Chemistry 218H – Principles of Chemistry II Honors Lab
Spring 2024

Location: Room 465 Science Building
Time: 9:30 – 11:50 TTh
Text: None.
Handouts: **All available on-line** @ http://science.marshall.edu/castella/C218H.html

Lecture notes	This syllabus and learning objectives
Homework assignments	An old final exam
Instrument/experiment instructions	

Course Description: An advanced laboratory class designed for Principles of Chemistry II students. This lab will introduce students to concepts and/or techniques important to later laboratory classes and research. (CR or PR: CHM 212 and admission to the Honors College)

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Office hours: 2:00 – 3:50 Monday and 11:00 – noon most Tuesdays and Thursdays. We have 3 teaching assistants for this course who will have scheduled hours to assist you with the equipment as well.

If you cannot come by during scheduled office hours or if you have questions at other times, please feel free to drop by my office. My schedule is fluid and so scheduling a time is frequently the easiest way to see me. To do this, just see me right before or after class or drop me an email. ***Many students believe that they bother instructors when they ask questions, but helping you learn is the reason why we are here. If you have questions, please ask them***.

If you have questions that you believe can be answered by email and would like to use that method, please feel free to send them to me. I check my email regularly during the day.

Attendance

Attendance for this course is optional, but strongly encouraged. With nearly all the material for this course available on the internet, there will be a temptation to miss class more often than if you needed to come to obtain the lecture notes, homework assignments, and other materials. There is a strong correlation between attendance and success in chemistry courses. While good study habits are the most important determiner of success, students who regularly attend class are more likely to keep up with assignments than those who miss frequently.

Grading

Quizzes	20%
Known compound lab reports	25%
Unknown compound lab reports	25%
Final Exam	30%

The tentative grading scale is 90%-100% = A, 80%-89.99% B, etc.

There are no dropped tests and no make-up tests will be given.

During tests talking to each other and sharing of calculators are forbidden.

Calculators with alphanumeric and/or graphing capabilities are not permitted for tests or the final exam. If you have questions regarding your calculator, I will be glad to look at it. Make sure you do this before the day of a test. Also, you may not use your cell phone as a calculator.

During tests you may not use your own paper or other materials except your pen/pencil and calculator.

Miscellaneous Topics

Marshall University's polices regarding academic honesty, excused absences, and disabled students may be found at http://www.marshall.edu/wpmu/academic-affairs/?page_id=802.

If a test falls on a day that is cancelled by the university (e.g. a snow day), the test will occur on the next period the class meets.

Please turn off cell phone ringers before class. Failure to do so may result in you being removed from the room, even during a test.

You may not record my lectures without my permission and under no circumstances may they be posted, transferred, or reproduced to any form of media (Internet, print, television, and the like) without my permission.

Schedule

Date	Goal(s)	Assignments & due dates
January 9 Introduction to NMR Operation of EFT for C13 spectra and interpretation of C13 spectra.	1. We meet students and they meet us. 2. Students learn how to run 400 MHz instrument. Each group of 4 does 4 C13 spectra. 3. Students learn how to the number of peaks in a C13 spectrum based on its structure. 4. Students make up a summary table of C-13 NMR results (peaks, ppm, relative intensity) and associate peaks with structures. 5. Students learn how to look up NMR spectra on the web. 6. Review of normal valence rules for H, C, N, O, Cl, Br.	Lab 1. Operation of instrument 2. C13 of knowns *n*-hexane, 1-hexanol, cyclohexanol, cyclohexane. 3. Interpretation and making summary table for 3 compounds with C-13 spectra. NMR Homework 1
January 11 Alkanes, cycloalkanes DEPT and C13 spectra	1. Basic organic nomenclature for alkanes, alkenes, etc. 2. Taking and interpreting DEPT spectra. Making a summary table that includes number of attached hydrogens.	Lab 1. Operation of instrument to obtain DEPT spectra. 2 Knowns. 2. 1st unknown. NMR Homework 2 Organic homework 1
January 16 Proton spectra: Coupling and Integration. Interpretation of H spectra especially coupling and integration 6 theoretical spectra.	1. Taking and interpreting DEPT spectra and making summary table that includes number of attached hydrogens.	Lab Alkane known due NMR Homework 3
January 18 Nomenclature of substituted alkanes, alcohols, amines, and halides.	1. Nomenclature of simple substituted hydrocarbons. 2. Structural isomers, nomenclature, structures, and NMR.	Lab Unknown 1 due. NMR Homework 4 Quiz 1 Organic homework 2
January 23 Arene compounds Known ethyl benzene. Making up NMR samples. 4 theoretical structures.	1. Nomenclature of arene compounds and geometric isomers, structures, and NMR.	NMR Homework 5 Organic homework 3 1H/DEPT known due

January 25 Coupling Revisited. Coupling in C-13 NMR. Decoupling	1. Origin of coupling. Pascal's triangle. 2. Nuclear Overhauser Effect. 3. Decoupling. Instrumental decoupling. Exchange decoupling.	NMR Homework 6 Quiz 2
January 30 Nomenclature of carbonyl compounds	1. Nomenclature of carbonyl compounds 2. NMR of isomers of carbonyl compounds	Unknown 2 due. NMR Homework 7 Organic homework 4
February 1 NMR details. Ppm and Hz, resolution, sensitivity, shimming, tuning, superconductivity, electromagnets, permanent magnets. etc.	1. Review of basic terminology and terminology that describes instrumental and technical problems. 2. Understanding factors involved with resolution.	NMR Homework 8 Unknown 3 due. Should have H, C-13 and DEPT spectra and interpretation of them Coupled/decoupled C-13 known due. Quiz 3
February 6 Previous continued	1. Understanding of sensitivity, solution concentration, field strength. 2. Calculation of energy difference of spin states. 3. Signal-to-Noise calculation.	Principles lab: high field *vs*. low field. Sensitivity of solution *vs*. neat samples. Sensitivity of instrument and field strength Unknown 4 due. NMR Homework 9
February 8 Nuclei other than C-13 and H-1: H-2 Lecture Notes	1. Basic nuclear properties that effect NMR. 2. Spectra of deuterated solvents and coupling by nuclei with spin = 1.	Principles lab. Proton spectra of deuterated acetone, D/H coupling. C-13 coupling to H in CHCl3, the natural abundance of C-13. Quiz 4
February 13 The pulse experiment	Look at the basic pulse experiment	Unknown 5 due. Should have H, C-13 and DEPT spectra and interpretation of them. High/low field NMR known due.
February 15 Signal to noise and number of scans	Design of experiments and signal to noise.	Should have H, C-13 and DEPT spectra and interpretation of them C-13 abundance lab due. Quiz 5

February 20 Spectral Editing (Attached Proton Test) and 2D NMR (Het2dj) Q&A for Final Exam	Brief introduction to more complex pulse sequences and spectra.	Unknown 6 due. Should have H, C-13 and DEPT spectra and interpretation of them. S/N known due.
February 22 2007 Final-NMR part		Final exam Unknown 7 (solution) due. 90º pulse known due.