CH 223 "Quantitative Analysis"
Fall 2002

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Office Hours: Monday 12:00 - 1:00 and Tuesday 1:00 - 2:00 and by appointment
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Required Text: D. Harris, Quantitative Chemical Analysis, 6th ed., W. H. Freeman, 2002

COURSE OUTLINE AND SCHEDULE:

Below are some notes which should help you to clearly understand the objectives of this course. In addition, suggestions are made in respect to preparation for lectures and tests as well as for some aspects of your laboratory work. The lecture schedule does include all areas and topics to be covered in this class. Please note that this iteniary can be downloaded from the internet.

PREPARATION FOR LECTURES AND LABORATORIES:

You should set aside some time to look at the lecture material to be covered before each class starts. If you want to stay ahead, you must adequately prepare! This will make it much easier to follow the lecture presentations. It is also a particularly effective device to cut down on the time required for test preparation since you actually already know the material to some extent. "Studying for tests" is not as effective as keeping up with the material as you go along. You have to put in more effort for the same result if you wait until the last day before the test.

It is assumed that you are familiar with basic concepts. The class has a prerequisite of CH101/CH102, after all. If it has been a while since you have taken the last chemistry course, you should spend extra time with problem solving. We have a new book. Its content is modern. As with nearly all books, there is too much information. The greatest weakness of the book is the problem section at the end of each chapter. The problems are just too long, and often, too complex. We will try to work around this difficulty.

Most of the figures in the book are available as Powerpoint presentations of variable quality. I will not make use of this technology but will present conventional overheads instead, to save some time. I will also still rely on the chalkboard as primary means of communication. The problems worked on the board will come from a variety of sources. I make it a habit of presenting at least 1 problem of each major topic (called "exercise" in your book) directly from your text. In this case, there is no need to write anything down. Use the time to do some thinking. Other examples from previous texts (Skoog & West, Harvey…) will complement the problems solving. **It is really important to remember what materials were covered in class.** I strongly suggest that you either highlight the text or somehow mark the chapters, examples, figures, etc. we covered in class. You will be responsible only for the material that was covered in class. This is an easy way to do it.

Please note that we will cover chapters out of sequence. The major reason is that the laboratory exercises must be coordinated with the lecture material as much as possible. The lecture schedule on the last page is only approximate.

ATTENDANCE POLICY

You should come to each and every class even though a roll call will not be taken. Participation in class is strongly encouraged. There is a proven correlation between performance (grade) and class room attendance, especially for students who normally earn grades in the C and D range. To encourage classroom participation, I will attempt to interact with you on an individual basis as much as possible. The following rules apply:

- You should select a seat of your choice and use the same seat throughout the semester (except for exams). This helps me to establish a seating chart and remember your names.
- I will ask simple questions at random during class. If a student is absent, a negative (-) mark will be recorded. An incorrect answer will be receive a check (√) mark. A reasonable or correct answer will be marked as plus (+).
- A total of 0-3 points will be added for this "classroom participation" to the grade point average you have earned (see grading philosophy).

USE OF COMPUTERS, CALCULATORS, DATA BANKS

"Quantitative Analysis" obviously deals with figures and calculations. Data treatment is perhaps the most important concept to be understood and applied. The calculation of something called "standard deviation" is central. The standard deviation of a data set can easily be calculated by hand, just as the result of an addition or multiplication. Unfortunately, the process can be quite lengthy for large data sets. There are simple "scientific calculators" (cost under $20) that can abbreviate this routine step. **You are strongly encouraged to buy such a calculator**. It will not only save you time during examinations but you will also need to calculate the standard deviation of the data sets produced in the laboratory.

Several computers are available in the laboratory. Some of the computers are normally used to control instruments but all have software to produce plots and do statistics. They are available for your personal use. Your TA will introduce you to the use of spreadsheets. You will frequently need to look up physical data such as dissociation constants, molar masses, etc. To save some time during examinations, the appropriate tables will be copied from your text and stapled to each exam.

QUIZZES

A total of 6-9 unannounced quizzes, approximately 5-10 minutes each, will be given. Quiz dates are random and will not be announced. There is no makeup for a quiz. If you miss the class period when a quiz is given, you automatically get a zero. If you have a legitimate excuse, please let me know immediately before or after class. The lowest 2 quiz grades will be dropped. A missed quiz will thus qualify as a drop grade. **Quiz questions will be taken either from the material covered in class (problems worked on the board) or from the problems given to you as a handout.** (To compensate for the lack of suitable practice problems at the end of each chapter, I have copied, from another source, short and concise problems, suitable for quizzes**). Quizzes will be limited to material covered within the last 2 classes.** Try to work at least one problem of each type.

HOME ASSIGNMENTS

There will be no home assignments and nothing has to be handed in. On the other hand**, up to 25% of exam questions will come directly from the practice problems and exercises listed in the lecture schedule.** (The only variation may be a change in numbers). It is clearly to your advantage if you work as many problems as possible. Please note that detailed

answers for the exercises are provided in the book whereas a separate solutions manual is required for the problem section.

HELP SESSIONS:

To help you along, help sessions will be offered, as needed. We will meet at a time to be determined by popular vote. This is your chance to take advantage of a free tutor. There is no such thing as a stupid question. The atmosphere in help sessions is quite relaxed, giving you a chance to work through problems which you may not want to bring up during regular class periods. Besides, there is little time to ask questions during class. It also helps me to get to know you. Who knows, you may need a letter of recommendation some time in the future. Since help sessions are entirely voluntary, extra points cannot be earned. This also means that you will not be penalized for not showing up.

