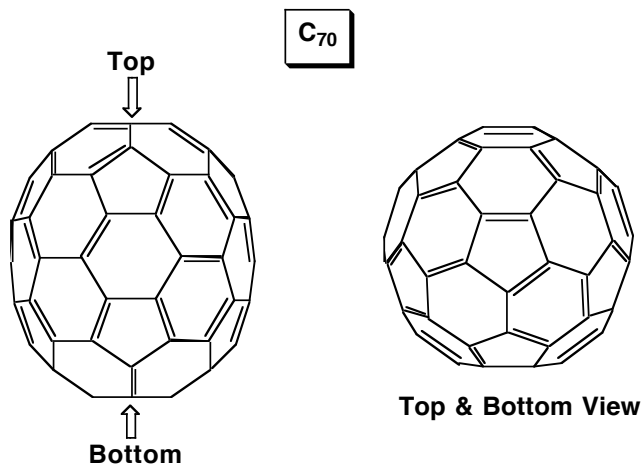
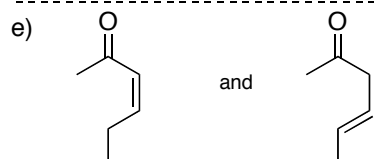
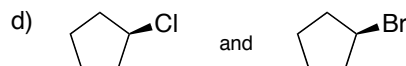
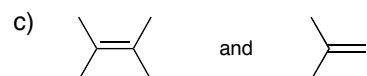
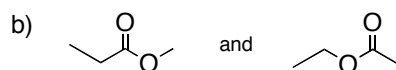
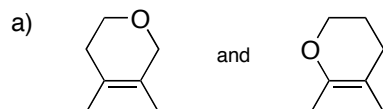


1. ^{13}C NMR spectroscopy is a technique that produces a peak for each unique carbon or set of carbons in a molecule. C_{60} (buckminsterfullerene) has only 1 peak because every carbon in the molecule is the same by symmetry. The ^{13}C NMR of C_{70} (the second fullerene discovered) is significantly different. The structure of C_{70} is shown below. If you were the researcher who discovered this molecule, how many peaks would you expect to see in the ^{13}C NMR spectrum? Answer the question by labeling the unique carbons in the structure(s) below. **Note: All carbons are part of a double bond.**



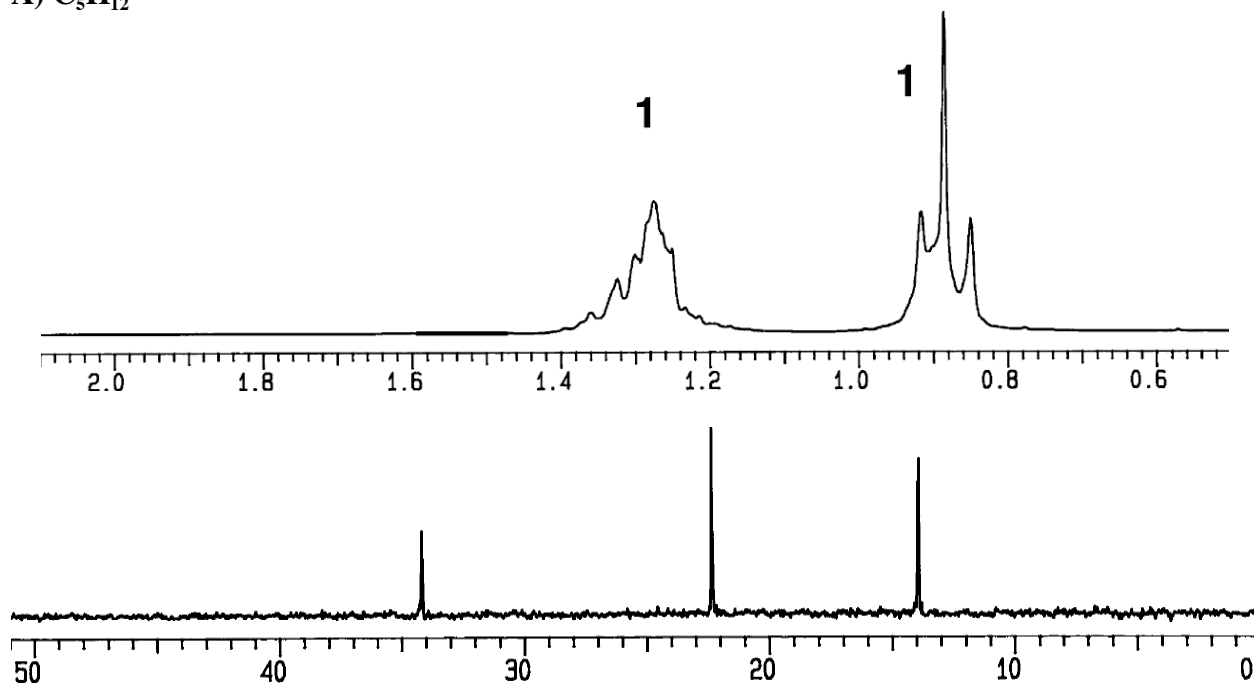
2. Determine whether IR or ^{13}C NMR would be the best method for distinguishing between the following compounds and indicate how you would make the distinction. Be as specific and concise in your answers as possible.

