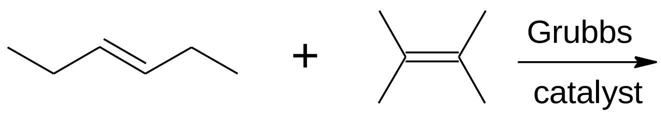
CHEMV12B, Organic Chemistry II

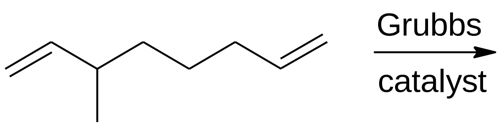
1.) Which is more reactive: an organolithium or organomagnesium reagent? **Explain.** (12 pts)

2.) Show **all** possible new products formed from the metathesis of the following compounds. If only one compound is listed, assume that it is in excess. (20 pts, 10 pts ea)

a.)

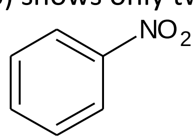


b.)

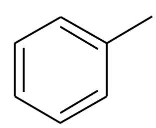


3.) Can Grignard reagents be used in aqueous solvent? Why or why not? (10 pts)

4.) Consider the following structures of (a) nitrobenzene and (b) toluene. Explain why the ^{1}H NMR spectrum on a 300 MHz instrument for (a) shows three separate signals (a doublet, a triplet, and a doublet of doublets), while (b) shows only two (a singlet and a rough "multiplet"). (20 pts)



(a) nitrobenzene



(b) toluene

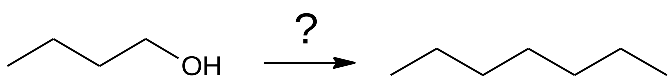
5.) Consider the free-radical monohalogenation of butane with Br_2 and light ($h\nu$). (18 pts)

a.) Give the structure of the *most probable* product.

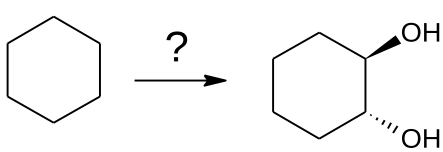
b.) Give the structure of the *most stable* product.

6.) Design multistep syntheses to convert the following reactants into the indicated products. Include all reagents and reaction conditions necessary. Show each step individually. (50 pts, 25 pts ea)

a.)



b.)



