C_4H_8O → Degree of Unsaturation

- Due to double bonds, triple bonds, and rings,

$$D.O.U = \frac{2C + 2 + N - X - H}{2}$$

maximum # of H given # of C

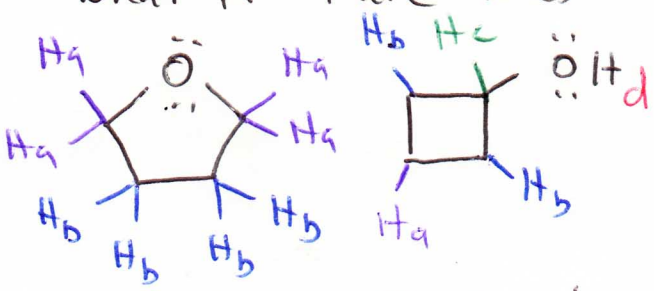
maximum # H adjusted for heteroatoms

δ 2.449, q, 2H
δ 2.34, s, 3H
δ 1.058, t, 3H

1 D.O.U

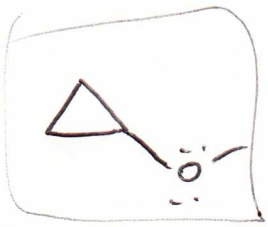
- must have a ring or C=C or C=O

what if there was a ring?



2 signals 4 signals

4 signals

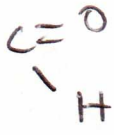


3 signals, but wrong integration

4 signals

- If there is no ring, compound must have a C=C or C=O,

δ 4.6-5.9



δ 9-10

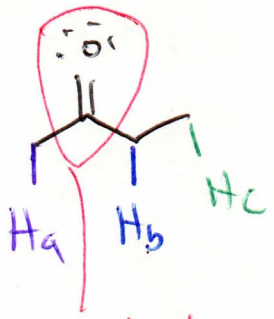
δ 2.0-2.7

It is possible to have an alkene w/o having alkene hydrogens if the alkene is fully substituted.

Ex:

In this case, due to the limited # of atoms and the fact no δ > 3, there is no alkene, → must have C=O

If there is a C=O →



C=O blocks splitting between neighbors

Can only be an aldehyde if $\delta > 9$

In this case, since max $\delta < 3$, must be a ketone.

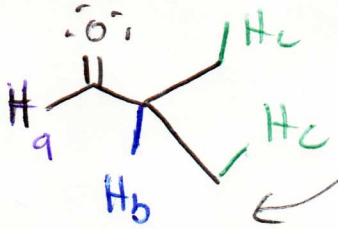
- δ 2.449, q, 2 H
- δ 2.34, s, 3 H
- δ 1.058, t, 3 H

C_4H_8O ~~δ 9.77, s~~,

- δ 9.57, d, 1H
- δ 2.39, dhept, 1H — heptet (7)
- δ 1.06, d, 6H — The only way integration can be greater than 3 is if the molecule has some symmetry *

1 P.O.U → ring, ~~C=C~~, C=O

Based on $\delta \geq 9$, compound is an aldehyde, which means it has no rings or C=C.



Based on the splitting of the aldehyde hydrogen, there can only be exactly one H @ this position, which means the other two atoms connected must be carbons.

* Since two methyl groups are attached to the same common position, they are chemically equivalent.

- δ 9.57, d, 1H
- δ 2.39, dhept, 1H
- δ 1.06, d, 6H

dt

$C_6H_{10}O$

δ 2.55, t, 4H
δ 2.05, tt, 4H
δ 1.70, quint, 2H → quintet (5)

$DØ !! $DO; try
try: command not found

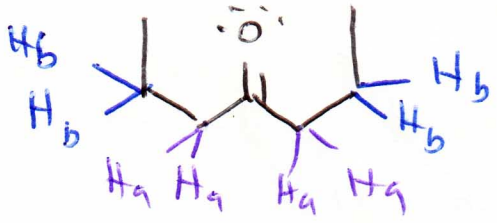
2 D.O.U

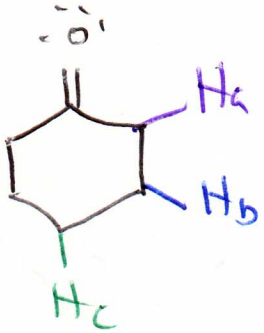
- C=O + ring
- C=C + ring
- 2 rings
- C=C + C=O
- C=C + C=C
- C≡C

Compound does not have an aldehyde (no δ>3) and, unless it is completely substituted, no alkene (no δ>3).

Guess: ketone

Since the likely integration for the ketone H's is 4, there must be symmetry,





- δ 2.55, t, 4H
- δ 2.05, tt, 4H
- δ 1.70, quint, 2H