Problem Set #2

Chemistry 3231
September 11, 2001

1. Determine the structure of each of the following compounds from their molecular formulae, IR, and ^{1}H NMR spectra.

   (a) $C_5H_{12}O$

   (b) $C_6H_{12}O_2$

(c) $C_4H_8O_2$

2. When dissolved in $CDCl_3$, a compound (**A**) with molecular formula $C_4H_8O_2$ gives a ^1H NMR spectrum as listed below. When dissolved in D_2O, the compound gives a similar ^1H NMR spectrum, except that the signal at 3.75 ppm disappears. The IR spectrum of the compound shows a strong absorption at 1720 cm^{-1}.

^1H NMR of **A**:	δ (ppm)	1.35	2.15	3.75	4.25
	multiplicity	d	s	broad s (1H)	q (1H)

   (a) Determine the structure of **A** and
   (b) Explain why the NMR signal at 3.75 ppm disappears when D_2O is used as the solvent.

3. The "normal" (i.e., at room temperature) ^1H NMR spectrum of cyclohexane consists of a single peak (all 12 H's) are equivalent). If the ^1H NMR is obtained at very low temperature, the spectrum becomes more complex. Explain.

4. Draw all possible products of the following reaction and indicate which one(s) will be formed fastest (i.e., from the most stable intermediate(s)).

5. Propose a mechanism for the following reaction: