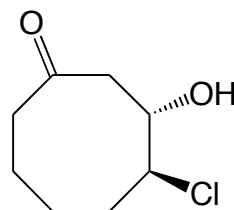
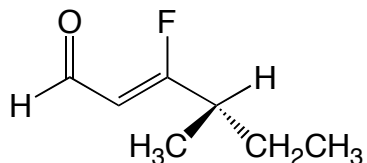
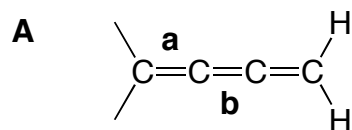


1. Provide an unambiguous name (IUPAC or common) for each of the following molecules. Be sure to indicate stereochemistry where appropriate. (10 points)

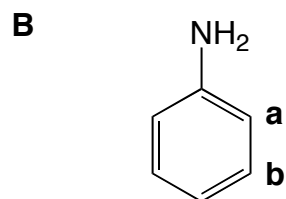


2. For each problem below, assign **a** and **b** to the spectroscopic data shown at the right. Then using pictures and/or words (whichever best illustrates your explanation), provide a rationale for your assignments. (12 points)



\_\_\_\_\_ 1900  $\text{cm}^{-1}$

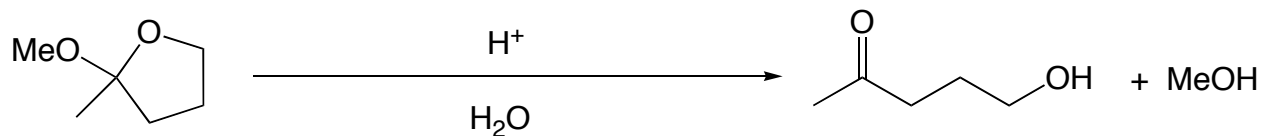
\_\_\_\_\_ 2100  $\text{cm}^{-1}$



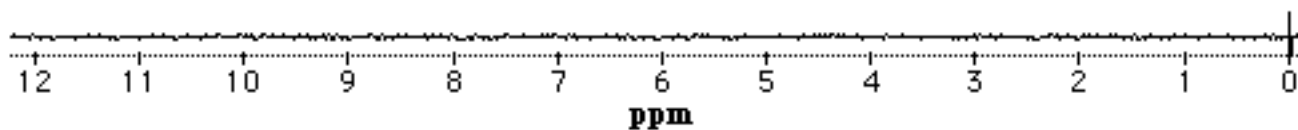
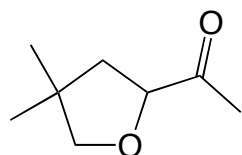
\_\_\_\_\_ 116 ppm

\_\_\_\_\_ 129 ppm

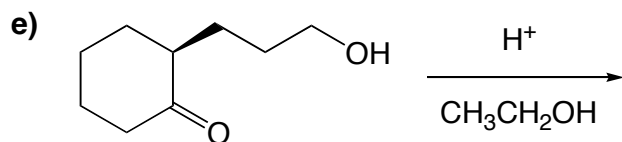
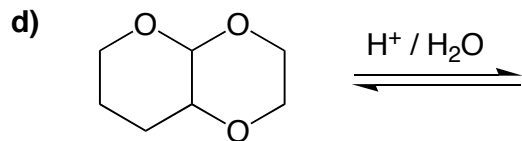
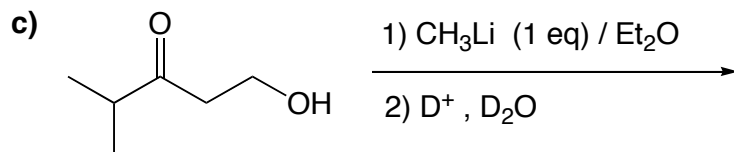
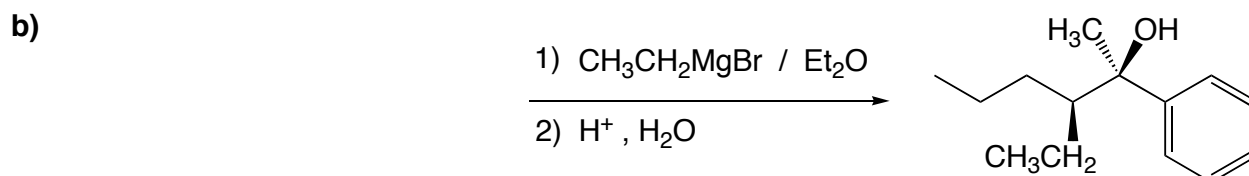
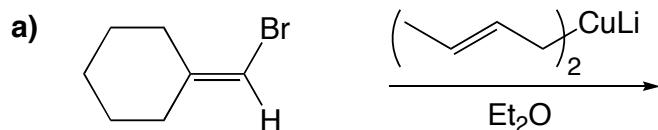
3. Provide a mechanism for the following reaction. Be sure to show all charges and lone pairs of electrons in your structures. Also provide the structures of all intermediates. (12 points)



4. Predict the proton NMR of the following molecule. For full credit, you must assign your peaks *and* consider the relative heights in all peaks that show splitting. (12 points)

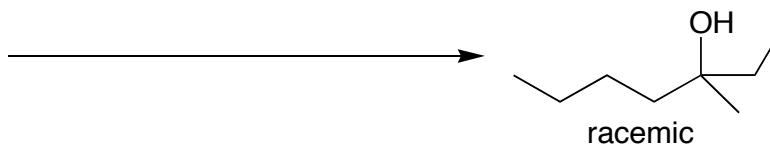


5. Complete the following reactions by providing either the starting materials or products. If you provide more than one product, circle the major product(s). (30 points)



6. Provide a synthesis for the following transformation. For full credit, be sure to draw all intermediary products along the way. (12 points)

Using any epoxide of 3 C's or less **and** any other carbon sources of 3 C's or less



7. A compound with the molecular formula  $C_7H_{12}O_3$  gives the following spectra. Provide a structure and assign peaks in each spectrum for full credit. *Circle your answer.* (12 points)

