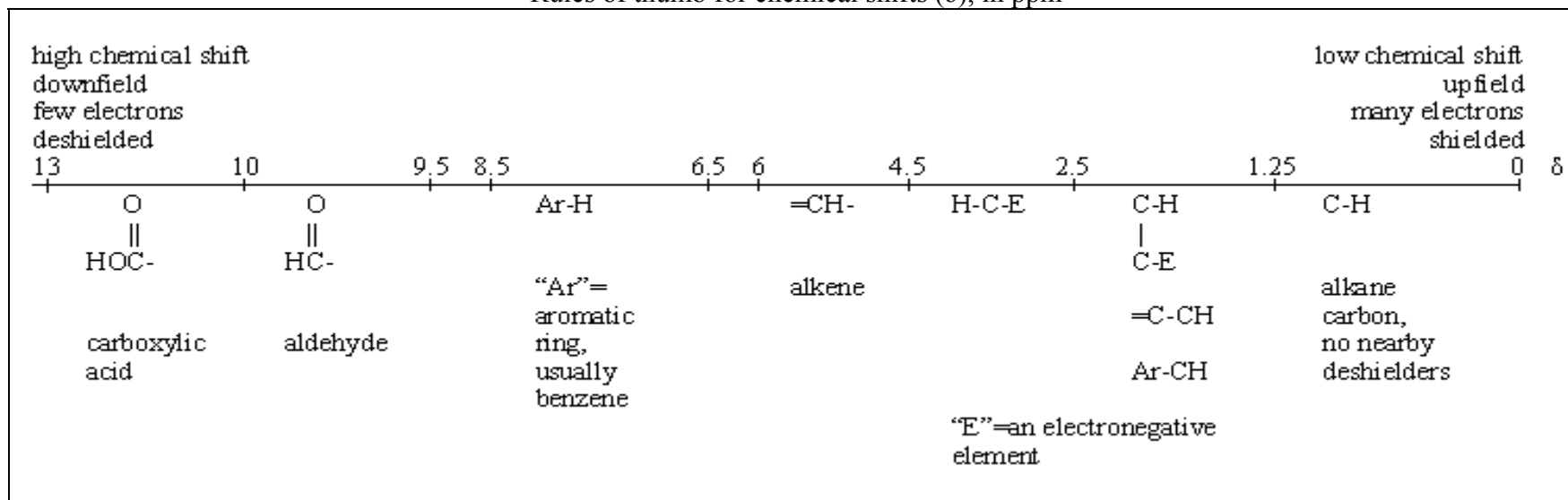


Rules of thumb for chemical shifts (δ), in ppm

These are just rules of thumb; there are exceptions.

Within each range, hydrogens on tertiary carbons tend to be shifted left; hydrogens on primary carbons tend to be shifted right.

Alcohol hydrogens: chemical shifts from 0.5-6.0; no splitting; often broad.

Alkyne hydrogens: chemical shifts from 2.0 to 3.0.

$$\text{degrees of unsaturation} = \frac{2 + 2 \times \#C + \#N - \#X - \#H}{2}$$

=# pi bonds + # rings

"X" = halogens. The number of oxygens does not affect the degrees of unsaturation.

Alkane coupling constants are from 5-8 Hz (usually 6-7 Hz)

Alkene coupling constants

type of coupling		coupling constant (J)
vicinal cis	H H C=C	6-14 Hz
vicinal trans	H C=C H	11-18 Hz
geminal	H C=C H	0-3 Hz
“allylic 1,2”	C=CH-CH	4-10 Hz
“allylic 1,3”	CH=C-CH	.5-3 Hz
“allylic 1,4”	CH-C=C-CH	0-1.6 Hz

Because of their small coupling constants, geminal, “allylic 1,3”, and “allylic 1,4” coupling are often not noticeable.

Benzene coupling constants

type of coupling	coupling constant (J)
ortho	6-10 Hz
meta	1-3 Hz
para	0-1 Hz

Because of their small coupling constants, meta and para splitting is often not noticeable.