Home work Problems

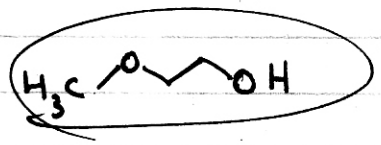
7 H s on C: 1 alcohol

(1) $C_3H_8O_2$ 1 HD = 0

	H's on C's
58 q	3
60 t	2
73 t	2
	7

1 OH

→ FG's – note → ALL down field.



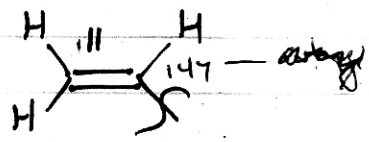
→ Try an arrangement where all attached to C's.

(2) $C_5H_{10}O$ 1 HD = 1

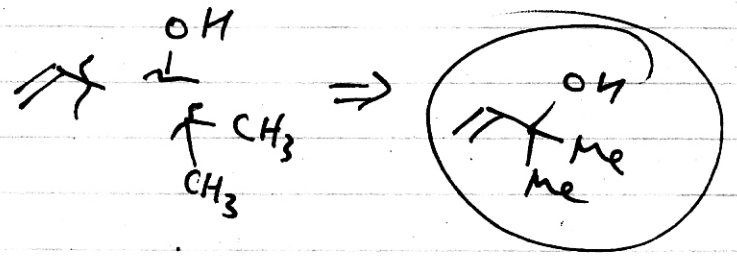
	H's on C
30 q (2)	6
71 s	0
✓ 111 t	2
✓ 147 d	1
	9

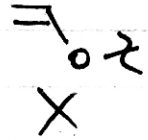
one OH (and only O)

FG's → alkene



→ Put together





not consistent:

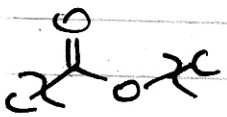
IHD = 1

③ $C_5H_{10}O_2$

			# H's on C
19	q	(2)	6
34	d		1
51	q		3
177	s		0
			10 → all

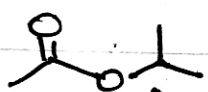
NO OH's

- FG's → ester (not acid)

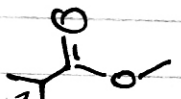


- 3 methyl groups → isopropyl + methyl

Possible



or



expected

22

~20 ~67

~30 ~50

this structure more consistent with data

4. $C_5H_{10}O$ IHD = 1

all H s on Carbons
213(s) = ketone
note symmetry of 2 Me groups

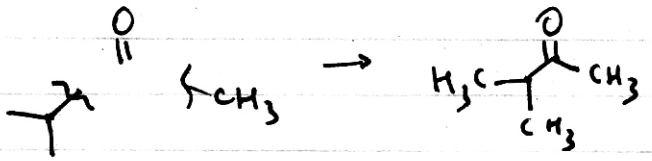
213 s
42 d
27 q
18 q (2)

H's on C = 10

No OH

→ FG → Ketone.

→ Looks like i-Pr



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5. $C_6H_{12}O$ IHD = 1

80 s 0
41 t 2 (2) H's on C's = 11
28 q 3
24 t 2 (2)
11

OH

11 H s on C-- 1 alcohol
no unsaturated functional groups--ring
2 symmetrical carbons

6. $C_5H_{11}N$ → IHD = 1

	H's on C
56, t (2)	4
42, q	3
24, t (2)	4
	11

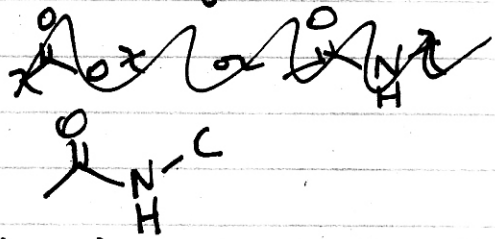
– FG's – must be a ring. More symmetry.

