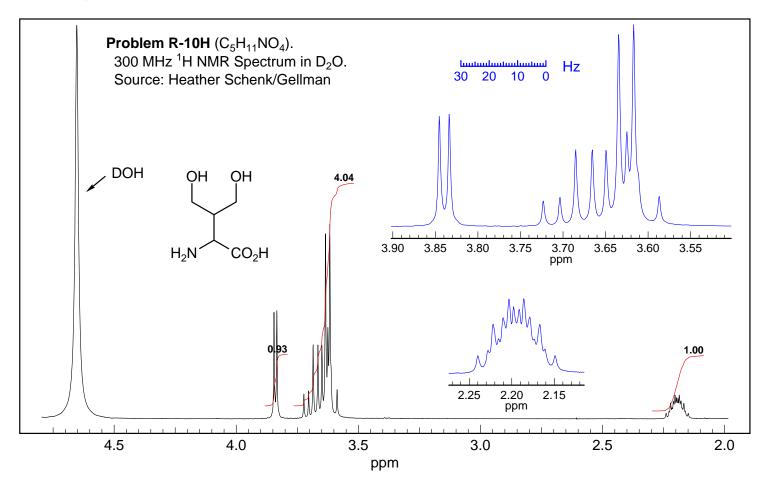
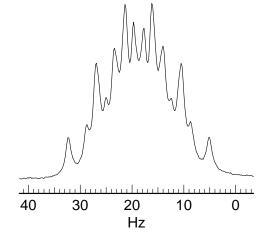


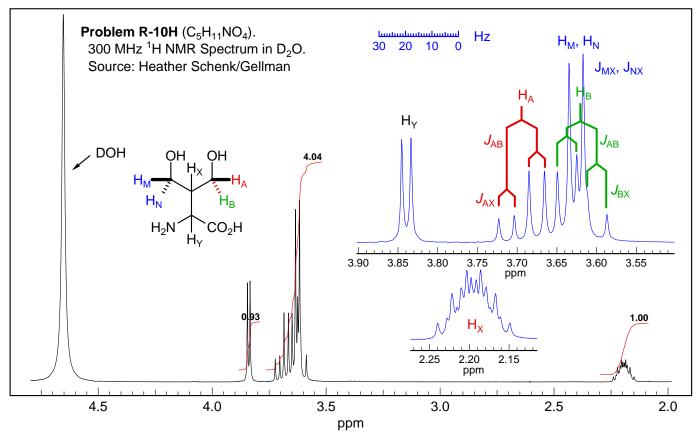
Problem R-10H ($C_5H_{11}NO_4$). A graduate student thought she had prepared the compound below, but was worried about the NMR spectrum (taken in D_2O), which seemed more than a little odd. Does the NMR spectrum fit the structure? Analyze and assign each of the multiplets. In particular, provide an explanation for the appearance of the key multiplet δ 3.5-3.8.



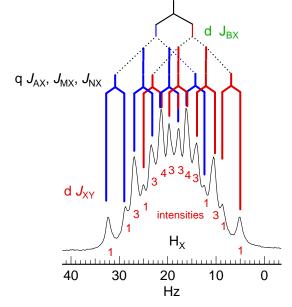


To show you understand the spectrum, draw a coupling tree for the multiplet at δ 2.2 (start with an intensity assignment).

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- The key here is that the two CH₂OH groups are diastereotopic, and each of the CH₂ groups are themselvees diastereotopic. So the protons form an AB MN XY system
 - One CH₂ group (labelled AB) has a reasonably large AB shift, $J_{AB} = 11$, $J_{AX} = 5.5$, $J_{BX} = 7.5$
- The other CH_2 group (labelled MN) has no detectable shift between the two protons, and so appears as a doublet, with <u>apparently</u> equal couplings $J_{MX} = J_{NX} = 5.5$ Hz. Because M and N are "strongly coupled" the actual couplings may not be the the same (viertual coupling).
 - The H_Y proton is a doublet, δ 3.7, J = 3.5 Hz.



To show you understand the spectrum, draw a coupling tree for the multiplet at δ 2.2 (start with an intensity assignment).

Expect this proton (X) to be coupled as follows:

$$J_{AX}$$
=5.5
 J_{BX} =7.5
 J_{MX} =5.5
 J_{NX} =5.5

Thus dqd, J = 7.5, 5.5, 3.5

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