Answers to Problem 74, Chemistry 301X - 2006

(a) Compound **C** will show no carbonyl (C=O) band in the IR. The aldehyde **B** should show the diagnostic pair of bands at 2700-2900 cm^{-1}, which the ketone **A** will not show.

(b) Let me count the ways.....The three compounds will have utterly different ^{1}H NMR spectra. Compound **A** is the only one to have a 3H methyl singlet. Compound **B** will show the characteristic very low field aldehyde H (δ = 9- 10 ppm). Compound **C** will show a single methyl doublet and a single 2H quartet.

(c) This one is harder. Usually in ^{13}C NMR one can get somewhere by just counting the different kinds of carbons, but not this time, as compounds **A** and **B** each have four different C's. Only compound **C** can be eliminated by a carbon count. One needs to do a coupled carbon spectrum to see the number of hydrogens coupled to the various C's to distinguish **A** and **B**. Compound **A** is the only one with a quaternary **C**, and will show one singlet in its coupled spectrum, in addition to two quartets and a triplet. Compound **B** will show one doublet, two triplets and one quartet.