

Do Not Use Pencil

Do Not Staple, Please!

Course Chem 345

Lecturer Gellman

Day Friday

Date 1-29-16

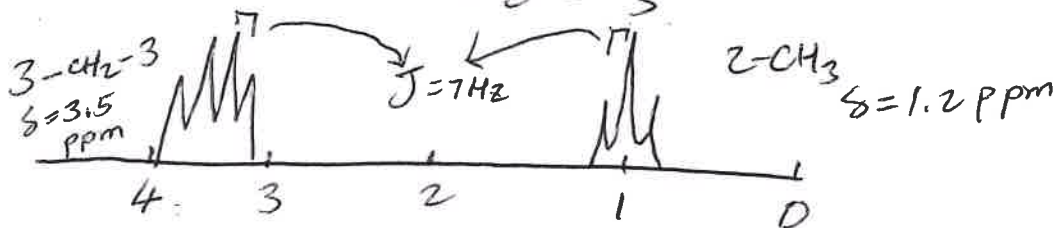
Notes Taken by In Liu

Page 1 of 4 (Total Pages)

Submit a **COPY** of these notes for posting, please.

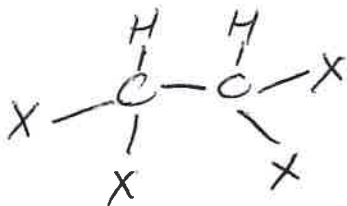
Recall:  $\text{CH}_3-\text{O}-\text{CH}_2-\text{O}-\text{CH}_3 \Rightarrow$  each resonance was a single line.

Contrast:  $\text{CH}_3-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_3$



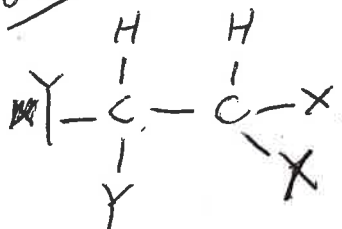
"The splitting of NMR"  $^1\text{H}$  Resonances arises because nearby non-equivalent H's influence the local magnetic field felt by one another.

i.e.



$\therefore$  H's equivalent  $\therefore$  one resonance

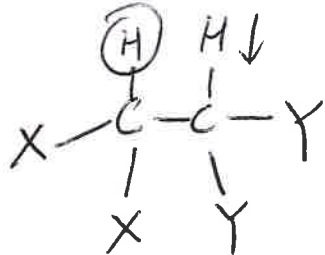
But



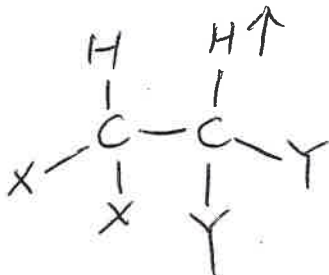
$\Rightarrow$  H's non-equivalent

$\therefore$  two resonances

AND each is split into a doublet.



vs.



$\Rightarrow$  influence of neighbors nucleus spin, via local mag. field

Do Not Use Pencil

Do Not Staple, Please!

