

The chemical shift of proton A is influenced by the direction of spin in proton B. Proton A said to be coupled ~~with~~ to proton B. Its magnetic environment is affected by whether proton B has a $+\frac{1}{2}$ or a $-\frac{1}{2}$ spin state.

So proton A absorbs at slightly different chemical shift value in X type molecule and Y type molecule.

* In X type molecules, proton A is slightly deshielded because the field of proton B is aligned with the applied field.

* In Y type of molecules, proton A is slightly shielded ~~because~~ with respect to what its chemical shift would be in the absence of coupling. In this later case, the field of proton B diminishes the effect of applied field on proton A.

04

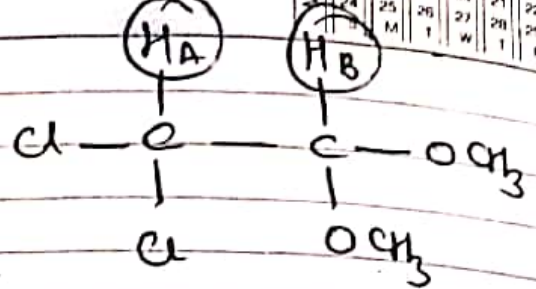
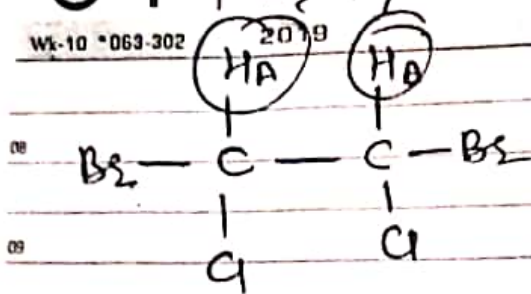
March
Monday

Wk-10 *063-302

2019

identical

Not identical



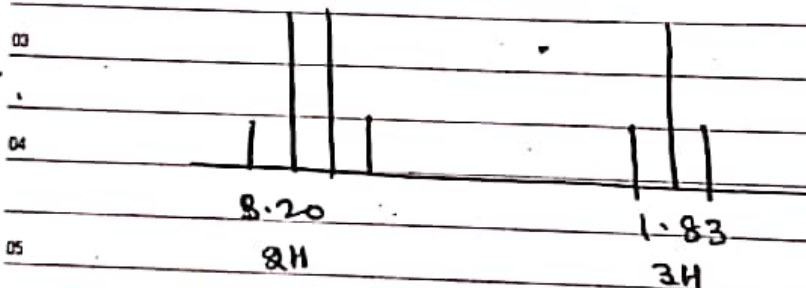
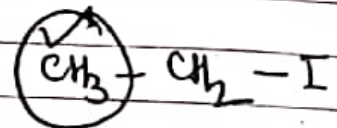
no coupling and splitting

HA & HB are identical

Give two signals
probably two doublets

12 One Signal [Proton A and Proton B has
11 same chemical shift value]

12



↑↑↑ ↑↑ ↓↓ ↓↓↓

↑↑↑ ↓↓

↓↑↑ ↓↓↓

Netspin $+\frac{3}{2}$ $+\frac{1}{2}$ $-\frac{1}{2}$ $-\frac{3}{2}$

Possible spin arrangements of the methyl protons

fig! Splitting pattern of ~~not~~ methylene protons due to the presence of methyl protons.

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				
S	M	T	W	T	F	S

March
Tuesday
2019

05

Wk-10 * 084-301

There are ~~actually~~ actually four different "types" of molecule in the solution, each type having a different methyl spin arrangement. Each spin arrangement causes the methylene protons in that molecule to have a different chemical shift from those in molecule with another spin arrangement (except, of course when the spin arrangements are indistinguishable, or degenerate)

Molecule having the $+\frac{1}{2}$ and $-\frac{1}{2}$ spin arrangements are three times more numerous in solution than those with the $+\frac{3}{2}$ and $-\frac{3}{2}$ spin arrangements.

