ideally they are in outline form, showing major topics and subtopics. The notes are short, but they include all special conditions that are essential to the main ideas: Good lecture notes also anticipate a follow-up in which the comments are expanded. This is done by writing notes on only one half of the page, or one of the facing pages in a bound notebook. The remaining space is available for additional comments.

After the lecture

This is a crucial time. It has been demonstrate that A .student who waits 24 hours before studying lecture notes forget almost half (46%) of the material presented in the lecture. In two days, 50% is forgotten, and at the end of the week 62% is gone. By contrast, the student who goes over the lecture notes within a few hour after the lecture retain about 98% of what was said, hold 97% a week later, and still remembers more than 90% of the lecture three weeks after.

It is during the review of the lecture that you use the open space in your notebook Write in greater details the items that were condensed to a few words during the lecture. Check your text for anything you didn't quite understand. Summarize the main points of the lecture. As in notetaking from the textbook, it is the act of thinking through something to the point that you can, write at it in your own words that assures learning. Review the lecture just as soon after it is over as possible. Nowhere you will find the better bargain in time and learning.

LEARNING EFFICIENCY

If you have homework that required three hours of genuine learning, how many hours will you study to accomplish that learning? Surely it will be more than three hours. For some students it would be a lot more. How much more for you depends on your LEARNING EFFIC NCY (LE). Learning efficiency is the ratio of minutes learning to minutes of study multiplied by 100. If a student gets 48 minutes of learning in one hour of study, the learning efficiency is

L E = (minutes of learning)/ (minutes of study) X 100 = (48/60) X 100 = 80% efficiency

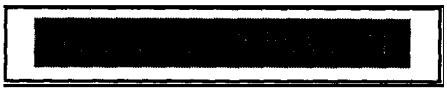
The object, of course, is to make the numerator as large as possible— maximize learning— while making the denominator as small as possible— minimize the time spent studying.

CONCLUSION

Learning is very individual matter. An excellent study technique for one student may be unsatisfactory for another. We do not mean to suggest that you should intermediately adopt all the suggestions given here, but we do suggest that you consider them. They have worked for other students, and there is every reason to believe that most of them will work for you too.

FINALLY: How difficult it is to learn chemistry? Here is one opinion.

> If to compr is ft as forming An image, we will never form an e of a happening whose scale is a millionth of a millimeter, whose rhythm is a millionth of a second, and whose protagonist are in their essence invisible
>
> PRIMO LEVI, "The Periodic Table'



NAME:

E-MAIL ADDRESS:

TELEPHONE NO:

-HIGH SCHOOL (AND LOCATION, IF NOT IN HAWAI`I):

HIGHEST MATH CLASS TAKEN:

CHEMISTRY CLASSES TAKEN:

GENERAL ORGANIC

NAME ANY OTHERS:

WHAT DO YOU CONSIDER THE MOST DIFFICULT ASPECT OF CHEMISTRY?