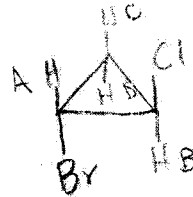


For each of the following compounds indicate the number of ^1H NMR or ^{13}C NMR signals you would expect to see (ignoring splitting and assuming no overlap of signals).

8. ^1H NMR

a.2 b.3 c.4 d.5 e.6



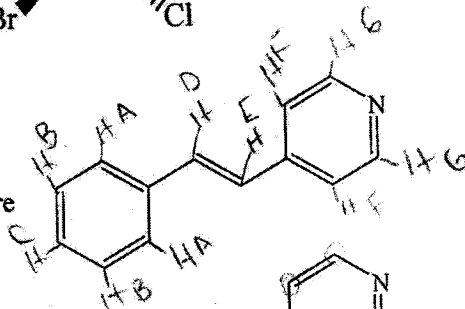
9. ^{13}C NMR

a.0 b.1 c.2 d.3 e.4



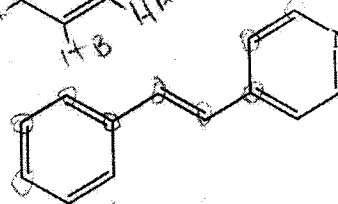
10. ^1H NMR

a.6 or less b.7 c.8 d.9 e.10 or more



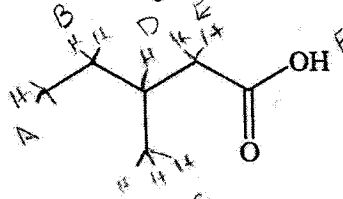
11. ^{13}C NMR

a.6 or less b.7 c.8 d.9 e.10 or more



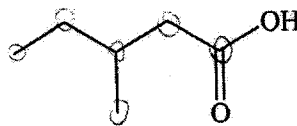
12. ^1H NMR

a.3 b.4 c.5 d.6 e.7



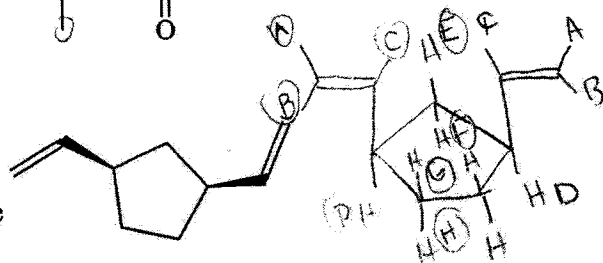
13. ^{13}C NMR

a.3 b.4 c.5 d.6 e.7



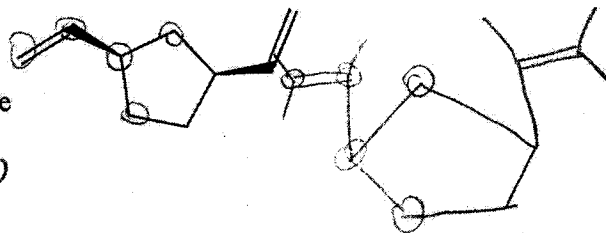
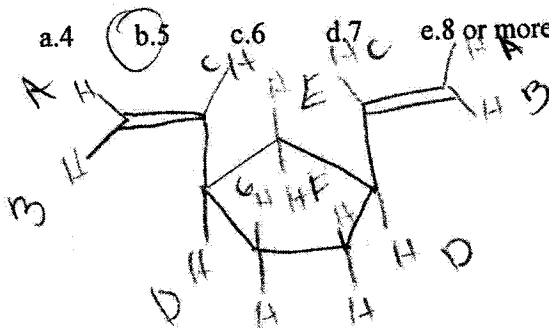
14. ^1H NMR

a.4 b.5 c.6 d.7 e.8 or more

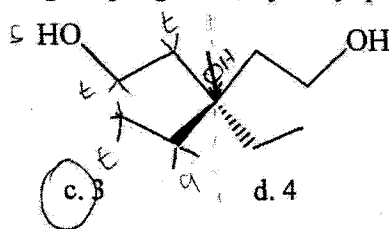


15. ^{13}C NMR

a.4 b.5 c.6 d.7 e.8 or more



16. How many distinct triplets would you expect in the ^1H NMR of the compound below?
 Note: recall that we are ignoring coupling due to hydroxyl protons because of proton exchange.



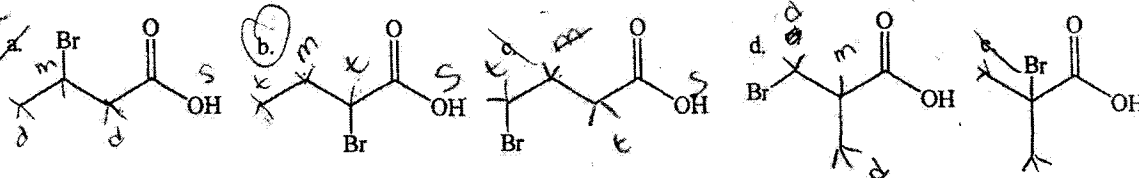
- a. 1 b. 2 c. 3 d. 4 e. 5 or more

17. Identify compound $\text{C}_4\text{H}_7\text{BrO}_2$, with ^1H NMR data as shown.

δ	# H	Mult.
1.08	3	triplet
2.07	2	multiplet
4.23	1	triplet
10.97	1	singlet

IR:
 broad peak in $2500\text{-}3000\text{ cm}^{-1}$ region.
 strong peak at 1715 cm^{-1}