Course Chem 345

Lecturer Gellman

Day Friday

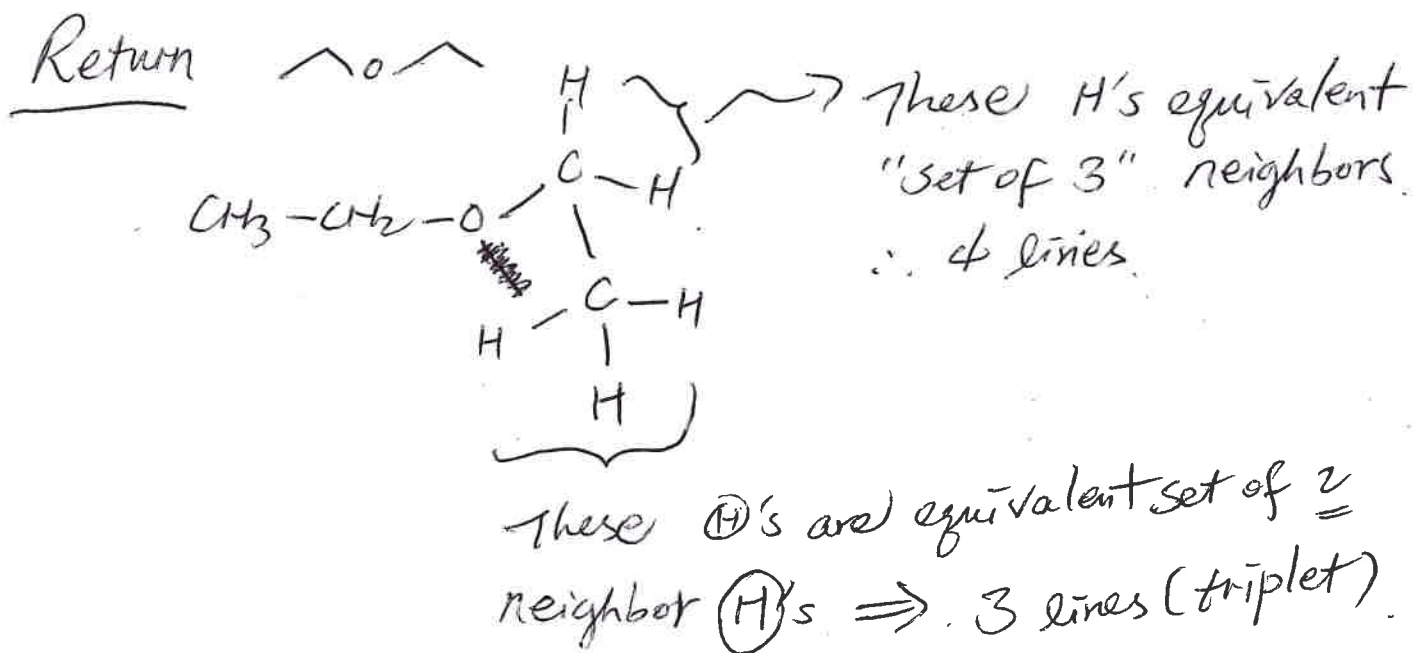
Date 1-29-16

Notes Taken by LD

Page 2 of 4 (Total Pages)

Submit a **COPY** of these notes for posting, please.

"n+1" rule for a given H, if there are  $\textcircled{n}$  H's on neighboring C, and these  $\textcircled{n}$  H's are all equivalent to one another, but not to the "given" H, resonance split into n+1 lines.



⇒ See text for explanation of "n+1" rule in terms of spin possibilities.

Overall ⇒ NMR provides 3 kinds of info (so far) for each set of chemically equivalent  $\textcircled{\text{H's}}$

Do Not Use Pencil

Do Not Staple, Please!

Course Chem 343

Lecturer Gellman

Day Friday

Date 1-29-16

Notes Taken by LL

Page 3 of 4 (Total Pages)

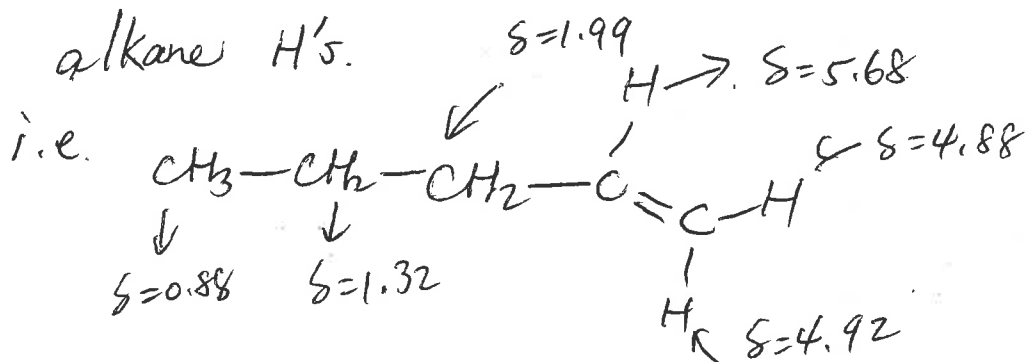
Submit a **COPY** of these notes for posting, please.

- ① Chemical shift  $\Rightarrow$  information about local environment w/n a molecule/ electronegativity of nearby atoms, other factors, etc.
- ② Integration  $\Rightarrow$  # of H's in the chemically equivalent set (relative)
- ③ Splitting  $\Rightarrow$  # non-equivalent neighbor H's (see text for complications).

"must do problems"

"As we move through the course we will spend time studying properties of functional groups including NMR characteristics."

① Alkenes H's near or on a  $\pi$  bond appear at a larger  $\delta$  ("downfield") relative to typical alkane H's.



Do Not Use Pencil

Do Not Staple, Please!

Course Chem 345

Lecturer Gellman

Day Friday

Date 1-29-16

Notes Taken by LL

Page 4 of 4 (Total Pages)

Submit a **COPY** of these notes for posting, please.

Origin of large  $\delta$  values for alkene H's: magnetic field created by induced motions of  $\pi$  e's.

