

ANALYTICAL CHEMISTRY

Chemistry 3120 (3 credit hours)
Fall Semester, 2016

Instructor: Dr. Jim Harper
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TA: Jacob Powell (jpowell@knights.ucf.edu), PS 315, office hours: Th 1:30–3:30.

Lecture: M, W, F 10:30 AM - 11:20 PM, CB2 206

Office Hours: Dr. Harper: M, W 11:30 PM - 1:00 PM in PS 248 (or by appointment)
Jacob Powell:

Required Textbook: *Exploring Chemical Analysis*, 5th Edition, by D. C. Harris Freeman: New York, 2012.

Other materials: Scientific calculator & access to Microsoft Excel. **Cell phones** and other electronic devices are prohibited during exams. Such devices should be **turned off** and inside your bag.

Course Objective: The goal of an analytical chemist is to obtain and accurately report quantitative results and errors with maximum precision. The main tools of the trade will be taught in lecture, including statistical analysis, sampling, and a survey of various analytical techniques. Students will have an opportunity to practice these tools in problem sets. Students will be tested on these tools during three exams and a final.

Problem Sets: Homework is assigned, but will not be collected or graded. The **tests will very closely reflect homework and it is therefore to your advantage to complete all assigned homework**. You are encouraged to work together to solve homework problems.

Exams: There will be **three** midterms worth 100 points and a final exam worth 200 points. Your lowest test score will be dropped from the final point total. If the final exam is your lowest score, half of the points will be dropped and half retained. Because one test will be dropped, no make-up exams will be given for any reason. Exams will be given on the following dates:

Midterm #1	9/21
Midterm #2	10/14
Midterm #3	11/4
Final	12/12 10 AM – 12:50 PM

Financial aid: All faculty are now required to document students' academic activity at the beginning of each course. In order to document that you have begun this course, please log onto webcourses and complete Quiz #1 by the end of the first week of class (August 22nd) or as soon as possible after adding the course, but no later than August 27th. Failure to do so may result in a delay in the disbursement of your financial aid.

ANALYTICAL CHEMISTRY
SYLLABUS

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Grading:

Lecture

Exam #1	100
Exam #2	100
Exam #3	100
Final Exam	200
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Total (after dropping the lowest test)	400

The percent of the total points that you earn will be used to determine your grade:

A	93 - 100%	C	67 - 71.99%
A-	89 - 92.99%	C-	62 - 66.99%
B+	85 - 88.99%	D+	58 - 61.99%
B	81 - 84.99%	D	54 - 57.99%
B-	77 - 80.99%	D-	50 - 53.99%
C+	72 - 76.99%	Fail	<50%

Academic Honesty: In this course I will not tolerate any dishonesty or cheating. Your exams must represent your own work and not be copied from other sources. Violations of these principles and rules are subject to severe sanctions, according to the University's Rules of Conduct (see <http://www.osc.sdes.ucf.edu/>).

The University of Central Florida is committed to providing reasonable accommodations for all persons with disabilities. Students who need accommodations must be registered with Student Accessibility Services, Ferrell Commons Room 132, phone (407) 823-2371, TTY/TDD only phone (407) 823-2116, before requesting accommodations from the professor. Students with disabilities who need accommodations in this course must also contact the professor at the beginning of the semester to discuss needed accommodations. No accommodations will be provided until the student has met with the professor to request accommodations.

