1. *Reference in proton NMR*
2. *Chemical Shift*
3. *Integration of Signal*
4. *Identification of signal*
5. *Anisotropic effect*
6. *Splitting of signals*

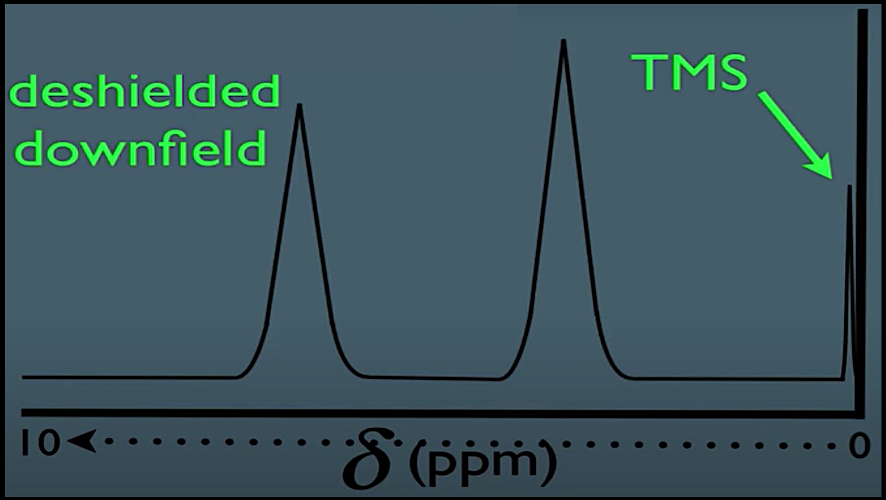
^{1}H NMR Spectroscopy

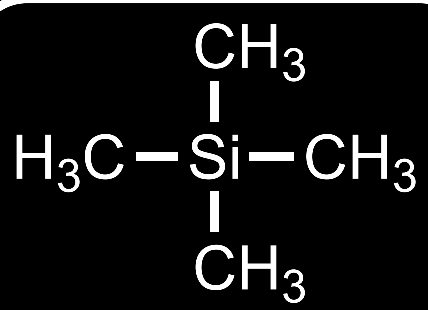
Reference in ^{1}H NMR

CH_3CH_2Cl

shielded
(Lower energy)

Deshielded
(higher energy)





Tetramethyl silane

1) Reference in proton NMR

2) Chemical Shift

3) Integration of Signal

4) Identification of signal

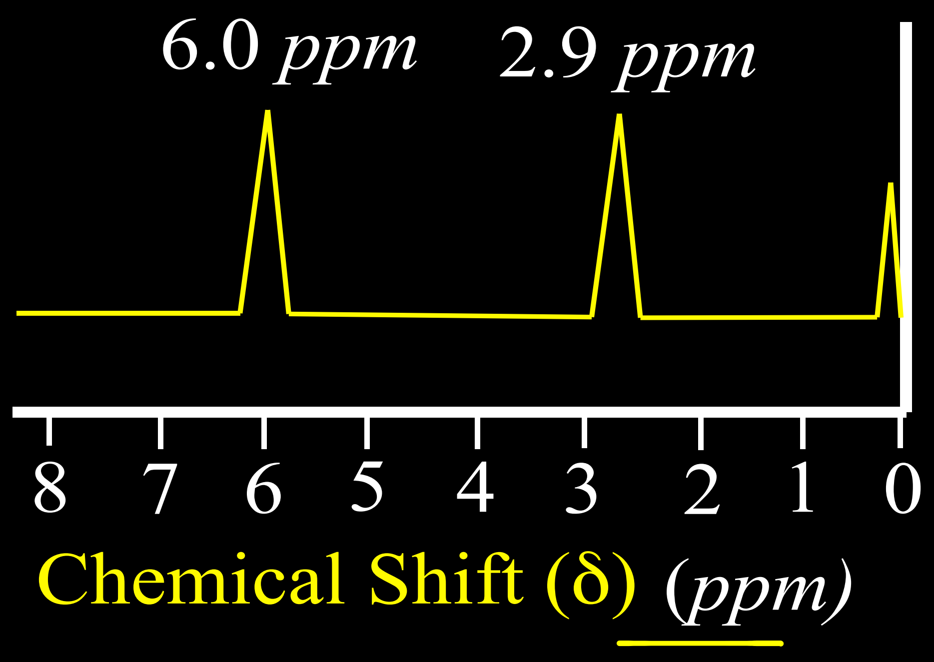
5) Anisotropic effect

6) Splitting of signals

^{1}H NMR Spectroscopy

Chemical Shift (δ)

The shift of an NMR signal from the signal of TMS.
Normally given in parts per million (ppm)



