CHEM 120-080
HONORS QUANTITATIVE CHEMISTRY
SPRING, 2015

Text:	Daniel. C. Harris, Quantitative Chemical Analysis, 8th Ed., W. H. Freeman & Co. Probable Coverage: parts of Chapters 1 – 5 (mostly review) 6 - 23, 26		
Lecture:	CHEM 120-080	12:30 – 1:45 Tu,Th	116 BRL
Laboratory:	CHEM 120-080L	0700 – 1000 Mo	006 QDH
		0330 – 0630 Tu	006 QDH

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The lab will not meet at 7 pm on Monday, 2/9, but will meet at 3:30 on Tuesday 2/10 in 006 QDH. Bring your laptop. **Lab experiments will begin on Monday, February 16. Bring goggles and notebooks to lab.**

There will be a mandatory safety presentation at the beginning of the lab period on Tuesday, 2/10.

Detailed course information {Power Point lecture notes, previous quizzes and solutions, and written procedures for laboratory experiments} is available on Sakai to students registered in the course. The topics to be discussed in lecture include gravimetric analysis, solubility of precipitates, analytical spectrophotometry, polyprotic acids and bases, complexometric analysis, redox processes, separations, and mass spectrometry.

There will be 11 laboratory experiments in lab this semester. Most of the experiments are done individually and a few are done in small groups. Some written lab reports are required. Quantitative results for most experiments are to be submitted *via* Sakai.

There will be two exams and a cumulative final exam in the course. Calculators should be used for problems on exams; Excel will be used for data analysis and presentation in reports.

The experiments may all be completed in the allotted time: two three-hour lab periods. It is not required that you spend the full time in the laboratory. You may come and go as your needs and the laboratory procedures require. You may bring material to lab to study while you are waiting.

You may not work in the laboratory without supervision and permission. The laboratory may be open on Saturday mornings for "catch up" or repeat experiments.

Reasonable care must be exercised in performing all of the experiments in the laboratory. Safety goggles are required and MUST BE WORN IN THE LABORATORY when anyone is working. No equipment or material may be removed from the laboratory. No additional experiments may be performed without MY (Munson's) permission.

CHEM 120H Course Learning Goals

{Letters in parentheses indicate the departmental goal to which each goal is applied.}

After successful completion of this course, a student should be able to do the following:
1. Perform calculations and explain why standard procedures are followed for gravimetric inorganic analyses and perform quantitative gravimetric analyses in the laboratory. {1, 2}
2. Quantitatively analyze problems involving the solubility of ionic inorganic compounds: including the common ion effect, pH effects, ionic strength effects, and complexation effects. {1, 5}
3. Perform calculations and experiments for single component and multi-component spectrophotometric analyses, explain the operation of a spectrophotometer, and identify standard techniques of spectrophotometric analysis. {1, 5}
4. Quantitatively analyze problems involving weak acids (including polyprotic acids), bases, ampholytes, and buffers and perform related quantitative analyses. {1, 5, 6}
5. Perform calculations and experiments in complexometric analysis of inorganic ions. {1, 2, 5}
6. Perform calculations and experiments for inorganic oxidation/reduction reactions. {1, 2}
7. Explain techniques and quantitatively analyze problems in liquid/liquid extraction and gas chromatography. {1}
8. Identify and explain common mass spectrometric techniques, calculate and identify isotopic distributions for organic and inorganic ions, and interpret EI and CI mass spectra of simple organic compounds. {1}
9. Work effectively in teams in the laboratory. {8}
10. Write brief technical reports. {8,10}
11. Understand and practice proper laboratory safety procedures. {7}

Grading Policies

Laboratory grading:

Both the average value and the best value will be graded. Each result will be graded on a scale of 2.5 - 5, based on the relative error of your analysis, ε_{Ri}, compared with the historical average value of the relative standard error for that experiment, ε_R(avg). A grade will also be given for the precision of your results, also based on a comparison with results from students in previous years.

Laboratory results are due via Sakai, by 8 am on the designated days. A deduction of 0.1 point will be made for each day (or fraction thereof) late.

A deduction of 0.1 point will be made if the unknown number or other essential datum is missing and the results can be graded. If sufficient data are not provided, the minimum grade will be given.

A deduction of 0.3 point will be made for calculational errors. No. You may not recoup these points by re-calculation.

A deduction of 0.5 point will be made if the required number of results is not reported. One value receives only one grade (5.0 max).

Accuracy

$\pm\ \varepsilon_{Ri}/\varepsilon_R(avg)$	Grade	$\pm\ \varepsilon_{Ri}/\varepsilon_R(avg)$	Grade
0.10	5.0	0.80	3.8
0.15	4.9	0.87	3.7
0.20	4.8	0.94	3.6
0.23	4.7	1.00	3.5
0.27	4.6	1.25	3.4
0.30	4.5	1.50	3.3
0.35	4.4	1.70	3.2
0.40	4.3	1.90	3.1
0.47	4.2	2.00	3.0
0.54	4.1	2.50	2.9
0.60	4.0	3.00	2.8
0.70	3.9	>3.00	2.5

Precision	Grade
$\sigma_{Ri}/\sigma_R(avg) \leq 0.50$	2.0
$0.50 < \sigma_{Ri}/\sigma_R(avg) \leq 0.80$	1.8
$0.80 < \sigma_{Ri}/\sigma_R(avg) \leq 1.00$	1.5
$1.00 < \sigma_{Ri}/\sigma_R(avg) \leq 1.30$	1.3
$1.30 < \sigma_{Ri}/\sigma_R(avg) \leq 1.50$	1.0
$1.50 < \sigma_{Ri}/\sigma_R(avg) \leq 1.80$	0.8
$1.80 < \sigma_{Ri}/\sigma_R(avg) \leq 2.00$	0.5
$2.00 < \sigma_{Ri}/\sigma_R(avg) \leq 2.50$	0.3
$\sigma_{Ri}/\sigma_R(avg) > 2.50$	0.0

Course Grading:

Laboratory		60 %
Experiments	50 %	
Notebook	10 %	
Lecture		40 %
Exams/Homework	20 %	
Final Exam	20 %	

Approximate Grade Range:

A	≥	88
A-	=	85 - 87
B+	=	81 - 84
B	=	77 - 80
B-	=	73 - 76
C+	=	68 - 72
C	=	63 - 67
C-	=	58 - 62
D+	=	53 - 57
D	=	47 - 52
D-	=	40 – 46