^{13}C NMR or IR? What would you look for?



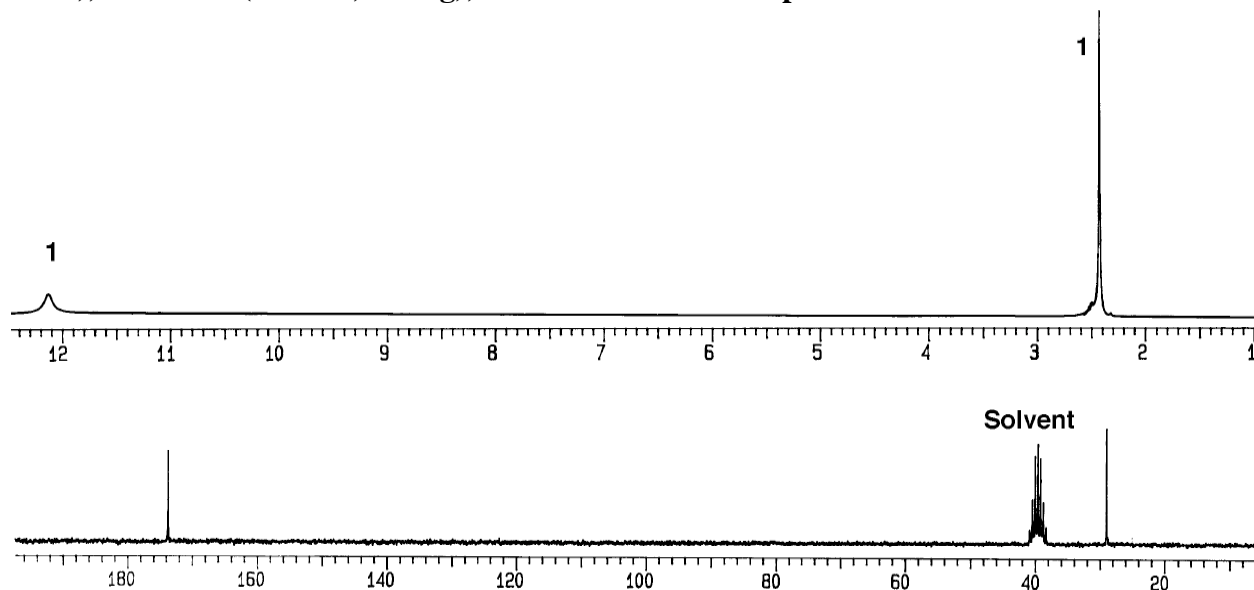
3. Provide structures for all of the following sets of spectra. Assign as many peaks as you can in each type of spectrum (using letters as labels).

