Chemistry 300 - Analytical Chemistry
Syllabus Summer 2013

Lecture: Tuesday & Thursday, 9 AM – 11:10 AM, University Center 115D
Lab: Tuesday & Thursday, 1 PM – 5 PM, Meyerhoff Chemistry 340

Instructor: Dr. Steve Mang
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Office Hours: by appointment

Email is by far the best way to get in touch with me. Please allow at least 24 hours for a response before you send your email again.

Important Dates:	May 31 – Last day to drop without a grade of "W" or change grade method July 3 – Last day to drop with a grade of "W" July 16 – Last day for "semester withdrawal" from session July 19 – Final exam (normal class time/place)

Course Summary and Objectives

Chemistry 300 is a course in analytical chemistry that combines a lecture, a discussion session that uses active learning methods, and a laboratory. Chemistry 300 will expose you to the theory and practice of quantitative chemical analysis and chemical equilibria. Active learning methods will be used in the Friday discussion sections and will also be incorporated into the lecture, in accordance with many recent studies on the ways in which students retain knowledge. Laboratories will loosely follow the topics covered in lecture, giving you a chance to experience the topics covered in Chemistry 300 with hands-on activities.

The following are the course objectives for Chemistry 300. Upon successful completion of this course:

- You will have a thorough understanding of the principles and theory behind chemical equilibria, quantitative analyses, and the laboratory equipment used to do real-world analytical chemistry.

- You will be able to interpret the results of quantitative experiments and interpret the data in meaningful ways.

Textbook and Other Materials

Daniel Harris, *Quantitative Chemical Analysis*, 8th ed., Freeman, New York. Other editions are fine, but you are responsible for figuring out discrepancies between your edition and the official course edition. Online web companion to the book at: www.whfreeman.com/qca

The laboratory manual will be available on the class Blackboard site. Printed copies of the manual will not be allowed in lab; you will need to write all relevant information from the manual in your lab notebook before coming to lab. Save some paper – please do not print the lab manual!

For this course, you will be required to use a carbonless copy lab notebook ("The Official Laboratory Research Notebook"), which can be purchased at the UMBC bookstore.

Clickers

Turning Technologies clickers will be used for short, interactive activities in lecture. It is your responsibility to purchase and register your clicker for this class. You will often be permitted and even encouraged to discuss these questions with your classmates and then each of you transmits your response based on your own judgment.

Clicker questions will represent 5% of your overall course grade. Each clicker question will be worth two points. Correct answers will get you two points, incorrect responses will earn you one point, and questions that you don't answer (because you are absent or just choose not to answer) will be counted as zeros. Clicker questions will be asked in every lecture meeting.

It is academic misconduct to bring someone else's clicker to class and/or to have someone bring your clicker to class. If you are found in possession of someone else's clicker or if it is found that someone brought your clicker to class, you will be reported to the UMBC Academic Misconduct Committee and you will receive an F in the course. Because unforeseen events happen, you will be given 3 free days for not clicking. These count towards all absences, forgotten clickers AND clicker malfunctions. If you think your clicker isn't working, contact Turning Technologies immediately!

You can purchase your clicker at the UMBC bookstore. If you are required to have a clicker in another class, you only need ONE clicker for all your classes. You must register your TT clicker through the course Blackboard site. You only need to register your clicker in Blackboard one time no matter how many courses you are using it in. The serial # is the 6 digit alpha-numeric code below the bar code. The code may include only 0-9 and A-F (not the letter "O" or the letter "I"). There is no additional registration fee. I strongly recommend writing your name on your clicker so that if you lose it, it can be returned to you. If you lose your clicker, you will have to purchase a new one or forfeit the opportunity for points in the class. If you get a new clicker during the course of the semester, register it as you did the first one and all points will be held and continued. You do not need to notify the instructor upon registering a new clicker.

Academic Integrity

UMBC takes a strong stand against academic dishonesty in the classroom. To read the full statement of academic integrity, please go to

http://www.umbc.edu/provost/integrity/Honorcode.htm

Cheating, fabrication of data, plagiarism, and other violations will not be tolerated in this course. Penalties will start with a zero for the assignment and may escalate for further infractions.

