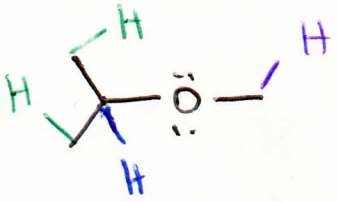
$C_4H_{10}O$

δ 3.337, 3H, s
δ 3.336, 2H, t
δ 1.59, 2H, tq
δ 0.93, 3H, t

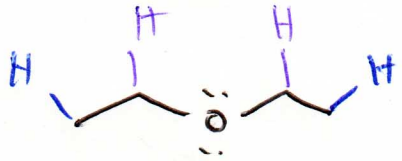
→ D.O.U = 0

Method 1: Degree of unsaturation

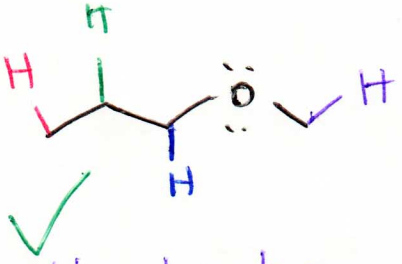
Since D.O.U = 0, the compound must be either an alcohol or an ether; also, the compound cannot be cyclic



3 absorbances



2 absorbances

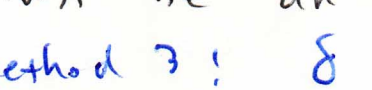


4 absorbances

Method 2: Integration

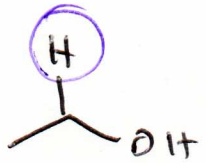
Since there is only one oxygen in the compound, it is either an ether or a monoalcohol. If it is an alcohol, it must have a peak that integrates to one. It doesn't have it, so it must be an ether.

Method 3: δ

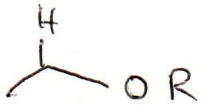


4.5 - 9

1.2



3.4 - 4



3.3 - 4

Alcohols undergo rapid proton exchange in solution, in which the alcohol momentarily becomes deprotonated the reprotonated again. This proton exchanges causes alcohol hydrogens to not participate in splitting (splitting will again appear if the sol'n is cooled sufficiently to slow or stop exchange).

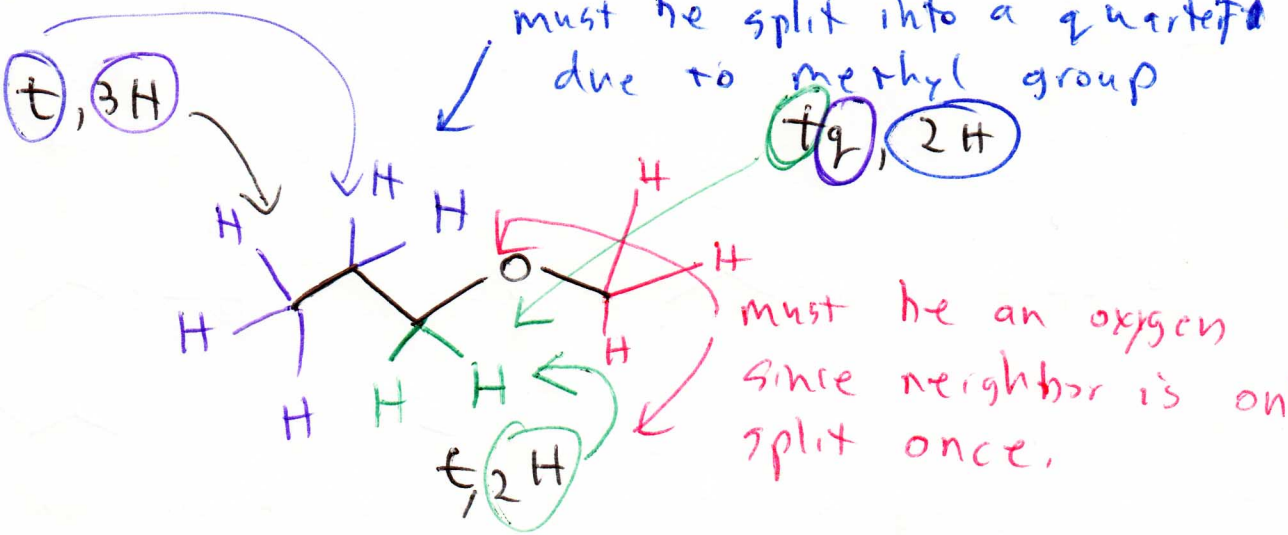
If D_2O is added to a NMR sample of an alcohol, the peak for the alcohol hydrogen effectively disappears since, if deuterium replaces hydrogen, it will not be scanned since it is a different nucleus and would appear at an entirely different frequency.

Since the compound has two peaks that have $\delta \approx 3.4$, the compound must be an ether since there is only one oxygen and therefore only one way to generate two peaks w/ that δ.

Method 4: Splitting

* A singlet that integrates to 3 usually indicates a methyl group w/ block splitting.

Since there is $\delta \sim 3.4$ and an oxygen is present, it is a reasonable guess that the compound is a methyl ether.



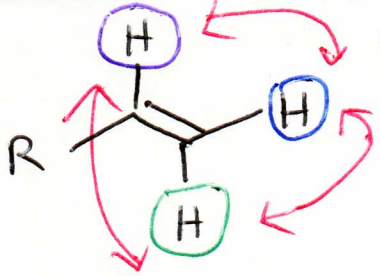
~~δ 3.337, 3H, s~~

δ. 3.337, 3H, s

δ. 3.336, 2H, t

δ. 1.59, 2H, tq

δ. 0.93, 3H, t



cis : J = 6 - 14 Hz

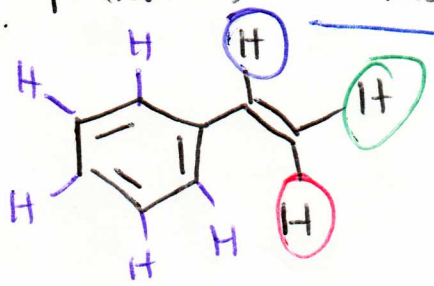
geminal : J = 0-3 Hz

trans : J = 12-18 Hz

C_8H_8

- δ 7.10 – 7.5, m, 5H — multiplet
- δ 6.992, dd, 1H, J_1 = 7 Hz, J_2 = 12 Hz — trans
- δ 5.737, dd, 1H, J_1 = 2 Hz, J_2 = 12 Hz
- δ 5.225, dd, 1H, J_1 = 2 Hz, J_2 = 7 Hz — cis

Based on δ and D.O.U, the compound likely contains benzene. An integration of 5 suggests the compound is a monosubstituted benzene.



does not experience geminal splitting

C_6H_{12}

δ 5.45, dt, 1H, J = 14 Hz
δ 5.42, dq, 1H, J = 14 Hz
δ 1.95, dt, 2H
δ 1.643, d, 3H
δ 1.360, tq, 2H
δ 0.885, t, 3H

C_5H_8O

δ 6.342, d, 1H, J = 6.2 Hz
δ 4.644, dt, 1H, J = 6.2 Hz
δ 3.957, t, 2H
δ 1.984, dt, 2H
δ 1.846, tt, 2H