Additional Practice Problems

1. Below is the IR and \(^1\)H NMR spectra for an unknown compound with a molecular formula C\(_5\)H\(_{10}\)O. In the \(^{13}\)C NMR, four resonances appear at 210, 45, 22, and 16 ppm. Determine the structure of this molecule.

![IR and \(^1\)H NMR spectra for an unknown compound with a molecular formula C\(_5\)H\(_{10}\)O]

2. A molecule with the formula C\(_6\)H\(_{12}\)O\(_2\) shows a characteristic Infrared absorption at 1735 cm\(^{-1}\) and the following NMR spectra. The proton spectra shows the peaks, the number of hydrogens that each resonance integrates for, and the coupling constant (J in Hz). Determine the structure.

![A molecule with the formula C\(_6\)H\(_{12}\)O\(_2\) shows a characteristic Infrared absorption at 1735 cm\(^{-1}\)]

3. A molecule with the formula C\(_5\)H\(_{10}\)O shows a characteristic Infrared absorption at 1715 cm\(^{-1}\) and the following MS and NMR spectra. Determine the structure.

![A molecule with the formula C\(_5\)H\(_{10}\)O shows a characteristic Infrared absorption at 1715 cm\(^{-1}\)]

4. Determine the structure for an unknown molecule with a molecular formula of C\(_{10}\)H\(_{12}\)O. The IR spectra shows a strong absorbance at 1680 cm\(^{-1}\). The \(^1\)H NMR and \(^{13}\)C NMR spectra for this unknown are shown below.

![Determine the structure for an unknown molecule with a molecular formula of C\(_{10}\)H\(_{12}\)O]

5. The three compounds shown below have very different \(^{13}\)C NMR spectra. Match the structures with the correct spectra.

- **A** (Spectrum 1)
- **B** (Spectrum 3)
- **C** (Spectrum 2)