Tentative Lecture Schedule

This schedule is *extremely* tentative and subject to change. Any changes, especially to exam dates, will be discussed well ahead of time in lecture.

Date	Topics	Chapters	Exam
May 28	Introduction, Measurements	1, 3	
May 30	Measurements, Error, Statistics	1, 3, 4	
June 4	Sample Preparation & Quantitation	5, 27	
June 6	Chemical Equilibria, Activity	6, 26, 7	
June 11	Exam 1; Titrations & Volumetric Analysis	7, 10	Exam 1
June 13	Titrations & Volumetric Analysis	8-10	
June 18	Titrations & Volumetric Analysis	8-10	
June 20	Analytical Separations	8-11, 15	
June 25	Exam 2; Analytical Separations	22	Exam 2
June 27	Gas and Liquid Chromatography	23, 24	
July 2	Chromatography and Mass Spectroscopy	21, 23, 24	
July 4	No Class – Independence Day Holiday		
July 9	Exam 3; Capillary Electrophoresis	23, 24	Exam 3
July 11	Spectroscopy and Spectrometry	17-20	
July 16	Review for Final Exam		
July 18	Final Exam		Final Exam

Grading

The lecture and laboratory sections of the class will be graded separately. A grade of D or better is required in each section in order to pass the class; you cannot fail the lecture portion but pass because of an A in the lab portion. Final grades will be 55% lecture and 45% laboratory. Lecture grades will be comprised of your scores on three one-hour exams and one comprehensive final exam. Laboratory grades will be calculated based on your scores on ten lab reports and a laboratory final exam, and on inspection of your laboratory notebook. The weighting of the various components is described below:

Assignment	**Percent of Grade**
Three one-hour exams	40%
In-lecture assignments (clickers)	5%
Lecture final exam	10%
Laboratory Reports	30%
Laboratory Final Exam	10%
Laboratory Notebook	5%

Letter grades for the class will be based on the following scale:

Class Percentage	Letter Grade
100 – 90	A
89 – 80	B
79 – 68	C
67 – 55	D
54 – 0	F

Make-ups

Make-up labs and exams will be given in accordance with University policy, which requires a signed and readable note on official letterhead from a physician, an officer of the court, etc. In the interests of fairness, no make-ups will be given without proper documentation. All make-up labs must be completed within one week of the missed lab or within one week of your clearance to return to school, whichever is earlier. Absolutely no make-up labs will be allowed after Thursday, April 26. It is your responsibility to schedule your make-up labs before the relevant deadlines.

Laboratory Schedule

Date	Experiment	Report Due
May 28	No Lab Meeting	
May 30	Check-in and Experiment 1: Introductory Lab	
June 4	Experiment 2: Glassware Calibration	Lab 1
June 6	Experiment 3: Neutralization Titration	
June 11	Experiment 4: Precipitation Titration	Labs 2 and 3
June 13	Experiment 5: Complexometric Titration	
June 18	Experiment 6: Redox Titration	Labs 4 and 5
June 20	Experiment 7: Redox Back-Titration	
June 25	Experiment 8: Potentiometric Titration	Labs 6 and 7
June 27	Experiment 9: Spectrophotometric Titration	
July 2	Experiment 10: Liquid Chromatography Analysis	Labs 8 and 9
July 4	No Lab – Independence Day Holiday	
July 9	Lab Final Exam	Lab 10
July 11	No Lab Meeting	
July 16	No Lab Meeting	
July 18	No Lab Meeting	

- All laboratory reports will be **due at the beginning of lab** on the days indicated above. Any labs received after 1:05 pm on the day of the lab will be assessed a one day late penalty (i.e., 10 points), with additional days being incurred every 24 hours from 1:05 pm.

- Students arriving to lab after 1:05 PM will be officially considered late. The only penalty for this will be the lateness penalty deducted from your lab report. Students arriving to lab after 1:15 PM without having made prior arrangements with the instructor will be considered too late to perform the lab and will need to arrange a make-up. You must actually show up to qualify for this kind of make-up.

