

CHAPTER OVERVIEW

14: Nuclear Magnetic Resonance Spectroscopy

Nuclear magnetic resonance (NMR) is a physical phenomenon in which nuclei in a magnetic field absorb and re-emit electromagnetic radiation. This energy is at a specific resonance frequency which depends on the strength of the magnetic field and the magnetic properties of the isotope of the atoms. Many scientific techniques exploit NMR phenomena to study molecular physics, crystals, and non-crystalline materials through nuclear magnetic resonance spectroscopy. NMR is also routinely used in advanced medical imaging techniques, such as in magnetic resonance imaging (MRI).

- [14.1: Nuclei Have Intrinsic Spin Angular Momenta](#)
- [14.2: Magnetic Moments Interact with Magnetic Fields](#)
- [14.3: Proton NMR Spectrometers Operate at Frequencies Between 60 MHz and 750 MHz](#)
- [14.4: The Magnetic Field Acting upon Nuclei in Molecules Is Shielded](#)
- [14.5: Chemical Shifts Depend upon the Chemical Environment of the Nucleus](#)
- [14.6: Spin-Spin Coupling Can Lead to Multiplets in NMR Spectra](#)
- [14.7: Spin-Spin Coupling Between Chemically Equivalent Protons is Not Observed](#)
- [14.8: The n+1 Rule Applies Only to First-Order Spectra](#)
- [14.9: Second-Order Spectra Can Be Calculated Exactly Using the Variational Method](#)
- [14.E: Nuclear Magnetic Resonance Spectroscopy \(Exercises\)](#)

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