

Table 13.3 Correlation of ^1H Chemical Shift with Environment

Type of hydrogen		Chemical shift (δ)	Type of hydrogen		Chemical shift (δ)
Reference	$\text{Si}(\text{CH}_3)_4$	0	Alcohol	$\begin{array}{c} \\ \text{---C---O---H} \\ \end{array}$	2.5
Alkyl (primary)	---CH_3	0.7-1.3	Alcohol, ether	$\begin{array}{c} \text{H} \\ \\ \text{---C---O---} \\ \end{array}$	3.3
Alkyl (secondary)	$\text{---CH}_2\text{---}$	1.2-1.6	Vinyl	$\begin{array}{c} \text{H} \\ \diagup \quad \diagdown \\ \text{C}=\text{C} \\ \diagdown \quad \diagup \end{array}$	4.5-6.5
Alkyl (tertiary)	$\begin{array}{c} \\ \text{---CH---} \\ \end{array}$	1.4-1.8	Aryl	Ar---H	7.0-8.5
Allylic	$\begin{array}{c} \text{H} \\ \\ \text{C}=\text{C---C---} \\ \end{array}$	1.6-2.2	Aldehyde	$\begin{array}{c} \text{O} \\ \\ \text{---C---H} \end{array}$	9.7-10.0
Methyl ketone	$\begin{array}{c} \text{O} \\ \\ \text{---C---CH}_3 \end{array}$	2.0-2.4	Carboxylic acid	$\begin{array}{c} \text{O} \\ \\ \text{---C---O---H} \end{array}$	11.0-12.0
Aromatic methyl	Ar---CH_3	2.4-2.7			
Alkynyl	$\text{---C}\equiv\text{C---H}$	2.5-3.0			
Alkyl halide	$\begin{array}{c} \text{H} \\ \\ \text{---C---Hal} \\ \end{array}$	2.5-4.0			

NMR. POSITIONS OF SIGNALS. CHEMICAL SHIFT

Table 17.4 CHARACTERISTIC PROTON CHEMICAL SHIFTS

Type of proton		Chemical shift δ , ppm
Cyclopropane		0.2
Primary	$\begin{array}{c} \text{H} \\ \\ \text{RC---H} \\ \\ \text{H} \\ \\ \text{H} \end{array}$	0.9
Secondary	$\text{R}_2\text{C---H}$	1.3
Tertiary	$\text{R}_3\text{C---H}$	1.5
Vinyl	$\text{C}=\text{C---H}$	4.6-5.9
Acetylenic	$\text{C}\equiv\text{C---H}$	2-3
Aromatic	Ar---H	6-8.5
Benzylic	Ar---C---H	2.2-3
Allylic	$\text{C}=\text{C---C---H}$	1.7
Fluorides	H---C---F	4-4.5
Chlorides	H---C---Cl	3-4
Bromides	H---C---Br	2.5-4
Iodides	H---C---I	2-4
Alcohols	H---C---OH	3.4-4
Ethers	H---C---OR	3.3-4
Esters	RCOO---C---H	3.7-4.1
Esters	H---C---COOR	2-2.2
Acids	H---C---COOH	2-2.6
Carbonyl compounds	H---C---C=O	2-2.7
Aldehydic	$\begin{array}{c} \text{H} \\ \\ \text{RC=O} \end{array}$	9-10
Hydroxylic	RO---H	1-5.5
Phenolic	ArO---H	4-12
Enolic	$\text{C}=\text{C---O---H}$	15-17
Carboxylic	RCOO---H	10.5-12
Amino	$\begin{array}{c} \text{H} \\ \\ \text{RN---H} \end{array}$	1-5