- Students leaving the lab after 5:00 PM will also be considered late. There will be a

penalty of 2 points per minute late leaving the lab.

- Any excused absences must be accompanied by appropriate documentation (e.g., doctor's note, police report, etc.). In the case of a university excused absence, any missed laboratory experiments **must be made up within one week** of the scheduled laboratory experiment.

Laboratory Reports

Ten lab reports (for experiments 1 to 10) must be turned in for grading **one week** after the respective lab experiment has been completed. Lab reports will be graded out of 100 points. **A mandatory 10 point deduction will be assessed on the lab report grade for each late calendar day,** calculated starting from the due date and including weekends and days when UMBC is not in session. **A minimum 5 point deduction will be assessed for significant figures and rounding errors.**

Missing lab reports, or reports that are turned in after July 9th, 2013 will be graded with a score of 0 and be included in the calculation of the final grade for the laboratory portion of the course.

Your lab notebook grade will be calculated from the carbon copy pages that you will turn in at the end of each lab day. Missing notebook pages will receive a score of zero. You can turn in the copy pages or the originals, as long as they are legible and neat. Illegible pages may receive lower scores if the information I am looking for cannot be located.

Laboratory Materials

1. Lab Notebook: Students should **purchase a 100-page notebook (carbonless copy)**. Procedures for the experiment are to be summarized in the notebook **before** the scheduled lab period. All data are to be recorded directly in the notebook in ink! Try to maintain an organized and legible notebook (see below). Have the TA check your notebook for style and format within the first few lab meetings.

2. Safety: Goggles are to be worn in the laboratory at all times! In addition, the workbenches are to be kept clear of clutter (books, backpacks, etc.). Appropriate clothing is to be worn in the laboratory - no sandals or open-toed shoes, no shorts or sleeveless shirts. Anyone coming to lab without proper attire will not be allowed to perform that day's experiment. Long hair should be tied back. NO FOOD OR DRINKS IN THE LAB!

Laboratory Notebook Guidelines

Your lab notebook is intended to be a substantive record of work performed in the laboratory, in which you must record the data/results obtained from your experiments. It should contain sufficient information so that anyone reading your notebook would be able to reproduce your experiments, and evaluate your conclusions. In general, scientific notebooks follow a basic format similar to that provided below.

1. Table of Contents - Leave a few pages at the beginning of you notebook so that you

can list the individual experiments, the dates on which they were performed, and the pages on which the relevant procedures and data may be found.

2. Experiments - **Each lab exercise should be dated and initialed on every page**. In addition, the following items should be included:

a) Title - Should be listed in the Table of Contents and on the first page.

b) Objective - A brief (2 to 3 sentences) description of the purpose and goals of the analyses to be performed (in your own words).

c) Procedures - An itemized list of the sequential steps performed, including information relevant to the preparation of samples, standards, and reagent solutions, and the equipment used.

d) Data - **All data obtained during the analysis should be permanently recorded, in ink, directly in the notebook! Do not write data on pieces of scrap paper!** The data should be clearly labeled (including appropriate units) so that it is obvious what the data represents, i.e. tare weight, weight of tare + sample, etc. You may want to use data tables for convenient data entry. Prepare these tables ahead of time. If you make a mistake in entering data, do not erase; rather, draw a single line through the erroneous value(s) and enter the correct value(s) either above or next to the mistake(s). Include graphs when appropriate.

e) Calculations - Provide any necessary calculations for the experiment (i.e., solvent volume calculations to provide a specific concentration solution from a certain amount of solute) in your laboratory notebook. Your calculations should be clear enough so that it is obvious how the final result was achieved.

f) Observations - Report any useful, unexpected or necessary observations (e.g., the solution turned pink momentarily, followed by a return to clear). Provide potential explanations for unexpected phenomena.

Duplicate pages of your lab notebook MUST BE TURNED IN IMMEDIATELY FOLLOWING THE LAB. The original pages in the notebook can then be used by

you to complete the laboratory report and any associated analyses.