GRADING PHILOSOPHY

The only important goal for you is to understand the material, and are able to demonstrate this. The laboratory is an integral part of the course. It may be possible to do very well in the lecture but poorly in the laboratory, or vice versa. If you have to miss a test, it is necessary to come by my office immediately before or after the test and present and acceptable excuse (i.e., doctor's statement).

You will take a total of 3 examinations of 1 hour each. This includes the final. In other words, the final will be a regular 1 h exam that happens to fall on the date of the published final (December 12, 2:00-4:30). Each exam will cover approximately 1/3 of the course material. Each exam counts the same. **The final exam will not be comprehensive.** You are allowed to drop the lowest of the three exams, including the final. Examples of a 1 hour exams with keys are in Room 318, which is your laboratory.

The grade average will be computed, as follows:

The two best hourly exams: 25% each
Laboratory: 25%
Quizzes: 25%

Remember a maximum of three points can be earned for classroom performance. These are additional points to be added on top of the grade average indicated above. A series of negative (-) marks will obviously not help you. Good attendance may make the difference.

DISABILITY ACCESS STATEMENT:

To request disability accommodations, please contact the Office of Disability Services at 348-4285. After initial arrangements are made with that office, contact your professor.

LABORATORY PROCEDURES:

Before coming to the laboratory you should have a look at the experiment you are to perform. Try to understand the basics. You can then decide for yourself which steps are critical and where you can afford to be lax.

You are requested to bring a laboratory notebook of your choice (no loose sheets) with you. Try to get into the habit of keeping a complete record of your lab activities as you go along. Your lab instructor will initial your lab book after each lab session (and after you have cleaned up your bench). Remember: This is your lab notebook. You will not be judged on its neatness but on

the completeness of your entries. You will receive, free of charge, a binder that describes the laboratory experiments.

You must come to all laboratory sessions. Under no circumstances will you be allowed to work by yourself in the laboratory. You instructor (or a substitute) must be present when you work. If he/she steps out for a moment, you will be told so. Violation of any safety rules will either result in a warning (first time) or expulsion if the transgression is serious enough. You have to wear safety glasses at all times. You must also be properly dressed. The departmental safety rules apply. Any mishap or accident must be reported immediately.

Balances are delicate tools. You are responsible for damage. Report malfunctions immediately. Your lab instructor will announce the policy concerning balances. He will also announce when report cards and bottles for unknowns are due.

APPROXIMATE LECTURE SCHEDULE

Projected Number of Class Periods	Chapter	Topic	Practice Exercises	Practice Problems
1	1	Measurements, review of general chemistry	1-B, 1-C	1-3, 1-4, 1-13, 1-14, 1-15, 1-22, 1-25
1 1/2	3	Experimental error		3-1, 3-2, 3-5, 3-6, 3-8, 3-9, 3-10, 3-12 3-14
1 1/2	27	Gravimeteric and combustion analysis	27-A	27-1 to 27-10, 27-14, 27-24, 27-25, 27-28, 27-29
1	6-1 and 6-2	Chemical equilibrium, fundamentals		
1	6-7 to 6-9	A) Acids/bases	6-K	6-33, 6-34, 6-35, 6-36
				6-38, 6-39, 6-40
1/2	7-1	Titrations	7-B	7-1 to 7-6
2	10	A1) Monoprotic	6-H, 10 C	6-41, 6-48, 6-52, 6-53
		acids/bases	10-H	10-2, 10-8, 10-17, 10-20, 10-26,10-27, 10-29, 10-31
Exam I				
1	11	A2) Polyprotic acids/bases	6-I, 6-J	6-50, 6-51, 11-2, 11-3, 11-4, 11-15,
				11-22, 11-23
1	12	A3) Acid/base		12-1, 12-3, 12-13,

Projected Number of Class Periods	Chapter	Practice Topic	Practice Exercises	Problems
2	6-3 to 6-5 (precipitation)	A4) Solubility	6-C, 6-D, 6-E	6-14, 6-15, 6-19, 6-24, 6-25
1	16	B) Redox		16-8, 16-9, 16-10
2	13	C) EDTA		7-16, 13-26, 13-28, 13-29
1 1/2	8	D) Activity	8-A, 8-B, 8-C	8-1, 8-2, 8-3, 8-12,
Exam II				
2	18	Spectrophotometry, Fundamentals	19-A, 18-B	18-1 to 18-19 18-16, 18-17, 18-18, 18-22, 18-23, 18-25
1	19	A) Applications		19-3
1	20	B) Spectrophotometers		20-1, 20-3, 20-5, 20-6,
2	23	Separations, Fundamentals		23-15, 23-16, 23-18, 23-19. 13-27 to 23-31, 23-33, 23-37, 23-43
1	24	A) Gas chromatography		24-1, 24-2, 24-3, 24-5 to 24-7, 24-11, 24-13, 14-14, 14-18
1	25	B) High performance liquid chromatography		25-1 to 25-3, 25-18 to 25-20
1	22	Mass spectrometry	22-A	22-2, 22-21 to 22-24
Exam III				