1) *Reference in proton NMR*

2) *Chemical Shift*

3) *Integration of Signal*

4) *Identification of signal*

5) *Anisotropic effect*

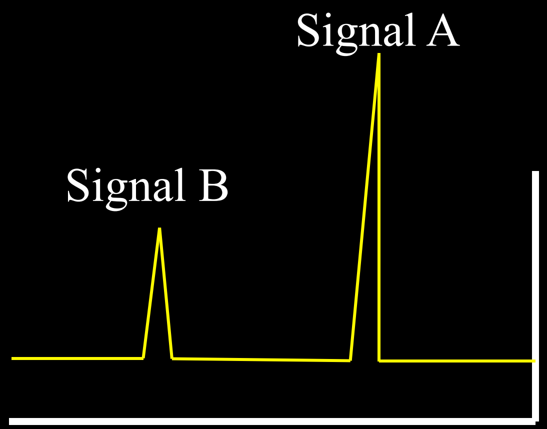
6) *Splitting of signals*

^{1}H NMR Spectroscopy

☆ Integration of signal

CH_3CH_2Cl

Signal A　　Signal B



$$\frac{\text{Area of signal B}}{\text{Area of signal A}} = \frac{2}{3}$$

It indicates, Signal A corresponds to 3 H's and Signal B corresponds to 2 H's

1) *Reference in proton NMR*

2) *Chemical Shift*

3) *Integration of Signal*

4) *Identification of signal*

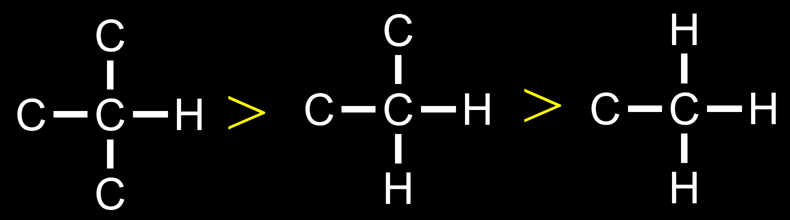
5) *Anisotropic effect*

6) *Splitting of signals*

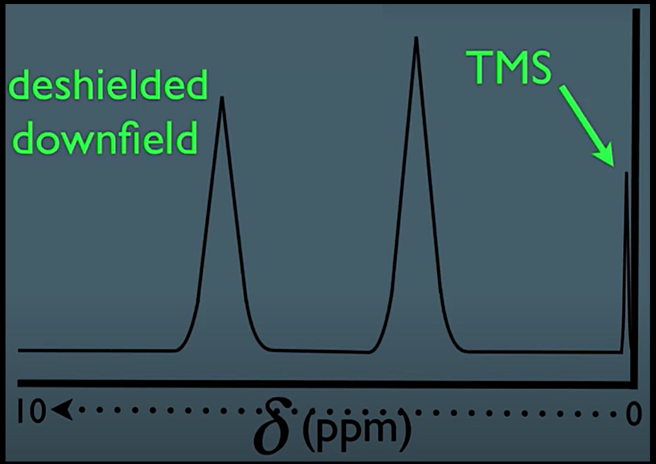
☆ How to identify a signal?

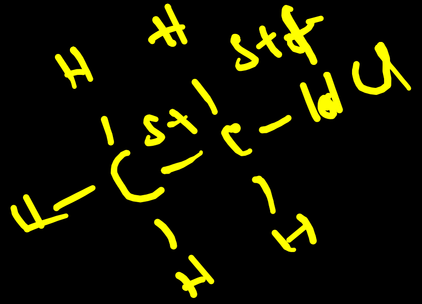
^{1}H NMR Spectroscopy

☆ Note-1:



~1.7 ppm > ~1.3 ppm > ~0.9 ppm



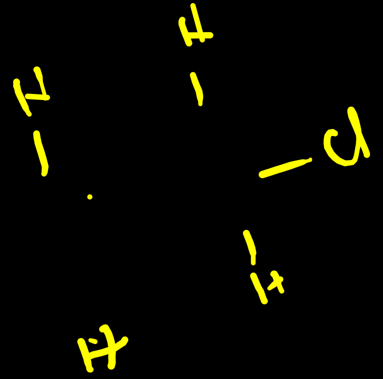


0.9+0.3

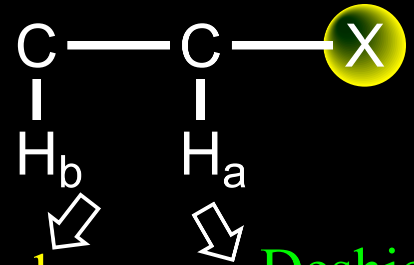
Electronegativity

2.55 2.2

C—H



0.9+0.3



shielded
(Lower energy)

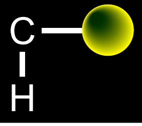
Deshielded
(higher energy)

X = electronegative atom
(or) Electron with drawing group

★ How to identify a signal?

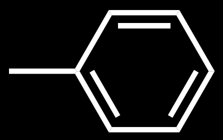
^1H NMR Spectroscopy

★ Note-2:



Roughly increase by

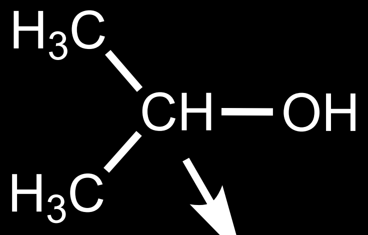
⇨ **E.N:** C < N < O < F

C ~1.0 *ppm*	N ~1.5 *ppm*	O ~2.0 *ppm*	F ~3.0 *ppm*
$-C=C$	$-NH_2$	$-OH$	$-F$
$-C\equiv C$	$-N(R)H$	$-O-R$	$-NO_2$
$-C(=O)-H$	$-N(R)R$	$-X$ (X = Br, Cl, I)	$-O-C(=O)-R$
$-C(=O)-R$			
$-C(=O)-OR$			
$-C(=O)-NH_2$			

CH_3CH_2Cl

0.9+0.3 = 1.2 ppm

1.3+2.0 = ~3.3 ppm



1.7+2.0 = ~3.7 ppm

0.9+0.3 = ~1.2 ppm