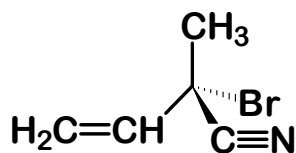
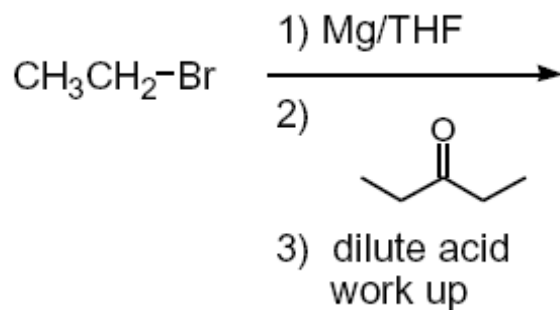
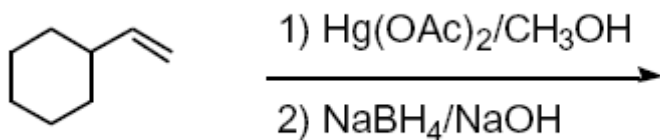
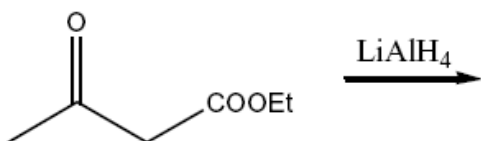
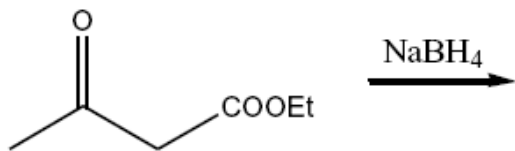


1. Draw the following compounds. Show the stereogenic centers in 3-D.
 - a.) (4R, 5S) 5-chloro-4-ethyl-2-methylheptane
 - b.) (1R, 4S) 3,4-dimethyl-2-cyclopentenol
2. Determine the absolute configuration of the following molecule. Label your priority assignments.

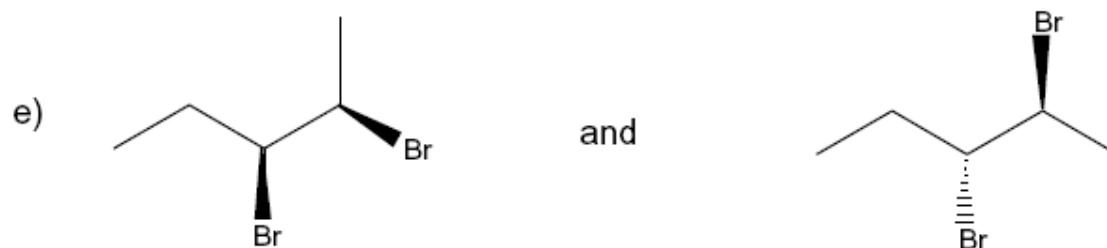
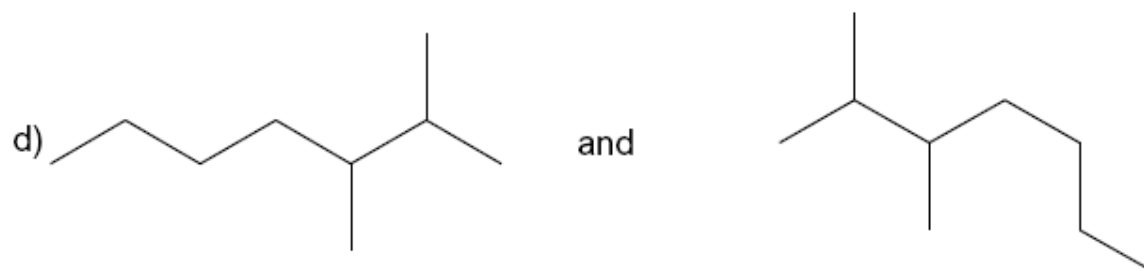
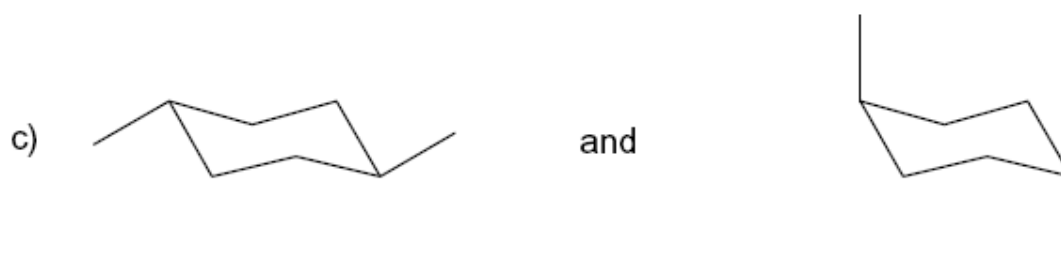
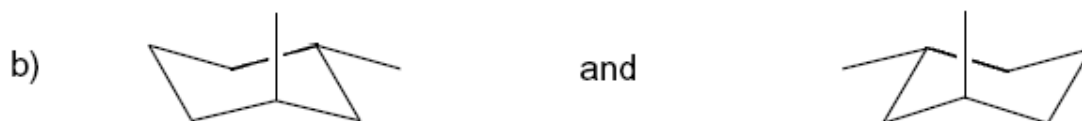
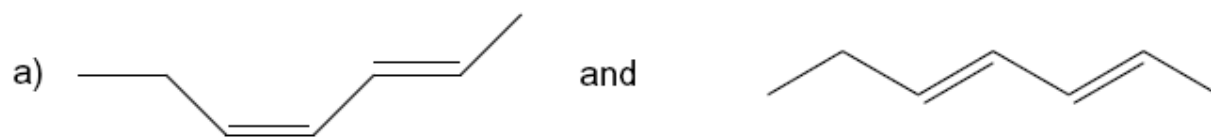


