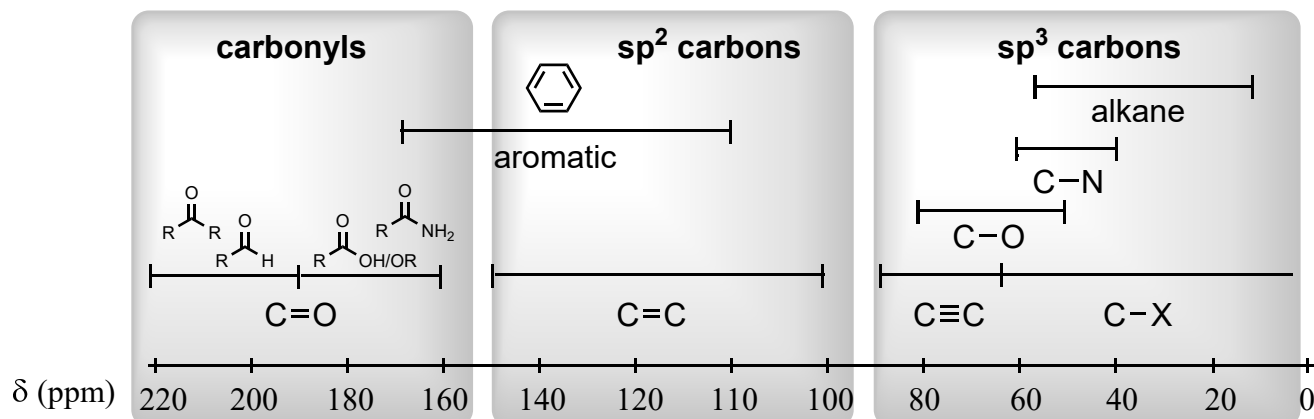



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¹³C NMR Chemical Shifts



Type of carbon	δ (ppm)	Description of carbon
R-CH ₃	10-30	primary alkyl (methyl)
R-CH ₂ -R	15-55	secondary alkyl (methylene)
R ₃ C-H $\begin{array}{c} \text{R} \\ \\ \text{R}-\text{C}-\text{R} \\ \\ \text{R} \end{array}$	20-60	tertiary or quaternary alkyl
C-I	0-40	attached to iodine
C-Br	25-65	attached to bromine
C-N	40-60	attached to nitrogen
C-Cl	35-80	attached to chlorine
C-O	40-80	attached to oxygen
RC≡CR	65-90	alkynyl
R ₂ C=CR ₂	100-150	alkenyl
	110-170	aromatic (phenyl ring C)
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{OH} \end{array}$ $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{OR} \end{array}$ $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{NH}_2 \end{array}$	165-185	C=O, carboxylic acid, ester, amide
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{R} \end{array}$ $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{H} \end{array}$	185-220	C=O, ketone or aldehyde