<u>Date</u>	<u>Chapter*</u>	<u>Topic</u>
8/22	0	Course overview and Introduction to Analysis (pp. 1–10)
8/24	1	Units and their conversions, concentration & dilution formulas (pp. 13–26), homework Ch. 1: 2-5, 7, 8, 12, 14, 15a, 18, 21, 23
8/26	3	Significant figures & math operations, propagation of errors (pp. 55–68)
8/29	3	More significant figures & practice, introduction to excel (pp. 68–72), homework Ch. 3: 1, 3-5, 9b, 9d, 9e, 11, 12b, 14a, 14b, 19b
8/31	4	Basic statistics, Gaussian distributions & excel applications (pp. 77–90)
9/2	4	Least-squares, linearization of data, calibration curves & excel (pp. 90–97), homework Ch. 4: 2, 6, 7, 10, 14, 15, 17
9/5		Labor day – no class!
9/7	4, 5	Review Chapter 4 as needed, Ch 5 – standard additions & internal standards (pp. 111–116), homework Ch. 5: 16, 17, 20, 22, 23, 24
9/9	1,6	Equilibrium constants (pp. 26–30) & solubility products (pp. 131–134), homework Ch. 1: 29, 30, 31 Ch 6: 18, 20, 21, 22
9/12	7	Chapter 7 – precipitation reactions (pp. 145–162)
9/14	7	More precipitation reactions, homework Ch 7: 2–4, 6, 9, 12
9/16	12	Advanced chemical equilibrium – Activity coefficients (pp. 259 –266), homework Ch 12: 9 – 11, 14, 16
9/19	1 – 7, 12	Review for Exam #1 – practice with class input
9/21		Exam #1 (50 min. in class)
9/23	8	Acids and bases – basic concepts (pp. 167–176)
9/26	8	pK_a , K_w and related concepts (pp. 176–185), homework Ch 8: 1, 3, 5, 10, 11, 13, 21, 22, 28, 34
9/28	9	Buffers & the Henderson-Hasselbalch eq. (pp. 189–195)
9/30	9	Buffers & acid–base indicators (pp. 195–203), homework Ch 9: 4, 7, 8, 12a, 14, 15, 17
10/3	10	Acid–base titrations (pp. 207–216)
10/5	10	The end point, digital filters & and applications (Kjeldahl) – (pp. 216–223), homework Ch 10: 6, 8, 10, 20
10/7	11	Polyprotic acids, K 's and pH calculations (pp. 233–243)
10/10	11	More polyprotic acids – determination of principal species & titrations (pp.243–251), homework Ch 11: 3, 8, 9, 12, 16, 22, 27a, 27b
10/12	8 - 11	Review for Exam #2 – practice with class input
10/14		Exam #2 (50 min. in class)

10/17	13	EDTA chelations and metal indicators (pp. 279–289)
10/19	13	More EDTA & practice (pp. 289–292), homework Ch 13: 1–4, 8
10/21	14	Fundamentals of electrochemistry (pp. 301–311)
10/24	14	The Nernst eq., equilibrium constants and cell voltages (pp. 312–321), homework Ch 14: 4, 7b, 10a, 13a, 14a, 16, 20
10/26	15	Potentiometry, junction potentials & ion selective electrodes (pp. 327–335)
10/28	15	Ion selective electrodes in practice – the pH meter, halides, cyanide etc., detection limits & compound electrodes (pp. 335–346), homework Ch. 15: 1-3, 7, 12, 14, 17
10/31	16, 17	Electrochemical analysis – redox titrations, coulometric analysis and voltammetry (pp. 351–358, 367–369, 375–381), homework Ch 16: 1, 3, 6
11/2	8 – 17	Review for Exam #3 – practice with class input
11/4		Exam #3 (50 min. in class)
11/7	18	Chapter 18 – Introduction to spectroscopy & Beer's law (pp. 387–403)
11/9	18, 19	When molecules absorb light (pp. 420–427), homework Ch. 18: 1, 2, 6, 9, 11, 14, 15, 23 Ch 19: 4, 5, 9, 12
11/11		Veterans day – no class!
11/14	20	Atomic Spectroscopy (pp. 435–443)
11/16	20	Instrumentation, interference and ICP (pp. 443–450), homework Ch 20: 3, 6, 7, 18a
11/18	21	Chromatography (pp. 455–465)
11/21	21	Mass spectroscopy (pp. 465–473), homework Ch. 21: 2, 8, 10–13, 20–22
11/23	22	Gas chromatography (pp. 479–488)
11/25		Thanksgiving holiday – no class!
11/28	22	Liquid chromatography (pp. 489–504) homework Ch 22: 2, 9a, 9b, 12, 16, 25
11/30	23	Ion exchange, exclusion & affinity chromatography & capillary electrophoresis (pp. 511–528), homework Ch 23: 1, 4, 11a, 13, 15, 18
12/2	18 – 23	Review for Final – practice with class input
12/12		Final 10:00 A.M.–12:50 P.M. Final will be comprehensive and include material from all chapters.

Chapters listed refer to D. C. Harris, Exploring Chemical Analysis, 5th Edition, Freeman: New York, 2012.

*This syllabus may be modified at the discretion of the instructor. The instructor reserves the right to modify the schedule, testing procedure and grading policy. Any such changes will be discussed in class or via e-mail.

Important Dates:

Monday, Sept 5
Monday, Nov 11
Nov 24–25
Monday, Oct 31

Labor Day Holiday
Veterans Day holiday
Thanksgiving holiday
Last day to withdraw