Handwritten: $\delta = 2.5\text{-}4.5$
 C-H

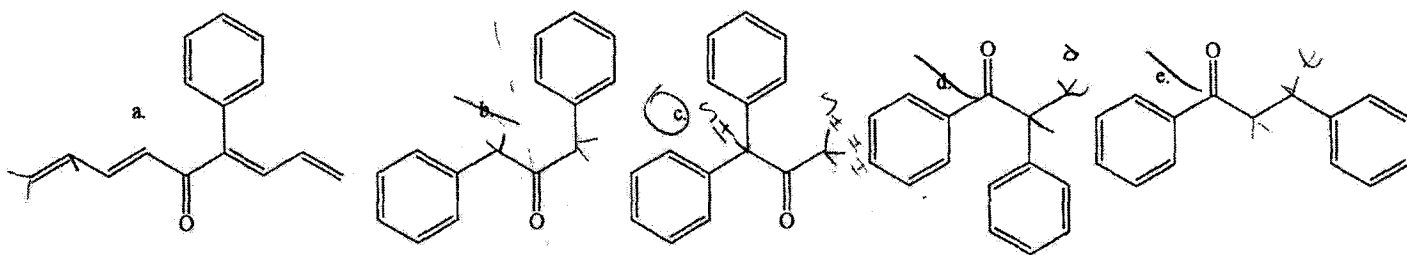


Handwritten: look over

18. Identify compound $\text{C}_{15}\text{H}_{14}\text{O}$, with ^1H NMR data as shown.

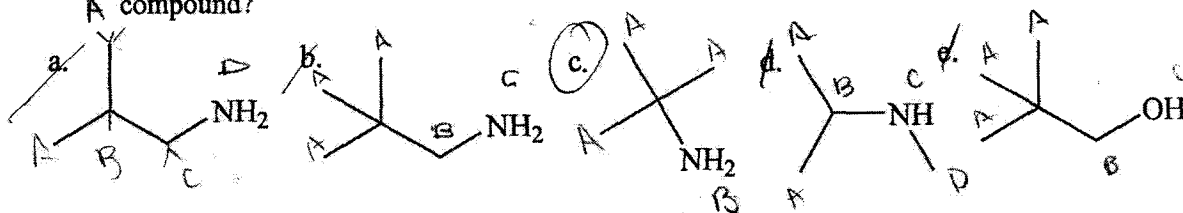
δ	# H	Mult.
2.20	3	singlet
5.08	1	singlet
7.25	10	multiplet

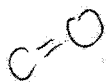
IR:
 strong peak at 1720 cm^{-1} C=O



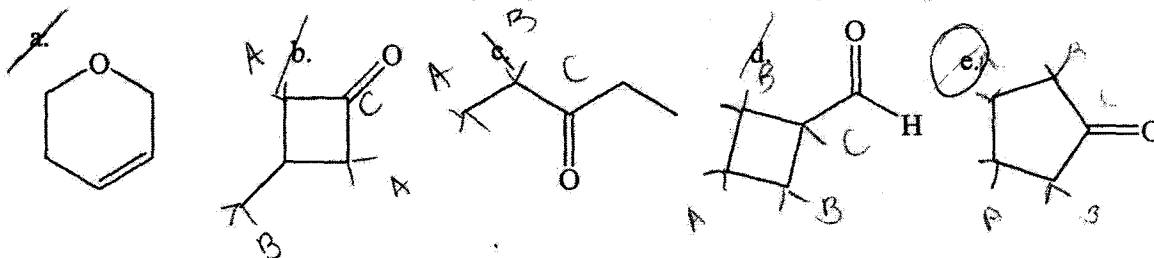
19. An organic compound gives an M^+ peak at m/z 73 and a base peak at m/z 58. The ^1H NMR data shows two singlets: δ 1.3 (broad, 2H); δ 1.2 (9H). What is a likely structure for the A compound?

Handwritten: 2 singlets





20. Compound C_5H_8O has a strong IR absorption at 1745 cm^{-1} .
DEPT ^{13}C NMR: $\delta 220$ (C), $\delta 39$ (CH_2), and $\delta 23$ (CH_2). Identify the compound.



21. Three compounds, A, B, and C, have the same molecular formula, C_5H_6 .
Compounds B and C have an IR absorption at roughly 3300 cm^{-1} ; compound A has no absorption in that region.

Compounds A and B show a UV-Vis λ_{max} near 230 nm . Compound C shows no absorption maximum beyond (i.e., higher than) 200 nm . Propose structures for A, B, and C.



