1) *Reference in proton NMR*

2) *Chemical Shift*

3) *Integration of Signal*

4) *Identification of signal*

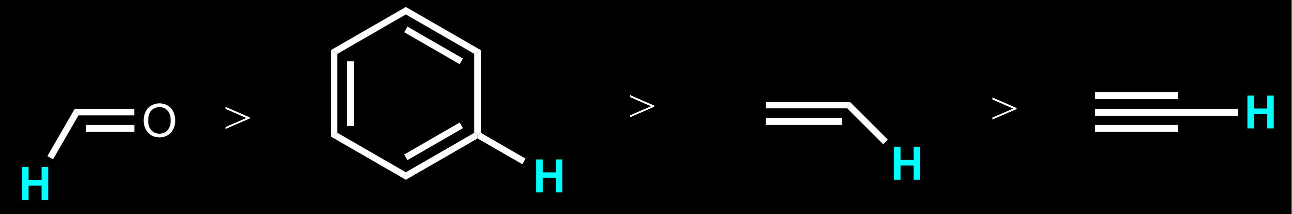
5) *Anisotropic effect*

6) *Splitting of signals*

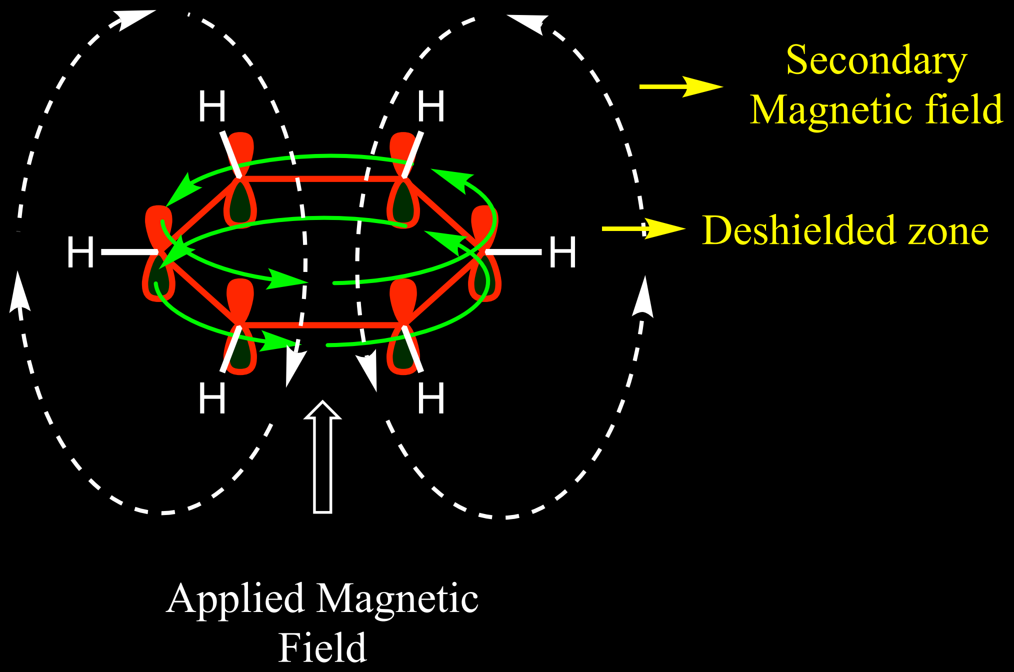
☆ How to identify a signal?

^1H NMR Spectroscopy

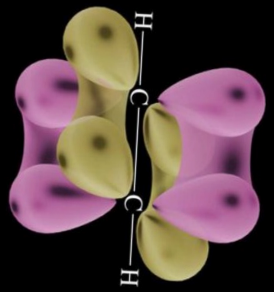
☆ Note-3:



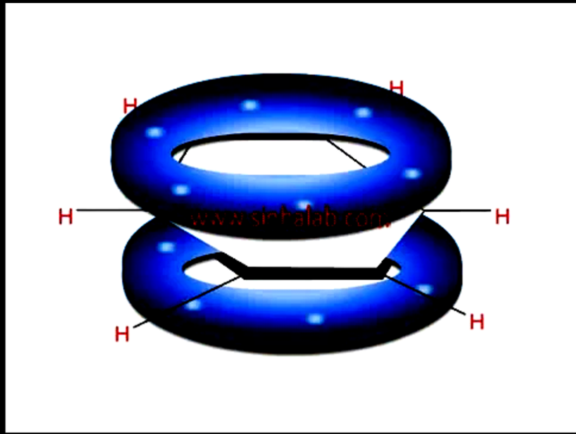
9.0-10.0 ppm | 6.5-8.5 ppm | 4.5-6.5 ppm | 2.0-3.5 ppm



Reason: Anisotropic effect

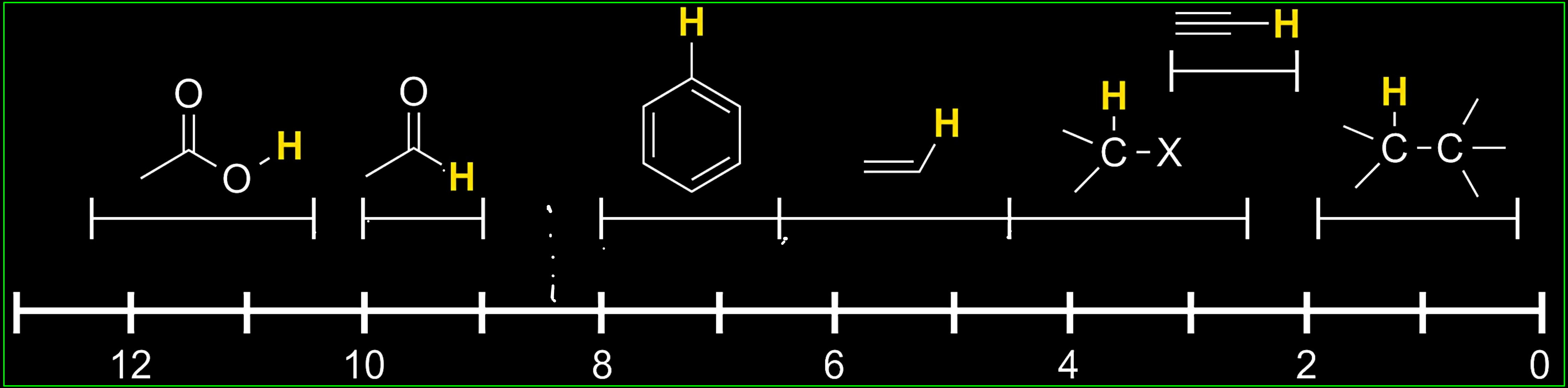


The circulating π -electrons induce a magnetic field that adds to the applied field which Causes them to experience a stronger net field and therefore resonate at higher frequency