PAGE 2: ____________

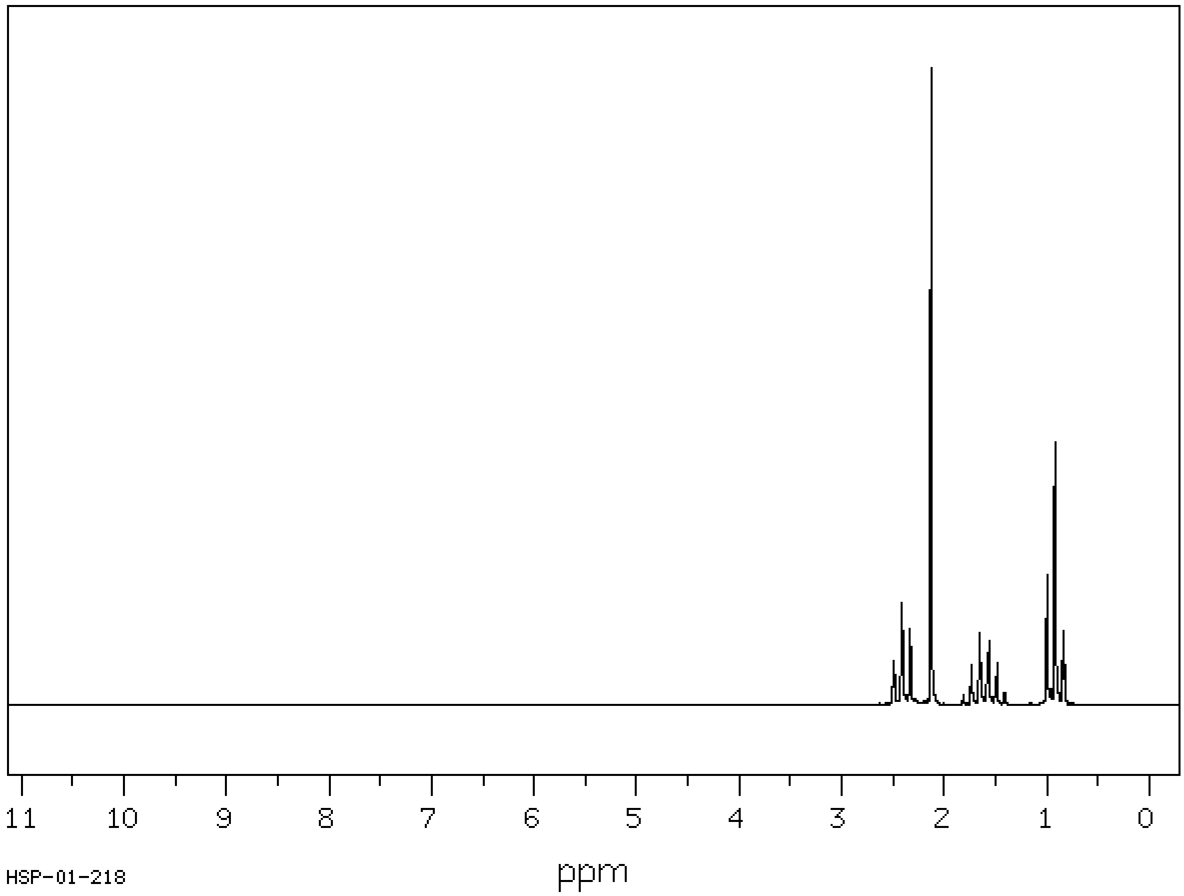
7.) From the provided ^{1}H and ^{13}C NMR spectra on the following pages and the molecular formulas given here for each, determine the **most likely structure**. Include (1) degrees of unsaturation, (2) labels for the multiplicity of each signal (singlet, doublet, multiplet, etc.), in the ^{1}H NMR spectra, and (3) labels for each H and C in the structure to their corresponding signals in the ^{1}H and ^{13}C spectra, respectively. (70 pts, 35 pts ea)

