



Chem 342 • Organic Chemistry II

Lecture Summary 01 - 14 Jan 2009

Introduction

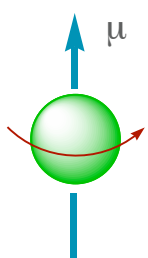
Tips for Learning Organic Chemistry

Learning organic chemistry is very much like learning a foreign language. You need the vocabulary (terms, structures, etc) and the grammar (reactivity, functional group properties) to put it together. Here are some suggestions for success: Read before coming to class. Come to class. Rewrite your notes using all your senses. Do problems. Use flash cards. Form a study group. Get a set of molecular models. And most important - DON'T FALL BEHIND.

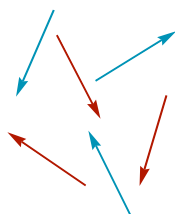
Chapter 13 - Nuclear Magnetic Resonance Spectroscopy

Provides detailed information about the structure of molecules

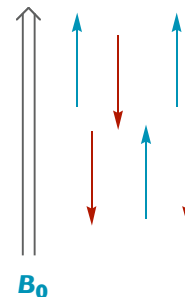
The NMR phenomenon occurs due to the spins of nuclei. A charged particle (like a proton) has a spin. This generates a magnetic field with a vector component. If a molecule is placed in an applied magnetic field (B_0), the nuclear spins can align with the field or against the field.



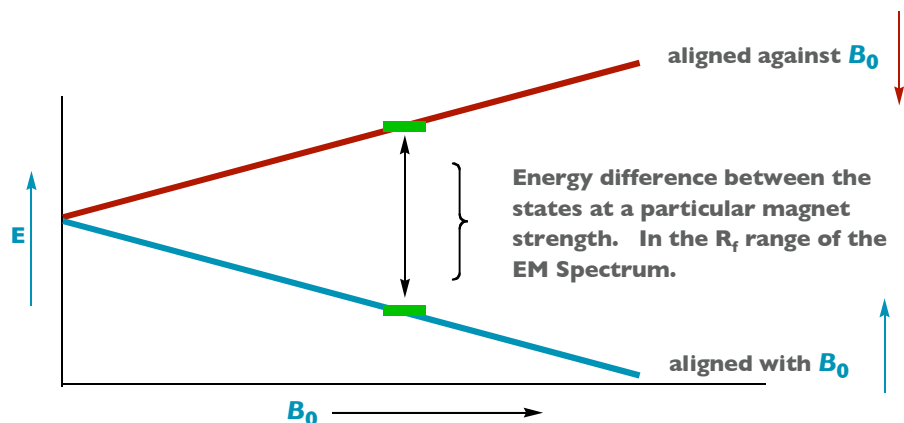
A spinning charged particle generates a magnetic field. A nucleus with a spin angular momentum will generate a magnetic moment (μ).



When placed in a magnetic field (B_0), they will adopt two different states - one aligned with the field and one aligned against the field.



Those nuclei that are aligned with the external field are lower in energy than those opposed to the applied magnetic field. This energy is in the range of radio frequencies. Thus, when radio waves are passed through the sample, the frequency corresponding to this energy difference will be absorbed and cause the spins to flip - this is termed **resonance**.



Many nuclei are "NMR Active". They are observable if the atom's Spin Quantum Number (I) does not equal zero. ^1H and ^{13}C are the most common NMR active nuclei used for organic structures. Others include ^2H (D), ^{14}N , ^{19}F , and ^{31}P . Atoms like ^{12}C and ^{16}O cannot be observed. The NMR phenomenon is the same utilized for medical Magnetic Resonance Imaging.

Chemical Shielding

Slight changes in the energy difference between the two spin states occur depending on the electronic environment around the nucleus. So, in ^{13}C NMR, different carbons (with different groups attached) will resonate at slightly different frequencies giving rise to separate peaks in the spectrum. The same is true for ^1H NMR. For example, the methyl acetate carbon NMR spectrum shows three different carbons - the most shielded by electrons occurs further to the right and the least shielded (most deshielded) lies on the left end of the spectrum.

