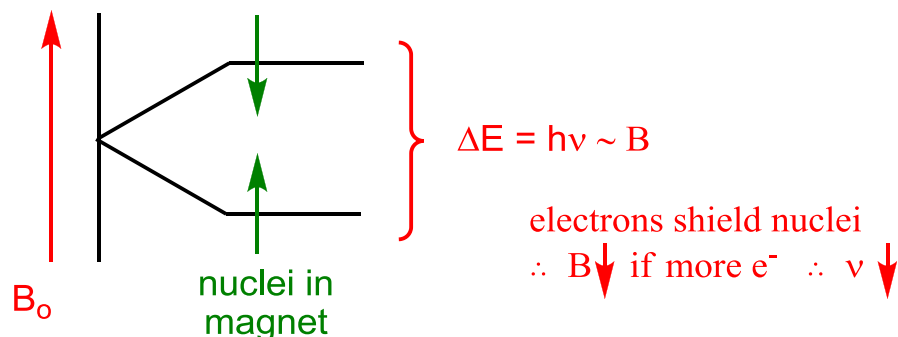


Overheads: - Outline, NMR Problems

Handout: - NMR Problems

Recap Wednesday: NMR

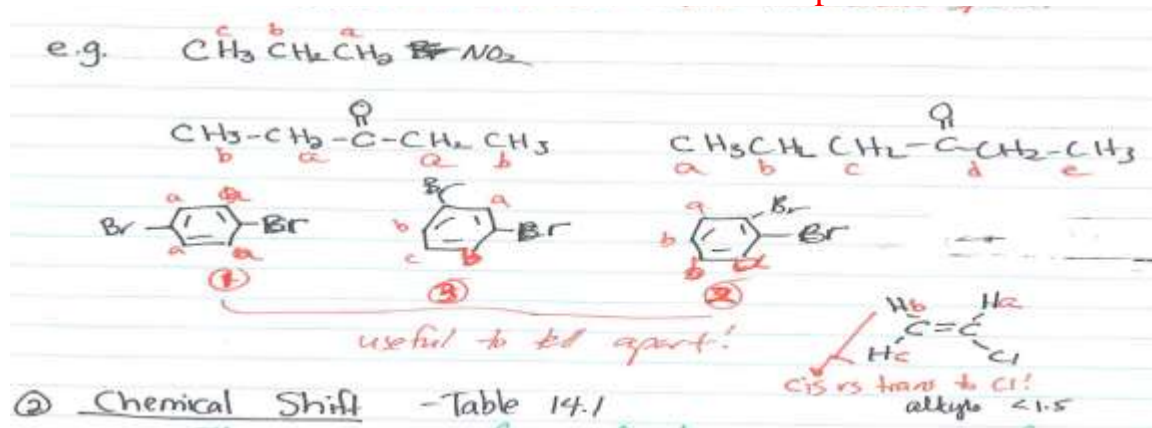


What to look for in a spectrum:

1) Number of peaks

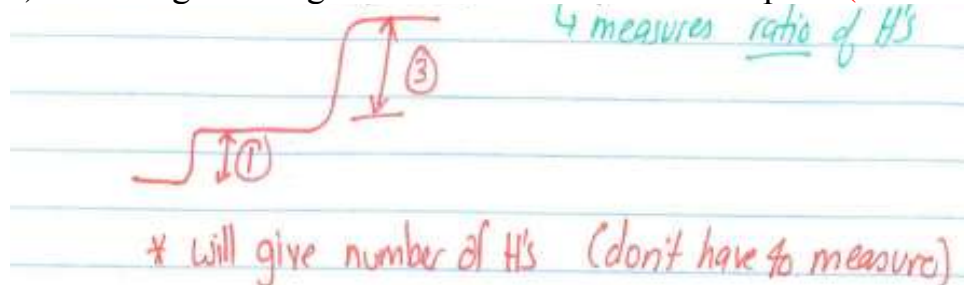
Each “different” H gives a peak (can overlap if similar ☹)

- Must be “identical” (aka “chemically equivalent”) to be the same
- Consider if H’s can rotate into same space

2) Chemical Shift (δ):

- electronegative groups pull ←
- aromatic H’s ~ 7-8; C=C-H ~ 5-6
- aldehyde ~ 9-10; RCO₂H ~ 10-12

3) Integration: gives relative # of H’s in each peak (will be given to you!)

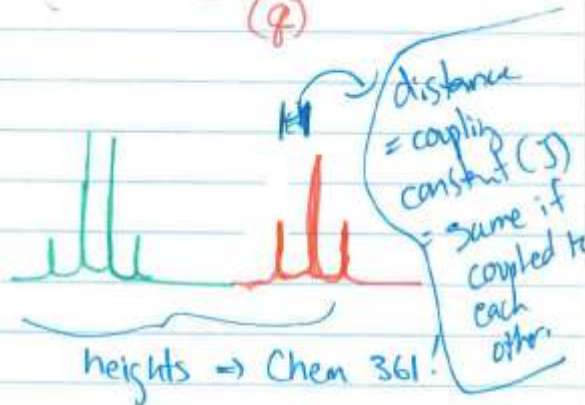
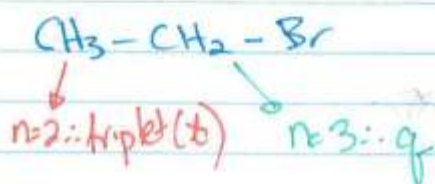
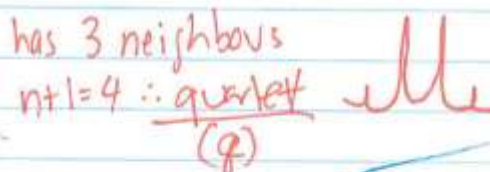
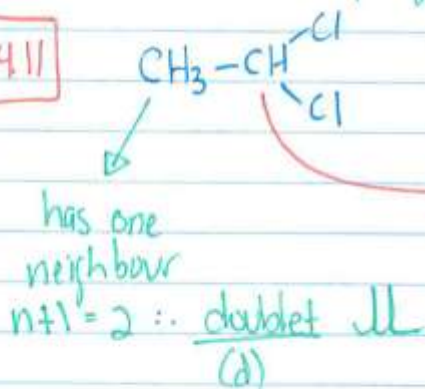


- 4) Coupling: peaks are split by "n" next-door neighbours into "n+1" peaks
- singlet (s) = no neighbours, doublet (d) = 1 neighbour;
 - triplet (t) = 2; quartet (q) = 3; quintet, sextet, septet etc

④ "splitting" \Rightarrow signals are "split" if neighboring C's have H's on them. (as long as neighbours are not same as original)
 ↳ aka coupling

n+1 rule: if neighbouring C have "n" H's on them (total), signal split into n+1 peaks

Fig 14.11



* δ (chem. shift) = middle of signal

* "multiplicity" = # of peaks in signal (s, d, t, q, "m" = unidentified)

normally see: - coupling between H's on direct neighboring C's
 - coupling longer range if there is a C=C in between
 * no coupling to O-H or N-H's

- protons on O/N "exchange"



⇒ exchanging H's don't couple because moving too often

Note: solvents for NMR → replace H w D (^2H) so invisible
to NMR.

e.g. $\left. \begin{array}{l} \text{D}_2\text{O instead of H}_2\text{O} \\ \text{CDCl}_3 \text{ instead of CHCl}_3 \end{array} \right\}$ most common/cheapest

→ D_2O exchanges with ROH or R-NH_2 ∴ disappear!