A) C_5H_{12}



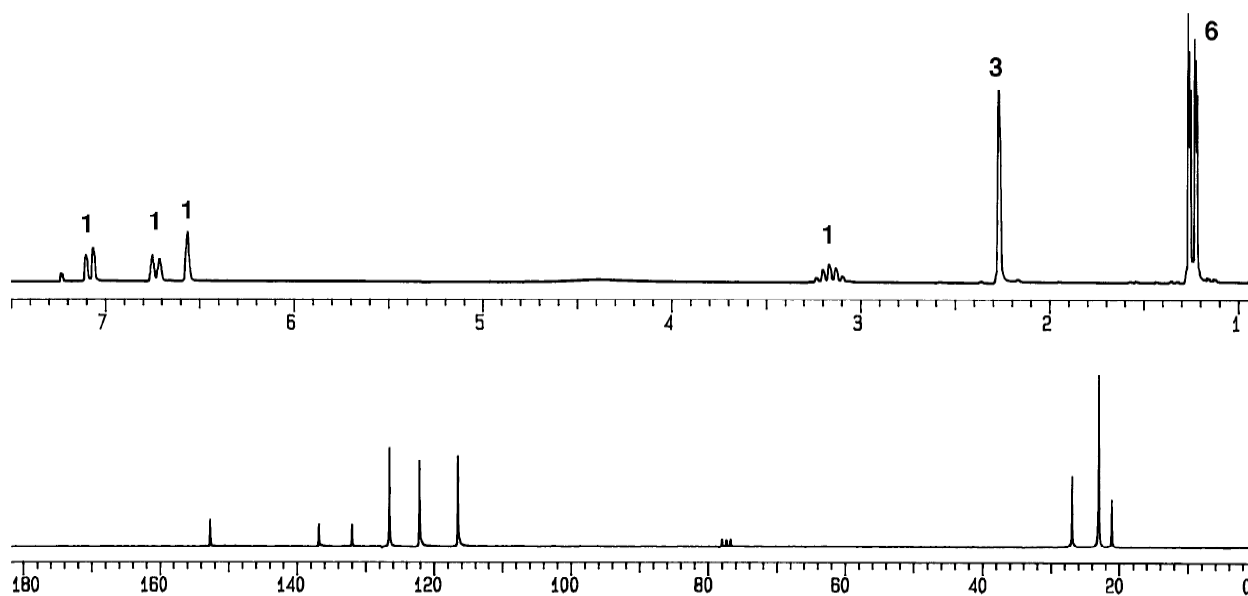
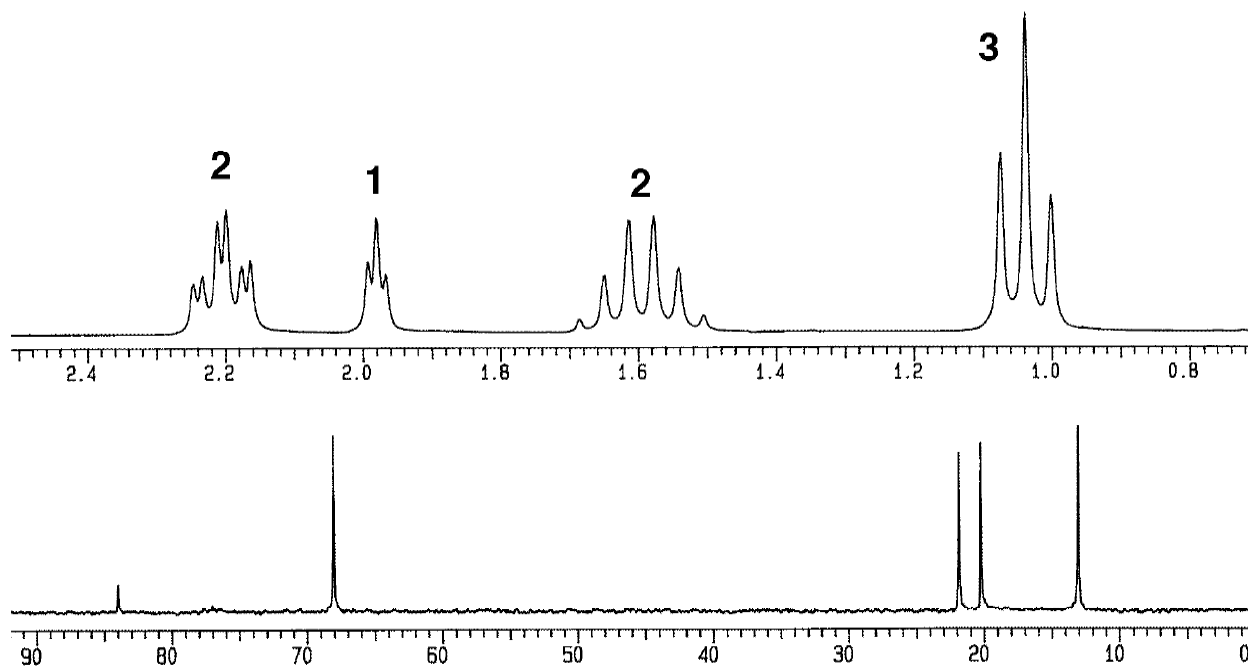
B) $C_4H_6O_4$