a.) Page 4: $C_5H_{10}O$

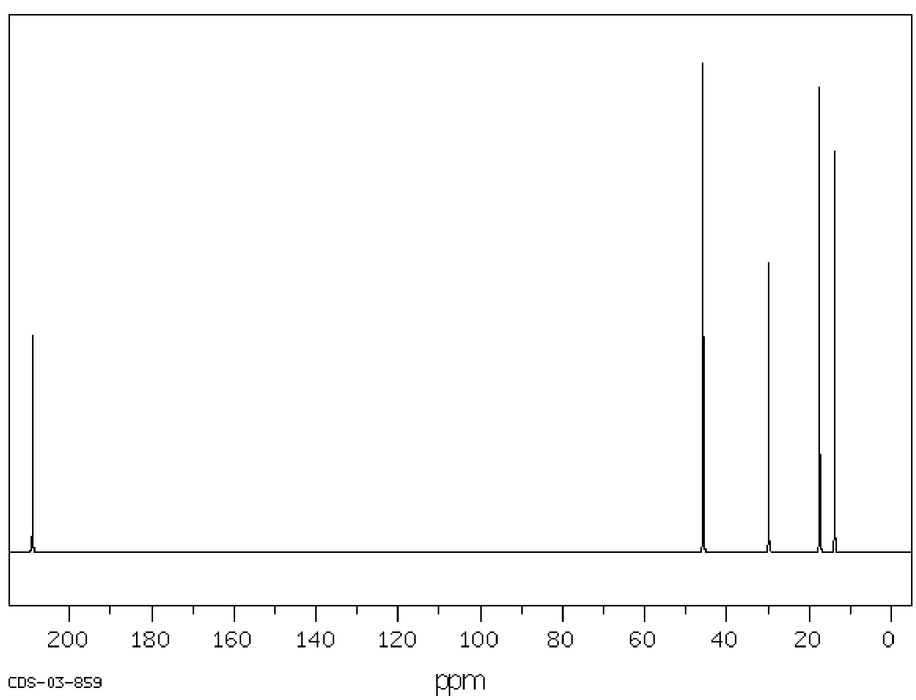
b.) Page 5: $C_4H_8O_2$

PAGE 3: ______________

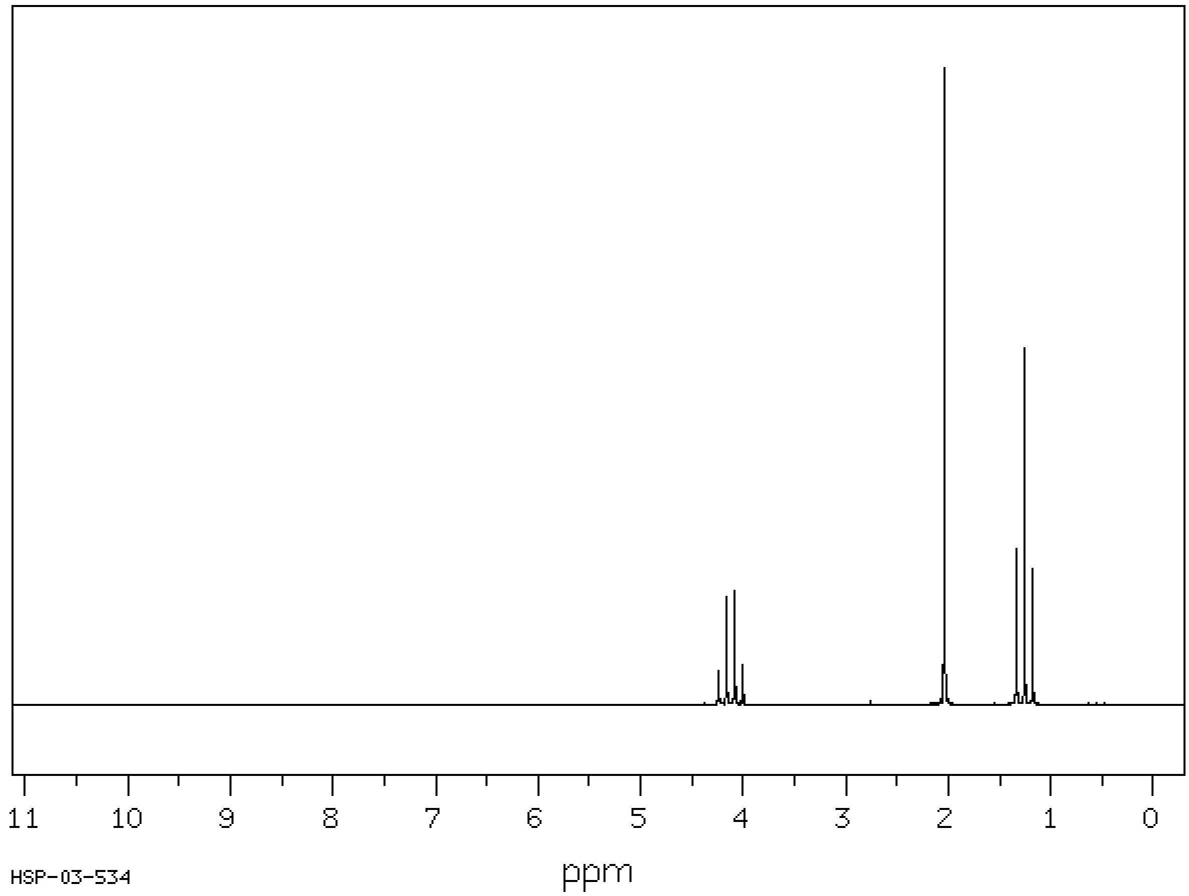
^{1}H NMR for $C_5H_{10}O$:



^{13}C NMR for $C_5H_{10}O$:



[1]H NMR for $C_4H_8O_2$:



[13]C NMR for $C_4H_8O_2$: