

Course Outline - CHEM 6362.015: Topics in High Resolution NMR
Winter 2012 (offered in March-April; lecture time/location to be determined)

Cross-listed as BIOC 6702.015

Instructor:

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Description: The graduate module “Topics in High Resolution NMR” is intended to provide a fundamental and practical basis for understanding of experiments employed in solution-state NMR spectroscopy. The material will be covered in an “accessible” manner, without assuming extensive background knowledge on the theoretical basis of NMR spectroscopy or of quantum mechanics. Upon completion, students should be in a position to: (1) comfortably use the product operator treatment to evaluate a typical high resolution NMR pulse sequence; (2) understand the fundamentals of 2D NMR experiments; and (3) understand the importance of phase cycling and coherence selection in modern NMR experiments.

Detailed lecture outline

Lecture # (90 min.)	Topic
1	The NMR Hamiltonian & review of quantum mechanical treatment
2	The Vector Model of NMR
3	Time independent treatment of a single spin $\frac{1}{2}$
4	Time dependent treatment of a single spin $\frac{1}{2}$
5	Relaxation in NMR
6	Product operators for isolated spins
7	Product operators for coupled spins
8	2D NMR spectroscopy – background topics
9	Analysis of 2D NMR experiments
10	Coherence selection – phase cycling
11	Coherence selection – gradients
12	Equivalent spins and spin system analysis

Method of evaluation: 4 problem sets (20% each; one following each set of 3 lectures) and a teaching style presentation (20%; to be scheduled outside of regular class time) covering the basis of an assigned NMR experiment to class and instructor.

Suggested Text:

James Keeler, “Understanding NMR Spectroscopy”, 2nd edition (2010), Wiley. (Available very cost-effectively from amazon.ca)

Additional Reading:

Malcolm Levitt, “Spin Dynamics: Basics of Nuclear Magnetic Resonance”, 2nd edition (2008), Wiley.
Ray Freeman, “Spin Choreography: Basic Steps in High Resolution NMR” (1998), Oxford University Press.