3. Predict the product of the following reactions:

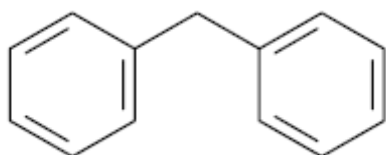
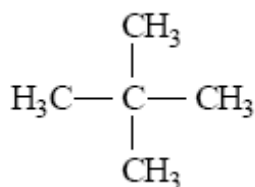


Isomer Relationships

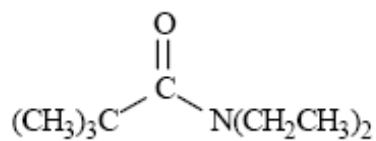
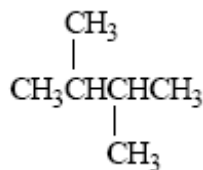
a-e) Identify the relationship between the following pairs of compounds. Are they: enantiomers, diastereomers, conformational isomers, constitutional isomers, or the same?



For each of the compounds below tell how many signals you would expect the molecule to have in its normal, broadband decoupled ^{13}C NMR spectra and in its ^1H NMR.

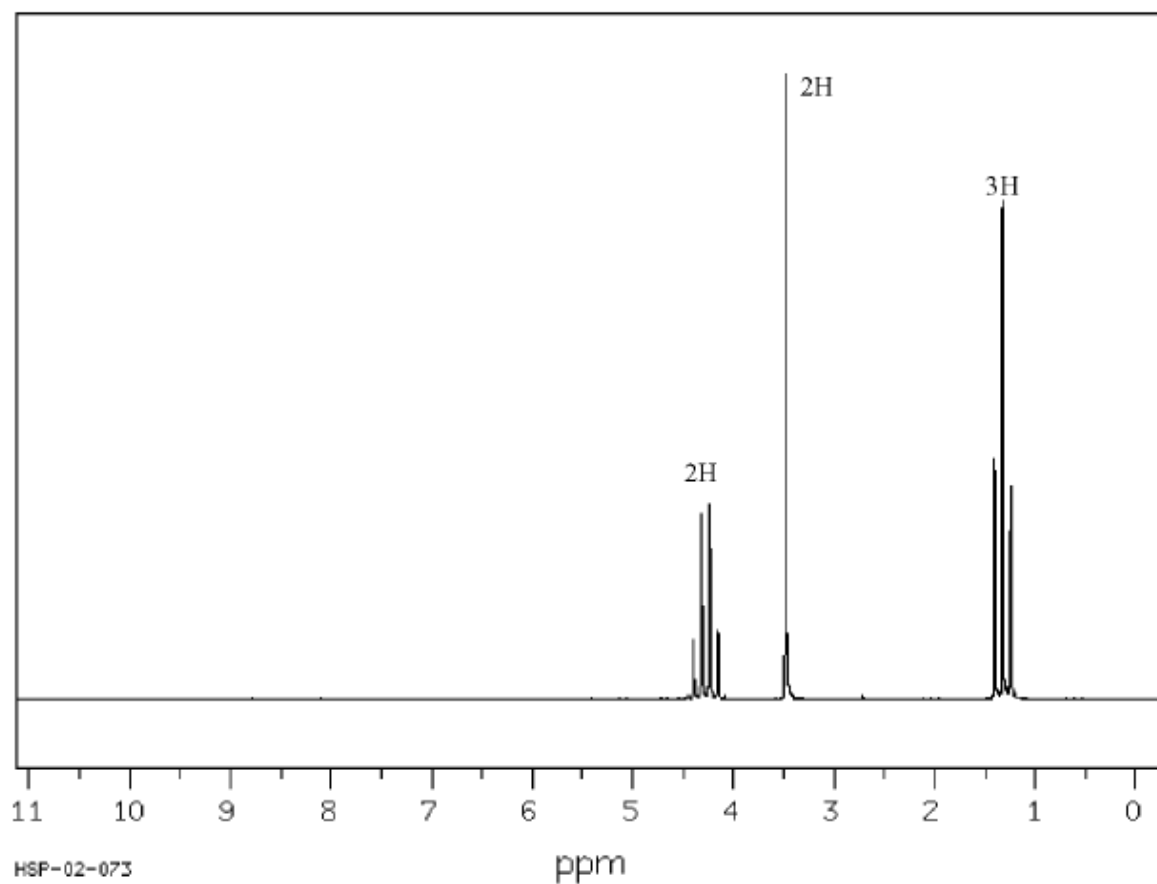


Predict the splitting patterns you would expect for each proton in the molecules below; list the important IR frequencies that would be observed in the IR spectra.



To answer the following questions, consider the data and ^1H NMR spectrum below:

The mass spectrum of this compound shows a molecular ion at $m/z = 113$, the IR spectrum has characteristic absorptions at 2270 and 1735 cm^{-1} , and the ^{13}C NMR spectrum has five signals.



(Spectrum obtained from: SDBSWeb: <http://www.aist.go.jp/RIODB/SDBS/>)

Based on the mass spectral data and the IR data, what functional groups are present in this compound?

How many types of nonequivalent protons and carbons are there in this molecule?