^1H NMR Spectroscopy

Your simple guide to chemical shifts



-OH | NH

1) *Reference in proton NMR*

2) *Chemical Shift*

3) *Integration of Signal*

4) *Identification of signal*

5) *Anisotropic effect*

6) *Splitting of signals*

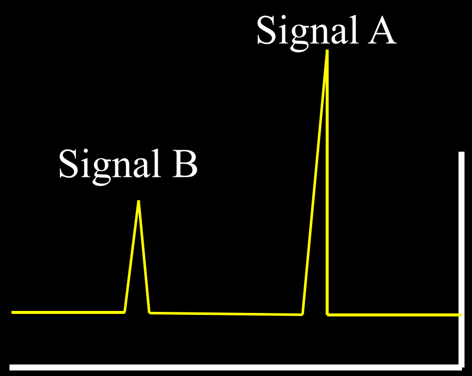
^{1}H NMR Spectroscopy

☆ Splitting of signal

CH_3CH_2Cl

Signal A

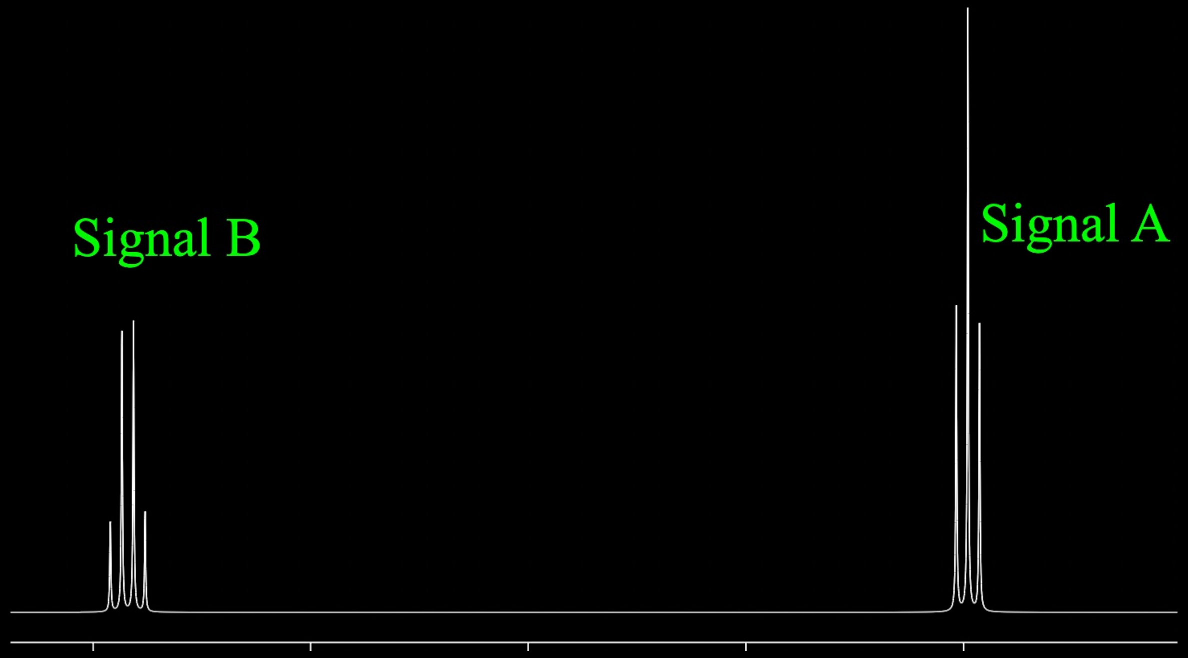
Signal B



Zoom the signals

These are not single peaks

Each signal splitted into multiple peaks



N+1 Rule

N= number of neighboring / different hydrogens

CH_2 Signal

Neighboring to CH_2 contains carbon with 3 H's

N+1 = 3+1 = 4

CH_2 signal will split into 4 peaks

CH_3 Signal

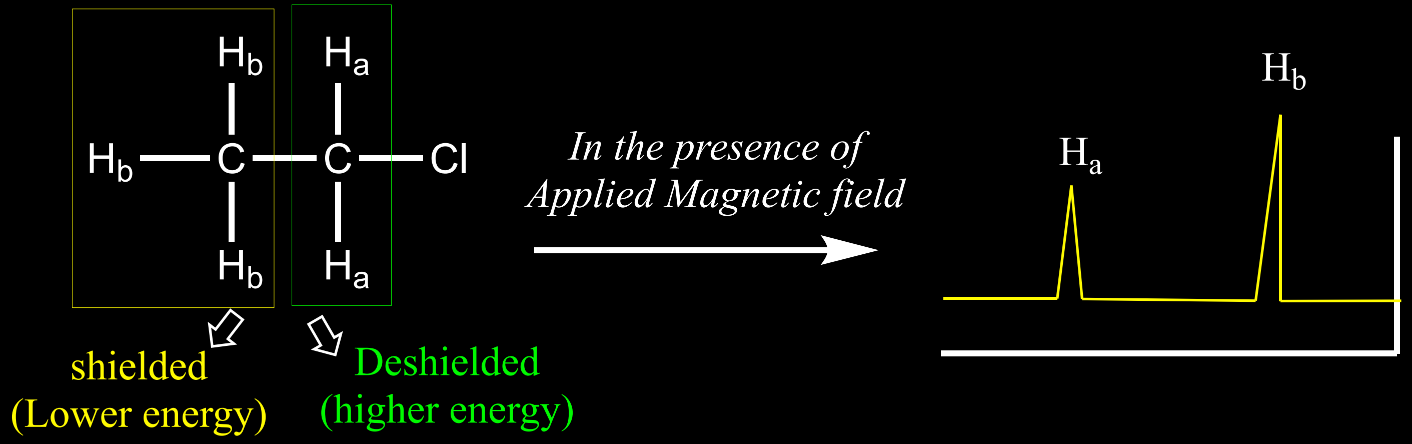
Neighboring to CH_3 contains carbon with 2 H's

