Hi C3045!

Several students has asked about "off-resonance decoupling" in 13C NMR spectroscopy (p. 539 Carey). This technique removes all of the carbon-hydrogen coupling from a signal except those between nuclei that are directly bonded to one another. Thus, a methine (CH) appears as a doublet no matter how many protons are on attached neighboring carbon atoms, a methylene (CH2) appears as a triplet no matter how many protons are on attached neighboring carbon atoms, and a methyl appears as a quartet no matter how many protons are on attached neighboring carbon atoms. If a carbon is not directly bonded to a hydrogen, it appears as a singlet.

The 13C NMR spectra that we have signals which are "broad band decoupled" which means that all proton couplings have been removed.

A number of assigned problems (13.24, 13.25, 13.26, 13.27, 13.28) give the multiplicity of the off resonance decoupled signals in parenthesis. For example, in question 13.25c you are asked to identify the C4H10) isomer which has a 13 C NMR spectrum consisting of two signals, one at 31 ppm (quartet) and one at 69 ppm (singlet). From this information you can conclude that the signal at 31 ppm corresponds to the carbon atom of a methyl group and the signal at 69 ppm corresponds to a carbon atom with no hydrogens attached. The structure must be tert-butyl alcohol.