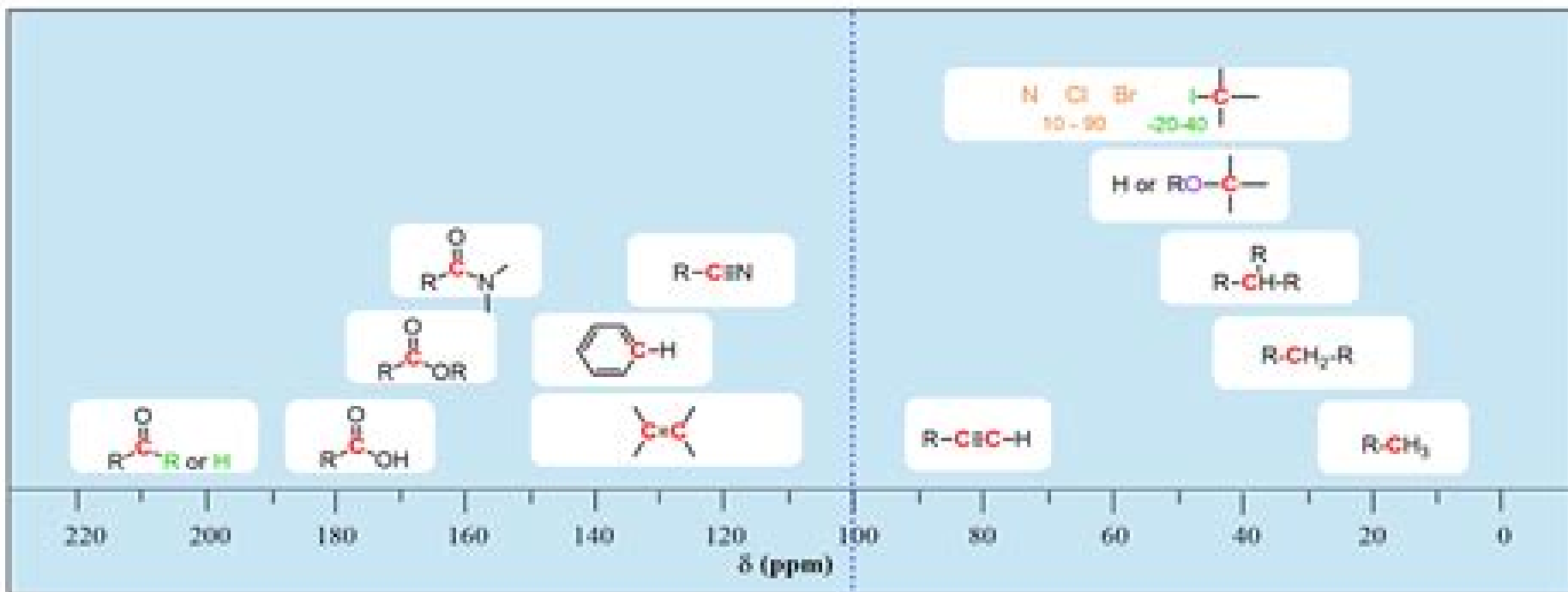


# <sup>13</sup>C NMR Chemical Shift Values



Unsaturated carbons ( $sp^2$ )

Saturated carbons ( $sp^3$ )

## Approximate Values of Chemical Shifts for <sup>13</sup>C NMR

$(CH_3)_4Si$	0	$I-C$	-20 - 40	$C=C$	100 - 150	$R-C(=O)N$	155 - 185
$R-CH_3$	8 - 30	$Br-C$	25 - 65	$C\equiv N$	150 - 170	$R-C(=O)OH$	165 - 185
$R-CH_2-R$	15 - 55	$Cl-C$	35 - 80	$C\equiv N$	110 - 140	$R-C(=O)OR$	165 - 185
$R_2CH$	20 - 60	$O-C$	40 - 80			$R-C(=O)H$	190 - 220
$R_3C$	30 - 50	$N-C$	30 - 65			$R-C(=O)R$	190 - 220

