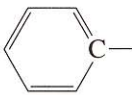
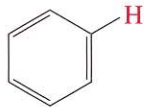


Approximate Chemical Shifts of Carbons in ^{13}C -NMR Spectra

Type of Carbon	Chemical Shift (δ)
1° Alkyl, RCH_3	0–40
2° Alkyl, RCH_2R	10–50
3° Alkyl, RCHR_2	15–50
Alkyl halide or amine, $\begin{array}{c} \\ -\text{C}-\text{X} \\ \end{array}$ (X = Cl, Br, or N—)	10–65
Alcohol or ether, $\begin{array}{c} \\ -\text{C}-\text{O} \\ \end{array}$	50–90
Alkyne, $-\text{C}\equiv$	60–90
Alkene, $\begin{array}{c} \diagup \\ \text{C}=\end{array}$	100–170
Aryl, 	100–170
Nitriles, $-\text{C}\equiv\text{N}$	120–130
Amides, $\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{N}- \\ \end{array}$	150–180
Carboxylic acids, esters, $\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{O} \end{array}$	160–185
Aldehydes, ketones, $\begin{array}{c} \text{O} \\ \\ -\text{C}- \end{array}$	180–215

Approximate Chemical Shifts of Hydrogens in ^1H -NMR Spectra

Type of Hydrogen	Chemical Shift (δ)
$-\text{C}-\text{CH}_3$	0.9
$\text{C}=\text{C}-\text{CH}_3$	1.6
$\text{C}\equiv\text{C}-\text{H}$	1.8
$\text{N}-\text{H}$	1–3
$\text{O}-\text{H}$	2–5
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{O}-\text{C}-\text{CH}_3 \end{array}$	2.0
$\begin{array}{c} \text{O} \\ \\ \text{C}-\text{CH}_3 \end{array}$	2.2
$\text{N}-\text{CH}_3$	2.2
$\text{I}-\text{CH}_3$	2.2
$\text{N}\equiv\text{C}-\text{CH}_3$	2.2
$\text{Ph}-\text{CH}_3$	2.3
$\text{Br}-\text{CH}_3$	2.7
$\text{Cl}-\text{CH}_3$	3.0
$\text{O}-\text{CH}_3$	3.3
$\begin{array}{c} \text{O} \\ \\ \text{C}-\text{O}-\text{CH}_3 \end{array}$	3.7
$\text{O}_2\text{N}-\text{CH}_3$	4.1
$\text{F}-\text{CH}_3$	4.2
$\text{C}=\text{C}-\text{H}$	5.5–6.5
	7–8
$\begin{array}{c} \text{O} \\ \\ \text{C}-\text{H} \end{array}$	10
$\begin{array}{c} \text{O} \\ \\ \text{C}-\text{O}-\text{H} \end{array}$	12

Note that these positions are only approximate. Furthermore, most of these positions are given for CH_3 groups. CH_2 groups appear farther downfield by about 0.3 ppm and CH groups by about 0.7 ppm.