IR Data (format = shape of peak, intensity of peak): 3420 cm^{-1} (broad, med.), 2932 cm^{-1} (broad, strong), 1695 cm^{-1} (narrow, strong), 1419 cm^{-1} (narrow, med.), 1311 cm^{-1} (narrow, med.), 1203 cm^{-1} (narrow, strong), and a few other weak peaks between $924 - 638\text{ cm}^{-1}$.



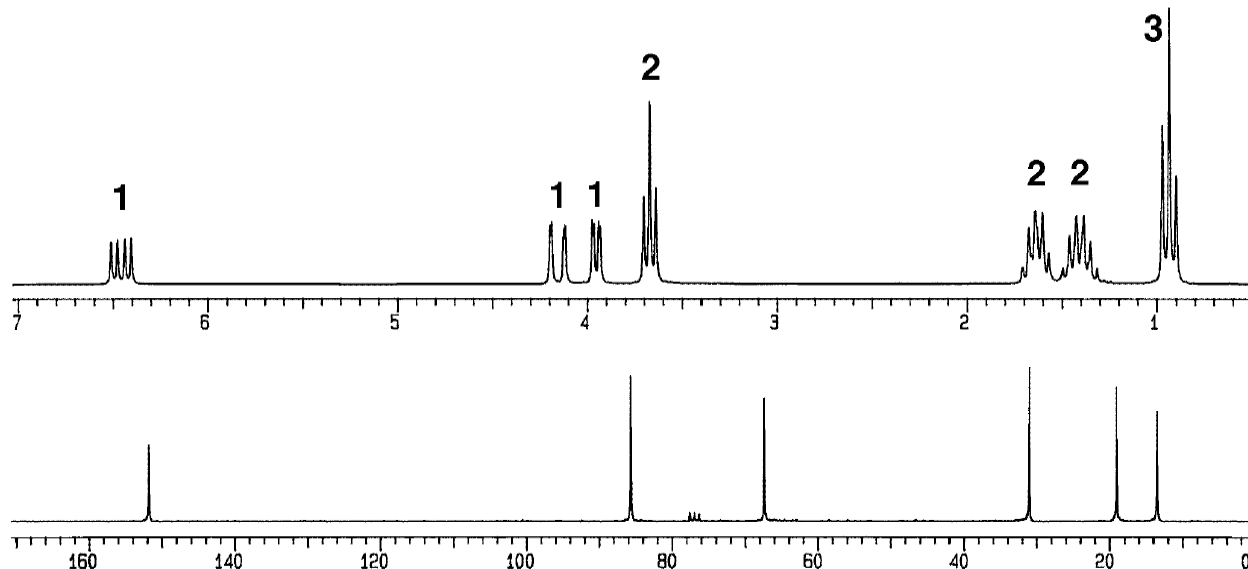
C) $C_{10}H_{14}O$

IR Data (format = shape of peak, intensity of peak): 3458 cm^{-1} (broad, strong), 2963 cm^{-1} (narrow, strong), 2926 