# Proton And Carbon 13 Nmr Spectroscopy

**F. W. Wehrli, T. Wirthlin**



## **Proton And Carbon 13 Nmr Spectroscopy:**

**Proton and Carbon-13 NMR Spectroscopy** Raymond John Abraham, P. Loftus, 1978      **Carbon-13 NMR Spectroscopy** Eberhard Breitmaier, Wolfgang Voelter, 1987 E Breitmaier W Voelter Carbon 13 NMR Spectroscopy High Resolution Methods and Applications in Organic Chemistry and Biochemistry Third completely revised edition New techniques and increased use of computers have led to rapid development in  $^{13}\text{C}$  NMR spectroscopy with enhanced instrumental sensitivity and improved quality of the spectra This necessitated a complete revision when the third edition of this successful monograph was prepared The new methods described include those for multiplicity analysis and two dimensional homo or hetero nuclear shift correlations As in the second edition the authors survey the large number of  $^{13}\text{C}$  NMR applications to organic molecules and natural products in a representative and systematic rather than an exhaustive way New sections about coupling constants organophosphorus and organometallic compounds as well as synthetic polymers have been added The scope remains limited to high resolution methods and molecular systems      **Interpretation of Carbon-13 NMR Spectra** F. W. Wehrli, A. P. Marchand, S. Wehrli, 1988-06-23 This is the second edition of a very successful book which provides the conceptual and experimental basis for the interpretation of  $^{13}\text{C}$  NMR spectra       **$^{13}\text{C}$  NMR Spectroscopy** Eberhard Breitmaier, Gerhard Bauer, 1984      *Carbon-13 NMR of Flavonoids* P.K. Agrawal, 2013-10-22 This detailed treatise is written for chemists who are not NMR spectroscopists but who wish to use carbon 13 NMR spectroscopy It shows why measurement of carbon 13 NMR is needed and explains how the method can or should be used for rapid characterization of flavonoids one of the most diverse and widespread groups of natural constituents The first part of the book presents background information and discussion of the essential aspects of flavonoids and carbon 13 NMR spectroscopy and demonstrates its significant role in the revision of several earlier established chemical structures It discusses various one and two dimensional NMR spectroscopic techniques and other relevant experimental methodologies for the interpretation of spectral details which enable individual resonance lines to be associated with the appropriate carbons in a molecule The second part provides a comprehensive coverage of the carbon 13 chemical shifts of various classes and subclasses of flavonoids It also illustrates how to utilize carbon 13 data to gain information for the determination of the nature number and site of any substituent in flavonoids Vital information for the differential and complete structure elucidation of the various classes of flavonoids by carbon 13 NMR shielding data is described in depth in the third part of the book The book will be welcomed by all those working in natural product chemistry who will appreciate the non mathematical approach and the fact that such a wealth of theoretical and practical information has been assembled in a single volume      *Carbon-13 NMR Spectroscopy of Biological Systems* Nicolau Beckmann, 1995-04-06 This book is intended to provide an in depth understanding of  $^{13}\text{C}$  NMR as a tool in biological research  $^{13}\text{C}$  NMR has provided unique information concerning complex biological systems from proteins and nucleic acids to animals and humans The subjects addressed include multidimensional

heteronuclear techniques for structural studies of molecules in the liquid and solid states the investigation of interactions in model membranes the elucidation of metabolic pathways in vitro and in vivo on animals and noninvasive metabolic studies performed on humans The book is a unique mix of NMR methods and biological applications which makes it a convenient reference for those interested in research in this interdisciplinary area of physics chemistry biology and medicine An interdisciplinary text with emphasis on both  $^{13}\text{C}$  NMR methodology and the relevant biological and biomedical issues State of the art  $^{13}\text{C}$  NMR techniques are described Whenever possible their advantages over other approaches are emphasized The chapters constitute comprehensive reviews and are written by acknowledged experts in their fields Chapters are written in a clear style and include a large number of illustrations and comprehensive references Proton and Carbon-13 NMR Spectroscopy Raymond John Abraham, 1987 Carbon-13 NMR Spectroscopy J Stothers, 2012-12-02 Carbon 13 NMR Spectroscopy focuses on the potential of  $^{13}\text{C}$  techniques and the practical difficulties associated with the detection of  $^{13}\text{C}$  NMR absorption This monograph includes a descriptive presentation of  $^{13}\text{C}$  shielding results that has been adopted with emphasis on the structural and stereochemical aspects Organized into four parts encompassing 11 chapters this book starts with an overview of the characteristics of the NMR signals derived from compounds containing  $^{13}\text{C}$  nuclei in natural abundance that are inherently much weaker than those exhibited by protons This monograph then compares the primary characteristics of  $^{13}\text{C}$  NMR with the more familiar proton methods Other chapters consider the  $^{13}\text{C}$  spectra of pyridine pyridazine pyrimidine pyrazine s triazine and s tetrazine The final chapter deals with the effects of solute solvent interactions on the shieldings of other nuclei This monograph is intended for organic chemists graduate students and researchers in various branches of chemistry with an interest in  $^{13}\text{C}$  NMR methods as another approach to chemical problems Spectra Interpretation of Organic Compounds Ernő Pretsch, 1997 A unique advanced textbook on spectroscopy This interactive tutorial presents text software and data in a state of the art introduction to the interpretation of  $^{13}\text{C}$  and  $^1\text{H}$  nuclear magnetic resonance infrared mass and UV VIS spectra Designed as a hands on guide the newcomer or student learns not only by reading but by experimenting using the powerful software tools and data provided on the accompanying CD ROM The software based on the outstanding SpecTool product enables you to learn how to interpret molecular spectra correctly rapidly and easily Moreover you can check your progress by working through the examples embedded in this self study course that demonstrate how to identify an organic compound and to elucidate its structure All the material and software presented are the essence of the two authors longstanding teaching experience Interpretation of Carbon-13 NMR Spectra F. W. Wehrli, T. Wirthlin, 1976 **Sadtler Standard Carbon-13 NMR Spectra** Sadtler Research Laboratories, 1974 **Spectroscopy of Organic Compounds** P S Kalsi, 2007 The Sixth Edition Of This Widely Used Text Includes New Examples Spectra Explanations Expanded Coverage To Update The Topic Of Spectroscopy The Artwork And Material In All Chapters Has Been Revised Extensively For Students Understanding New To This Edition New Discussion And New  $^1\text{H}$

