(14) **Today**

Chap 13: Nuclear Magnetic Resonance Spectroscopy

Next Class (15)

Chap 13: Nuclear Magnetic Resonance Spectroscopy

(16) **Second Class from Today**

Chap 13: Nuclear Magnetic Resonance Spectroscopy

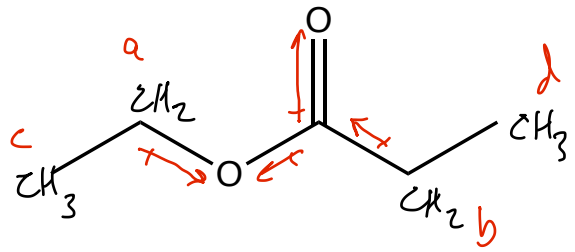
Third Class from Today (17)

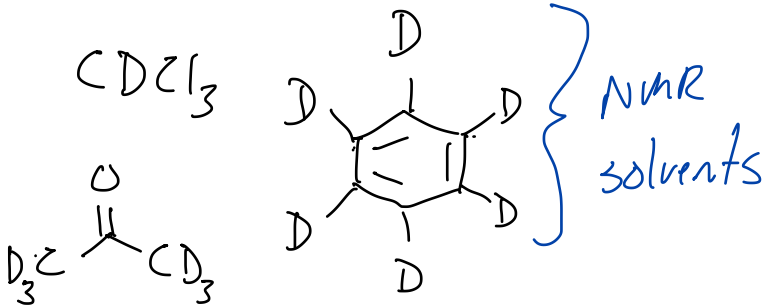
Chap 12: Infrared Spectroscopy

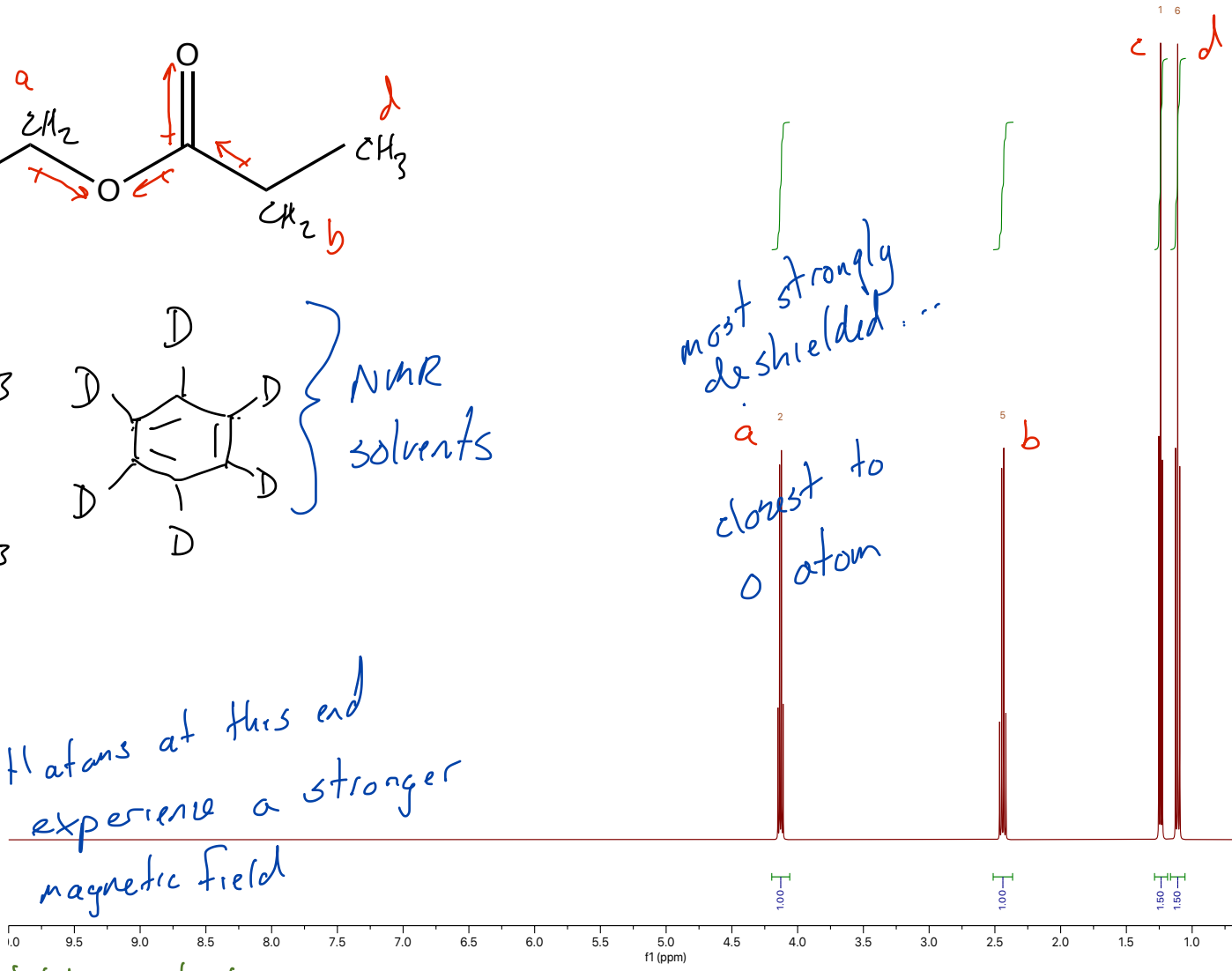