cm^{-1} (narrow, med.), 2872 cm^{-1} (narrow, med), and many narrow, weak to medium peaks between $1618 - 810\text{ cm}^{-1}$.

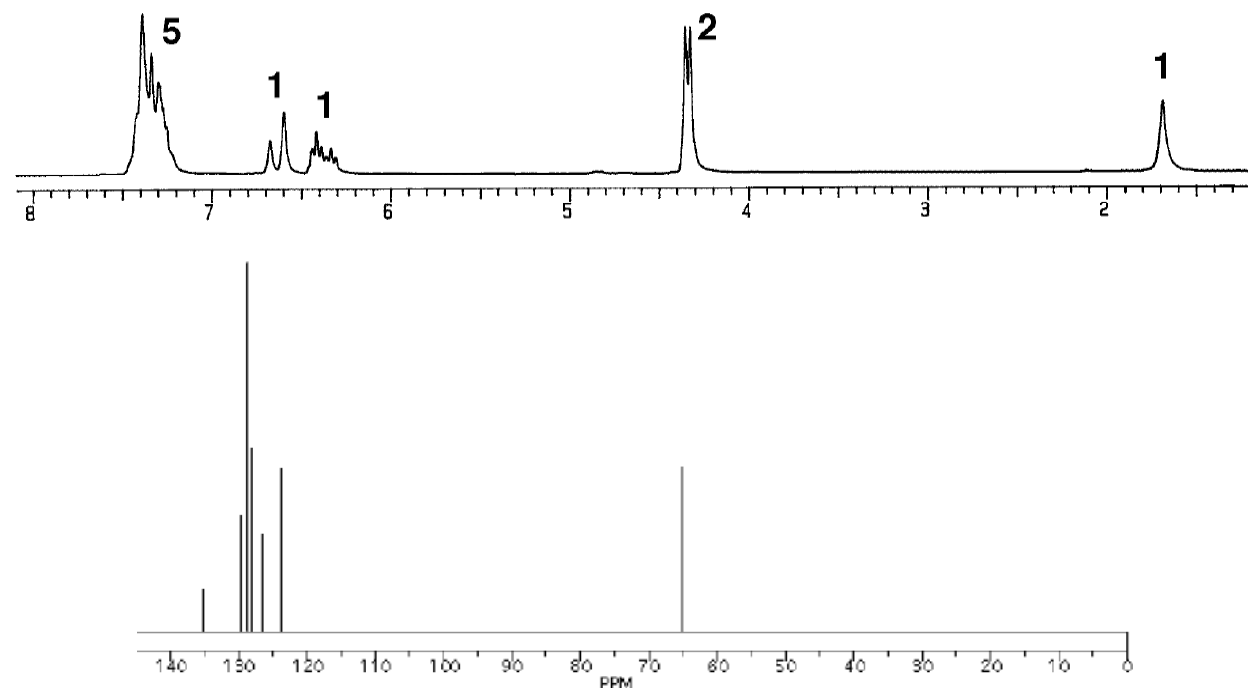
D) C_5H_8 

E) $C_6H_{12}O$

IR Data (format = shape of peak, intensity of peak): 3121 cm^{-1} (narrow, weak), 2963 cm^{-1} (narrow, strong), 2937 cm^{-1} (narrow, med.), 2876 cm^{-1} (narrow, med), 1635 cm^{-1} (narrow, med.), 1612 cm^{-1} (narrow, med), and many narrow, weak to medium peaks between $1468 - 812\text{ cm}^{-1}$.