7. C_4H_9NO IHD = 1

	H on C
170, s	0
34 t	2
23 q	3
15 q	3
	8

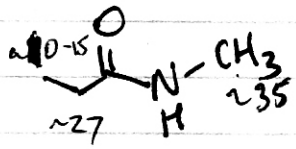
–OH or –NH$_2$

FG's →



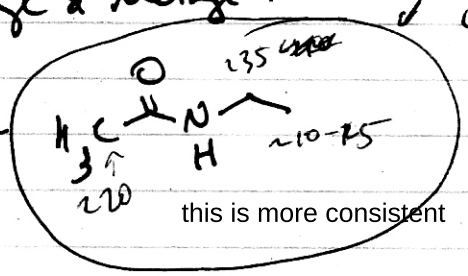
What is left? → ethyl & methyl.

if this were the structure, would expect



expect

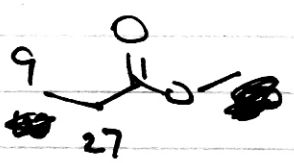
or

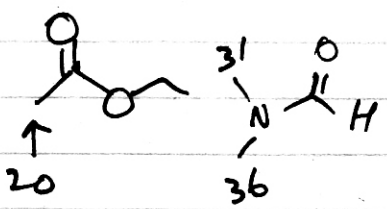


this is more consistent

✓ more consistent

Go to book.





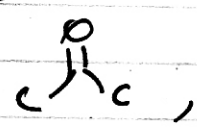
the above chemical shifts are for the closest structures from tables in your book.

8. $C_6H_{12}O$ 1 HD = 1

211	s	9
44	t	2
36	t	2
17	t	2
14	q	3
8	q	3
		12

No OH

→ FG's

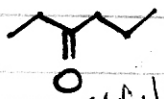


, 2 Me, 3 CH_2's.

→

expect 30 45

expect chemical shifts of
8, 35, 46, 16, 14 (see below)

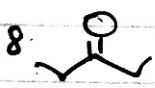


→ fit in closely

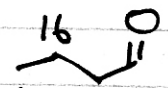
~~35~~ 46 16 14

numbers from book: Book

31



8 35



16 14 46

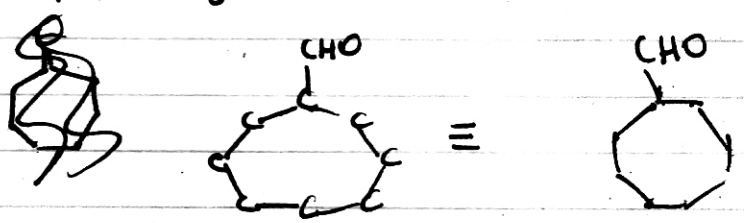
9. $C_9H_{16}O$ $1HD = 2$ all H s on C

		# H on C
205	d	1
51	d	1
27	t (2)	4
26	t (2)	4
25.6	t	2
25.3	t (2)	4
		16

→ FG's  aldehyde, 205(d)

→ No alkenes. No Methyls → think ring

note symmetry.



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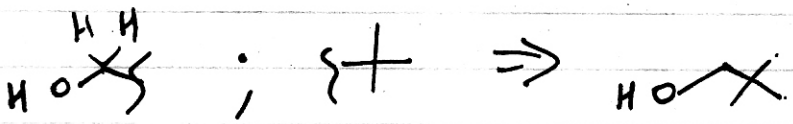
10. $C_5H_{12}O$ $1HD = 0$ 1 H not on C: alcohol

	# H on C
73, t	2
33, s	0
26, q (3)	9
	11

OH



73(t) consistent with 3-identical methyl groups

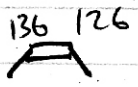
11. $C_5H_{10}O$ IHD = 1

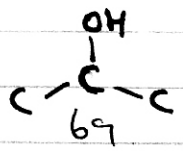
136	d	1
126	d	1
69	d	1
23	q	3
18	q	3
		9

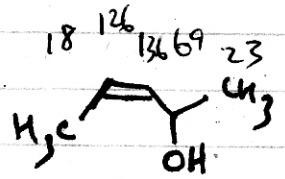
OH

one H not on C: alcohol
FG = 1,2-disubstituted alkene
69(d) = CH of alcohol (see below)

FG's - Alkene.







