2012-10-26

NMR Problems #1

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https://hdl.handle.net/2144/4360

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13) On the graph paper on the following page, draw that the following multiplets. Pay attention to relative intensities of lines. (10 pts)

   a) (ddd, $J = 10.0, 3.0, 3.0$ Hz)
   b) (qd, $J = 8.0, 8.0$ Hz)
9) Below is the $^1$H NMR spectrum of triazine 1 with expansions printed above. In the expansions, assign ALL peaks in the spectrum (including the ones at 7.26 and 1.6), and above each resonance write the correct multiplicity designation. (10 pts)
9) Below is the proton spectrum of diol 1. For the three expanded multiplets, list the \(^1\text{H}\) NMR data as you would for publication: \(\delta\) (multiplicity, \(J\) = coupling constants Hz, \#H’s), and assign these three peaks. The spectra were recorded at 300 MHz. How could you determine which peaks were the “OH” resonances? (14 pts).
15) Assign the hydrogen resonances in the $^1$H NMR spectrum of (-)-α-damascone (1) below. (You did the multiplicities on the last exam, 12 pts).
3) On the following pages are the $^1$H, and IR spectra of compounds 1 (below), taken at 400 MHz (Larmour frequency). On the first spectrum, assign the proton resonances, then follow the additional instructions below. NOTE: You will need to use the H,H-COSY spectrum (on the subsequent page) to complete these assignments. An H,H-COSY is a coupling matrix where the lower left to upper right diagonal is the identity element (no couplings), and off-diagonal signals indicate coupling linkages between the coupled partners (i.e. links between the identity elements. “COSY = CORrelated SpectroscopY).

The next four spectra are expansions of the multiplets of 1. Above each multiplet write out the resonance information (shift, multiplicity, coupling constants, no. of H’s: x.xx (m, $J = x.x$ Hz, #H’s) for each of these four resonances.

Finally, on the IR spectrum, assignment the bands at 3397, 2957/2914/843, 1761, and 1680 cm$^{-1}$. 