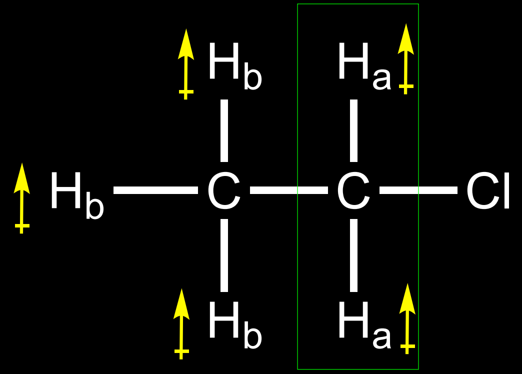
N+1 = 2+1 = 3

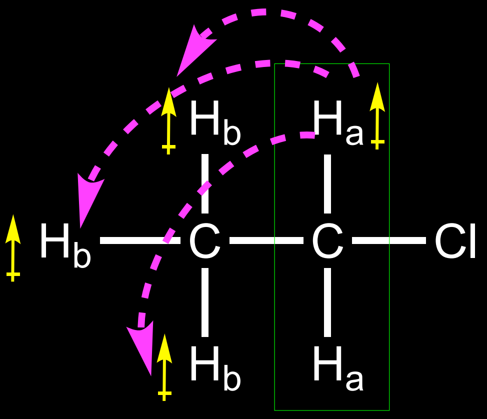
CH_3 signal will split into 3 peaks

^1H NMR Spectroscopy

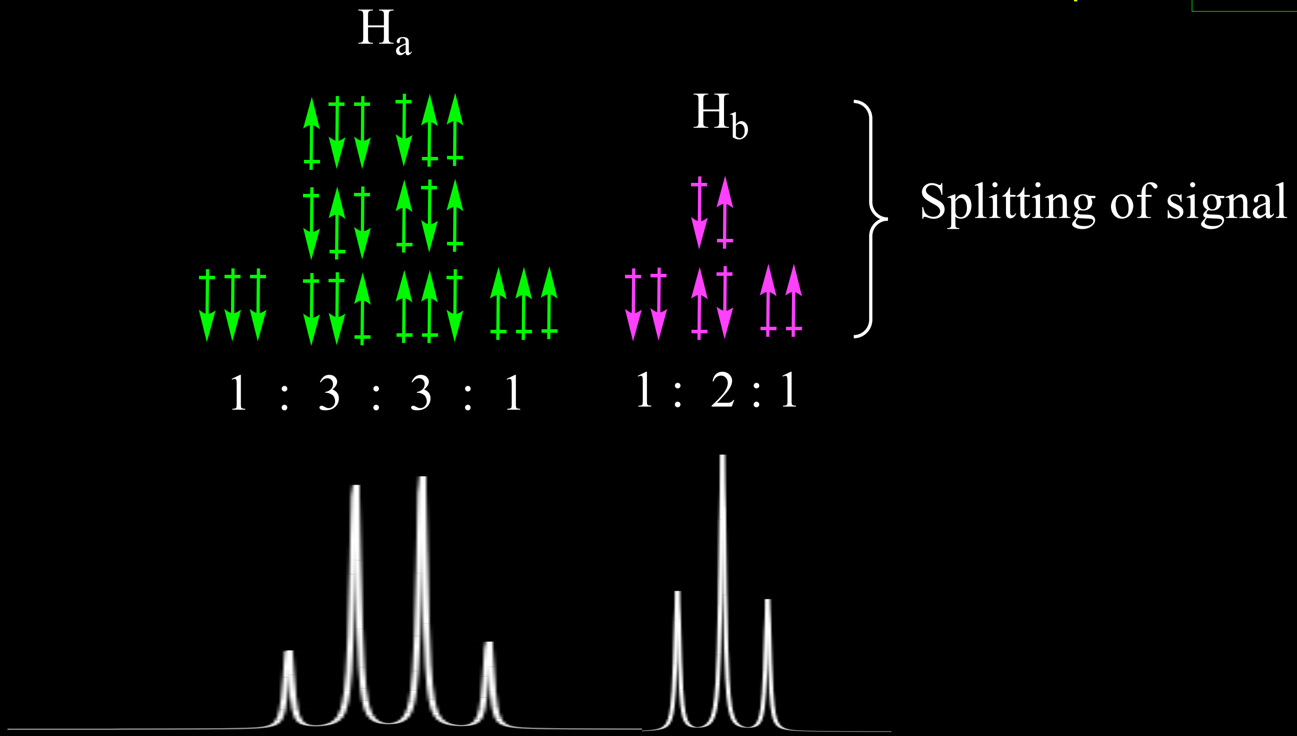
☆ Splitting of signal





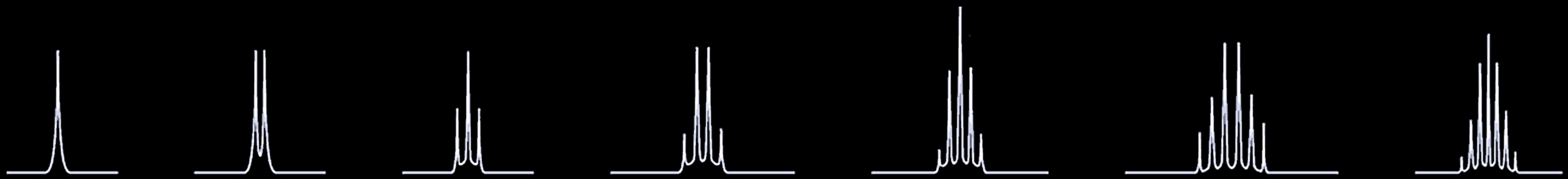


Spin-Spin coupling



^{1}H NMR Spectroscopy

☆ Multiplets



singlet *doublet* *triplet* *quartet* *quintet* *sextet* *septet*

Number of Neighboring H's (n)	Relative intensities of split peaks	Name of Multiplet
n = 0	1	singlet
n = 1	1 1	doublet
n = 2	1 2 1	triplet
n = 3	1 3 3 1	quartet
n = 4	1 4 6 4 1	quintet

☆ Examples:

^1H NMR Spectroscopy

- $Cl\text{-}CH_2\text{-}CH_2\text{-}Br$