- ~~a.~~ A = I; B = II; C = III
- b. A = II; B = I; C = III
- c. A = II; B = III; C = I
- ~~d.~~ A = I; B = III; C = II
- ~~e.~~ A = III; B = II; C = I

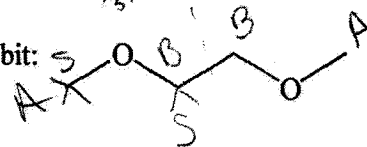
ROYGBIV

22. Which of the following is **not** a true statement?

- a. A π to π^* transition has a smaller λ_{max} (λ_{max}) than an n to π^* transition.
- b. A chromophore is the part of a molecule responsible for a UV/Vis spectrum.
- ~~c.~~ Ultraviolet light is higher in energy than visible light.
- d. Conjugation raises the energy of the LUMO and lowers the energy of the HOMO.
- ~~e.~~ More energy is required for a π to π^* transition than for an n to π^* transition.

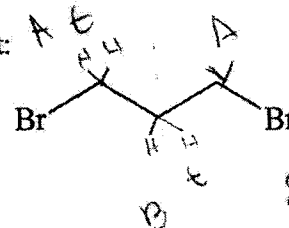
23. The 1H NMR of the following compound would be expected to exhibit:

- a. two singlets at around $\delta 2.1$ with a relative area of 6:4
- ~~b.~~ a singlet and a triplet at around $\delta 3.3$ with a relative area of 6:4, respectively
- ~~c.~~ a singlet and a triplet at around $\delta 2.1$ with a relative area of 3:2, respectively
- d. two singlets at around $\delta 3.3$ with a relative area of 3:2
- ~~e.~~ a singlet and a quintet at around $\delta 2.5$ with a relative area of 6:4



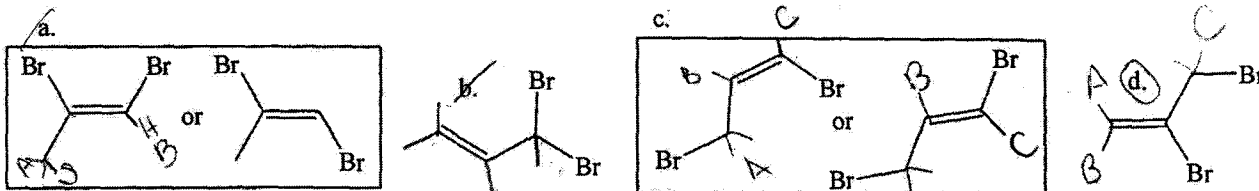
24. The 1H NMR of the following compound would be expected to exhibit:

- ~~a.~~ a quintet and a triplet with a relative area of 2:1, respectively
- ~~b.~~ a quintet and a triplet with a relative area of 1:2, respectively
- c. two triplets with a relative area of 2:1
- ~~d.~~ a triplet of triplets and a triplet with a relative area of 9:3
- e. M, M + 2 and M + 4 peaks in the relative ratio of 1:2:1

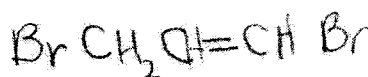


25. Identify the compound, $C_3H_4Br_2$, with 1H NMR data as shown.

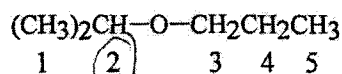
δ	# H	multiplicity
4.2	2	singlet
5.6	1	singlet
6.0	1	singlet



(e) more than one of the above is consistent with the data



26. Which of the following protons would be expected to give an NMR signal with the highest chemical shift value (farthest downfield)?

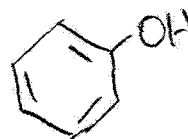


a. 1 b. 2 c. 3 d. 4 e. 5

\uparrow molarity = moles \uparrow
 \downarrow solution A = $\frac{E}{C \cdot L}$

27. Which of the following would increase the UV/Vis absorbance of a solution of phenol (C_6H_5OH) in ethanol?

- a. increasing the amount of phenol in the solution
- b. decreasing the amount of ethanol in the solution
- c. decreasing the light path through the solution
- d. both a and b
- e. both b and c



excitance \downarrow \uparrow mo
 making \uparrow \uparrow mo

28. I. Which has a lower characteristic stretching frequency, a C-H or C-D bond?

II. How could IR distinguish between triethylamine, $(CH_3CH_2)_3N$, and methylethylamine, $(CH_3)(CH_3CH_2)NH$?

	I.	II.
a.	C-H	presence or absence of a stretch at around 1600 cm^{-1}
b.	C-H	presence or absence of a stretch at around 3300 cm^{-1}
c.	C-D	presence or absence of a stretch at around 1600 cm^{-1}
d.	C-D	presence or absence of a stretch at around 3300 cm^{-1}

\uparrow
2

lighter molecule, larger \uparrow

C-H

large 1

C-D
2

lower \uparrow

Class: CHM 202 Q

Professor: HELLER

Your Answer(1- 50): CDDADBBCDB DDDEBCBCCE BBDCEBDD

Correct Answer :D.BD...

Possible Points: 28

Number Omitted: 0

Score: 25.0

Number Double Coded: 0

Percent Correct: 89.3

Guessing Penalty: none

Group Number: 1

Seat Number:

Form Number: 1

=Right, * =Double Mark, - =Omitted, # =Question Dropped, + =Free Question