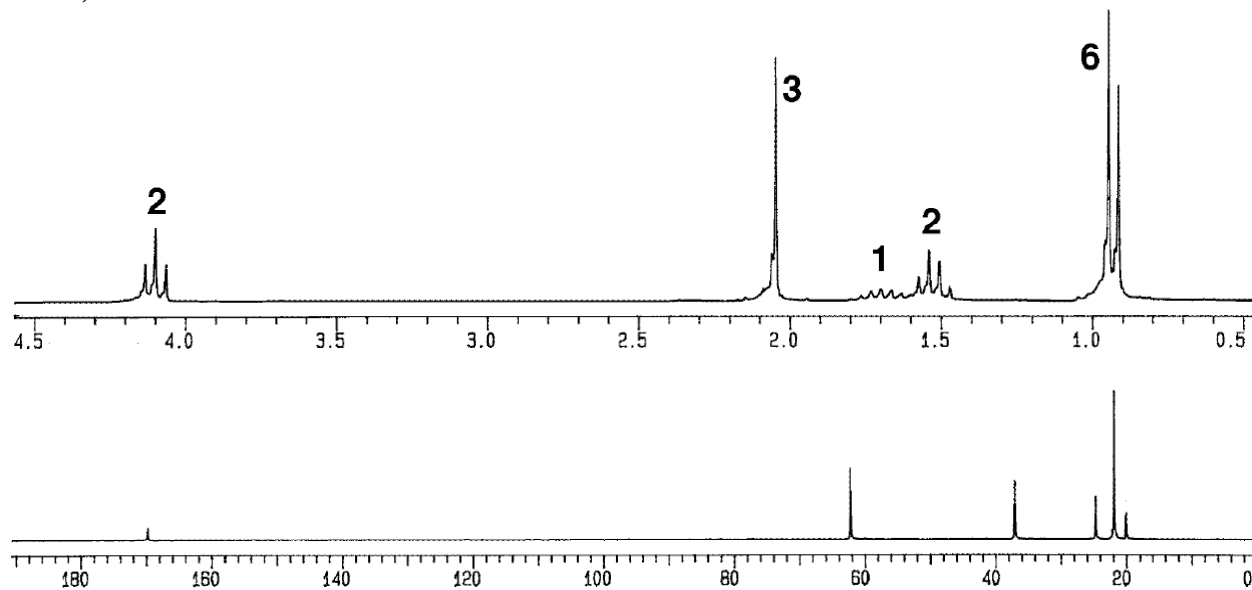
F) $C_9H_{10}O$

IR Data (format = shape of peak, intensity of peak): 3333 cm^{-1} (broad, strong), 3033 cm^{-1} (narrow, med.), 3026 cm^{-1} (narrow, med.), 2862 cm^{-1} (narrow, med), 1664 cm^{-1} (narrow, med.), 1495 cm^{-1} (narrow, med.), 1448 cm^{-1} (narrow, med.), and many narrow, weak to medium peaks between $1093 - 892\text{ cm}^{-1}$.



G) $C_7H_{14}O_2$

IR Data (format = shape of peak, intensity of peak): 2963 cm^{-1} (narrow, med.), 2936 cm^{-1} (narrow, med.), 2878 cm^{-1} (narrow, med), 1743 cm^{-1} (narrow, strong), 1466 cm^{-1} (narrow, weak), 1367 cm^{-1} (narrow, weak), 1240 cm^{-1} (narrow, strong), and 1041 cm^{-1} (narrow, weak).

H) $C_9H_{18}O$

IR Data (format = shape of peak, intensity of peak): 2959 cm^{-1} (narrow, strong), 2874 cm^{-1} (narrow, med.), 1713 cm^{-1} (narrow, strong), 1468 cm^{-1} (narrow, weak), 1367 cm^{-1} (narrow, med.), 1294 cm^{-1} (narrow, weak), 1169 cm^{-1} (narrow, weak), and 1041 cm^{-1} (narrow, weak).