  - *2 chemically non equivalent protons*
  - *two signals*

Cl-CH_2 Signal

Neighboring to CH_2 contains carbon with 2 H's

N+1 = 2+1 = 3

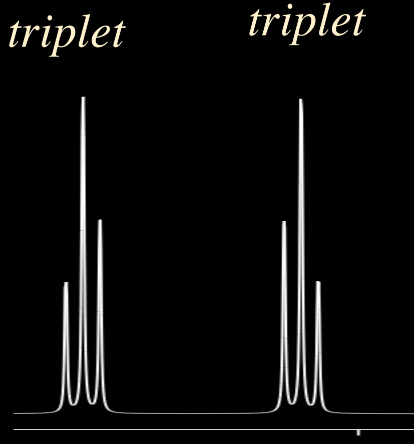
CH_2 signal will split into 3 peaks

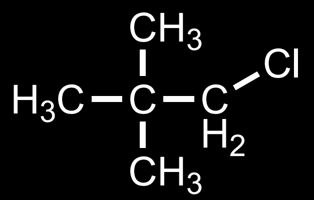
CH_2-Br Signal

Neighboring to CH_3 contains carbon with 2 H's

N+1 = 2+1 = 3

CH_2 signal will split into 3 peaks





- *2 chemically non equivalent protons*
- *two signals*

CH_2 Signal

Neighboring to CH_2 contains carbon with 0 H's

N+1 = 0+1 = 1

CH_2 signal will appear as singlet

CH_3 Signal

Neighboring to CH_3 contains carbon with 0 H's

N+1 = 0+1 = 1

CH_3 signal will appear as singlet