Spring Break Begins at 4:30

Test is not graded yet :-(

Why Are Some Further to the Left or Right?







most strongly deshielded...

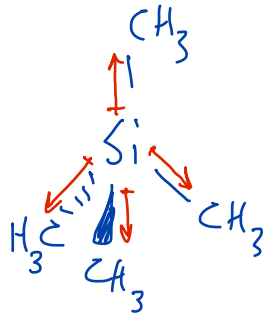
a closest to O atom

H atoms at this end experience a stronger magnetic field

'H's out here experience a stronger field because they are "deshielded"

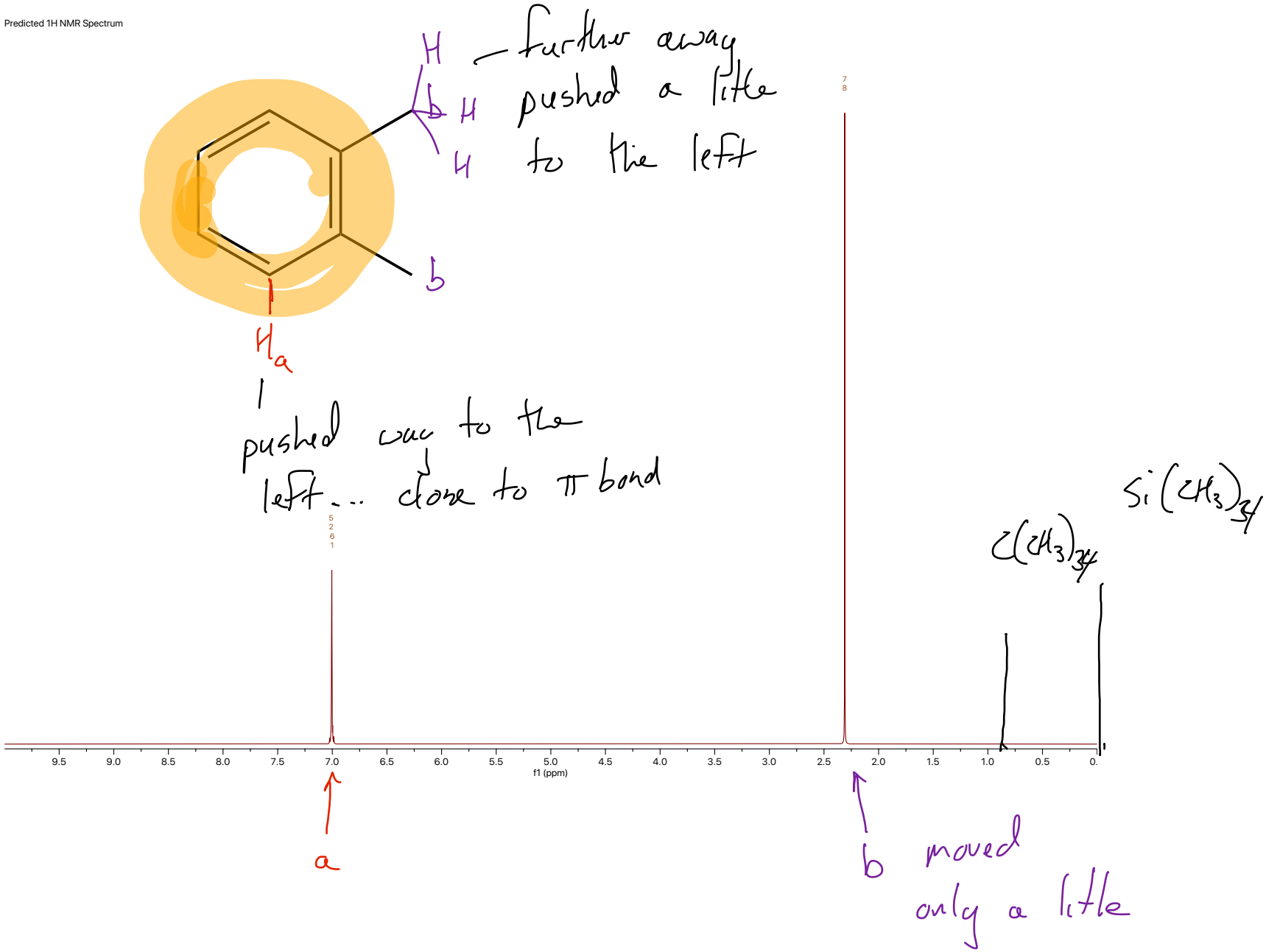
The 'H atoms in TMS are in a e^- rich environment