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Carbon-13 Nuclear Magnetic Resonance Spectroscopy George C. Levy, Robert L. Lichter, Gordon L. Nelson, 1992

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**Carbon-13 NMR Spectral Problems** Robert B. Bates, William A. Beavers, 2012-12-06 With the advent of Fourier transform spectrometers of great sensitivity it has become practical to obtain carbon 13 nuclear magnetic resonance C 13 NMR 13C NMR CMR spectra routinely on organic molecules and this technique has become one of the highest utility in determining structures of organic unknowns When the usual spectrometric techniques proton magnetic resonance H 1 NMR 1H NMR PMR infrared IR mass MS and ultraviolet UV do not readily reveal a compound's structure a C 13 NMR spectrum will often provide sufficient additional information to yield it unequivocally With this in mind the present work was designed to give advanced undergraduates graduate students and practicing chemists a working knowledge of and facility with the use of this valuable technique Some

familiarity with other spectrometric techniques is assumed recommended book Silverstein Bassler and Morrill Spectrometric Identification of Organic Compounds but no prior knowledge of C 13 NMR which is treated very lightly if at all in the widely used elementary organic texts is necessary A discussion of C 13 NMR spectroscopy is followed by 125 problems each consisting of a molecular formula two types of C 13 NMR spectra partially and completely proton decoupled with connecting lines to facilitate multiplicity assignments an integrated H I NMR spectrum and the most important IR UV and MS data These problems have been very carefully prepared thoroughly tested by students at the University of Arizona and we believe that very few errors remain

Methods in Plant Biochemistry Volume 1 P. M. Dey, 2012-12-02 Methods in Plant Biochemistry Volume 1 Plant Phenolics reviews current knowledge about techniques used in the analysis of the biochemistry of plant polyphenols and their importance in the agricultural and food industries It looks at the application of these techniques in the fractionation of cellular constituents isolation of enzymes electrophoretic separation of nucleic acids and proteins and chromatographic identification of the intermediates and products of cellular metabolism Organized into 15 chapters this book opens with an overview of the general procedures and measurement of total phenolics from detecting phenolic substances in crude plant extracts to determining which classes they belong to and the quantitative estimation of total phenol The reader is introduced to the chemistry structural variation function and distribution of each class of plant phenolics and in a few cases where this is practicable detailed listings of known derivatives are given Most chapters focus on chromatographic separations and high performance liquid chromatography HPLC along with thin layer and paper Rf values with HPLC retention times and NMR spectroscopy The book also outlines the procedures for the extraction isolation separation and characterization of different classes of phenolic compounds ranging from phenols and phenolic acids to phenylpropanoids lignins stilbenes and phenanthrenes flavones and flavonols chalcones and aurones flavanoids anthocyanins biflavanoids tannins isoflavanoids quinones xanthones and lichen substances The book is a valuable resource for students biochemists and researchers in the plant sciences

**Organic Chemistry** T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder, 2023 Organic Chemistry 13th edition provides a comprehensive yet accessible treatment of all the essential organic chemistry concepts with emphasis on relationship between structure and reactivity in the subject The textbook includes all the concepts covered in a typical organic chemistry textbook but is unique in its skill development approach to the subject Numerous hands on activities and real world examples are integrated throughout the text to help students understand both the why and the how behind organic chemistry This International Adaptation offers new and updated content with improved presentation of all course material It offers new material on several topics including the relevance of intermolecular forces in the immune response and vaccines like those for Covid 19 the chemistry of breathing carbonic anhydrase how conjugation and complexation affect the color of lobsters and how biodegradable polymers are used to stabilize vaccines and pharmaceuticals Content is revised to reflect the current understanding of chemical processes and improved depictions of longstanding

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web don't want to make a mistake here these are sequences you might also see the word a series and you might even see a geometric series a series the most conventional use of the word series means a sum of a sequence so for example this is a geometric sequence a geometric series would be  $90 + (-30) + 10 + (-10) + 3$

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