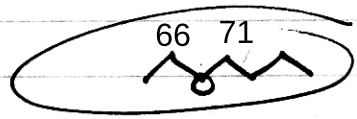
12. $C_6H_{14}O$ 1 HD = 0

71 t 2
66 t 2
32 t 2
20 t 2
15 q 3
14 q 3
14

all H s on carbon: must be an ether, no symmetry

No OH

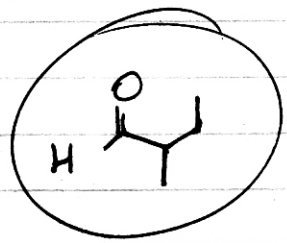
For this we would expect the Me-group at ~58 ppm: this is not observed



this one would be symmetrical

13. $C_5H_{10}O$ 1 HD = 1

205 d 1
48 d 1
24 t 2
13 q 3
11 q 3
10



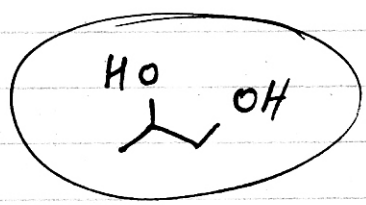
205 (d) = aldehyde
no symmetry

14. $C_3H_8O_2$ 1 HD = 0

2 H s not on C: 2 alcohols

68 d 1
67 t 2
19 q 3
6

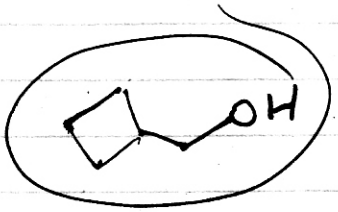
2 OH's



15. $C_5H_{10}O$ 1 HD = 1

67 t 2
37 d 1
25 t (2) 4
18 t 2
9

1 H not on C: 1 alcohol
symmetry: 2 carbons are identical
no unsaturated functional groups: we have a ring.
67(t) = CH2 connected to alcohol



16 C_4H_8O 1 HD = 1

		H on C
146	s	0
110	t	2
67	t	2
20	q	3
		7

only 7 H s on C: must be alcohol
146 and 110 = alkene
67 = CH2 next to alcohol

17. $C_5H_{12}O$ 1 HD = 0

		H on C
73	t.	2
59	qr	3
32	t	2
19	t	2
14	q	3
		12

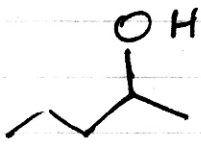
ether

all H s on carbon: must be ether
59(q) = Me–O
73(t) = –CH2–O

18. $C_5H_{12}O$ 1 HD = 0

67	d	1
42	t	2
23	qr	3
19	t	2
14	q	3
		11

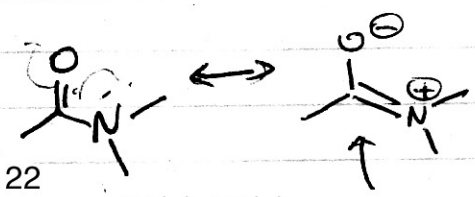
only 11 H s on C: must be alcohol
67(d) = –CH–OH



19. C_4H_9NO · IHD = 1

171	s	0
38	q	3
35	q	3
22	q	3
		9

171 (s) = amide



22

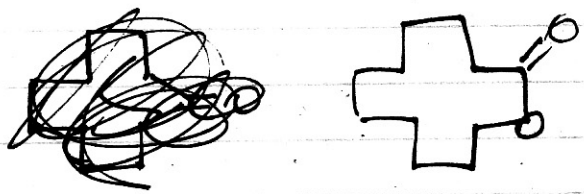
35(q), 38(q)

Double bond character of amide results in slow rotation: the N-Me groups are different!

Double bond character results in slow rotation → the N-Methyl groups are different!

20. $C_{11}H_{20}O_2$

174	s
65	t
34	t
26	t
24.8	t
24.5	t
24.0	t
23.9	t
23.5	t
23.3	t
23.1	t



all H's are on Carbons

174(s) = ester (or lactone, which is a cyclic ester)