e^-'s interfere with the magnetic field



these 'H's experience a weak field because they are shielded by the e^-

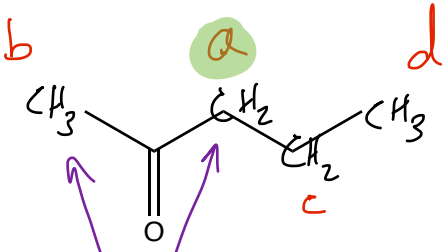
Why Are Some Further to the Left or Right?



Why Some Further to the Left or Right?

Practice: How many peaks? Assign letters alphabetically based on expected position in the NMR spectrum: A farthest to the left, B first peak to the right of A, etc.

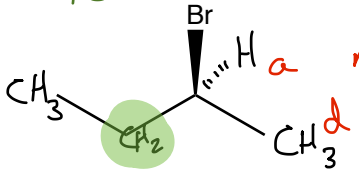
4



least deshielded

strongly deshielded

CH_2's start farther to the left than CH_3's, so if the C=O pushes them to the left, the CH_2 will wind up farther to the still



most deshielded.- closest to Br

farthest to right

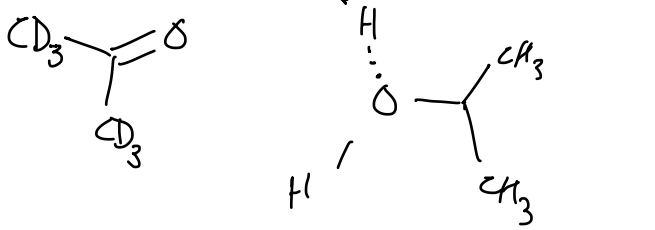
Farthest From deshielding Br

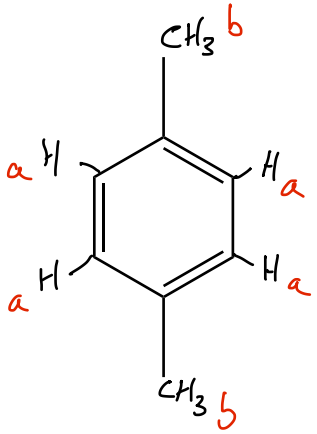
diastereotopic H's here

5

3

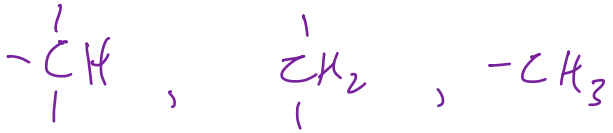
nope a? b?





2

Characteristic Chemical Shifts

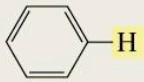
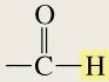
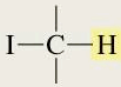
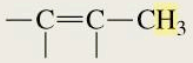
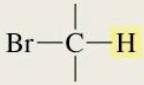
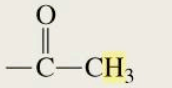
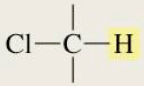
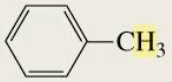
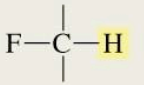
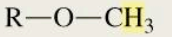
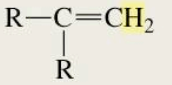
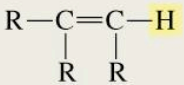
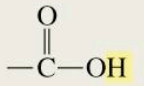
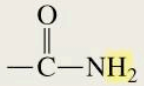


1.4 1.2–3 0.9

not exact values

use as a guide

Table 14.1 Approximate Values of Chemical Shifts for ^{1}H NMR[a]

Type of proton	Approximate chemical shift (ppm)	Type of proton	Approximate chemical shift (ppm)
$(CH_3)_4Si$	0		6.5–8
$-CH_3$	0.9		
$-CH_2-$	1.3		9.0–10
	1.4		2.5–4
	1.7		
			2.5–4
	2.1		
			3–4
	2.3		
			4–4.5
	2.4		
	3.3	RNH$_2$	Variable, 1.5–4
	4.7	ROH	Variable, 2–5
		ArOH	Variable, 4–7
	5.3		Variable, 10–12
			Variable, 5–8

[a]The values are approximate because they are affected by neighboring substituents.