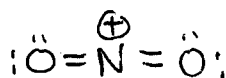


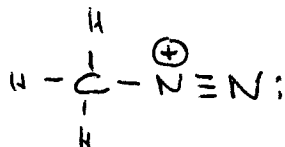
You have one hour to answer all of the following questions. Note the point values (110 total), be sure to budget your time, and **write all your answers below in ink.** Good luck!

1 (20 Points). Write complete Lewis structures for the compounds below. Be sure to show all of the major contributing resonance structures and formal charges, if any.

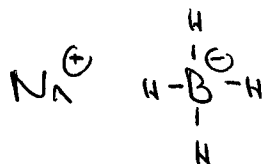
a. NO_2^+



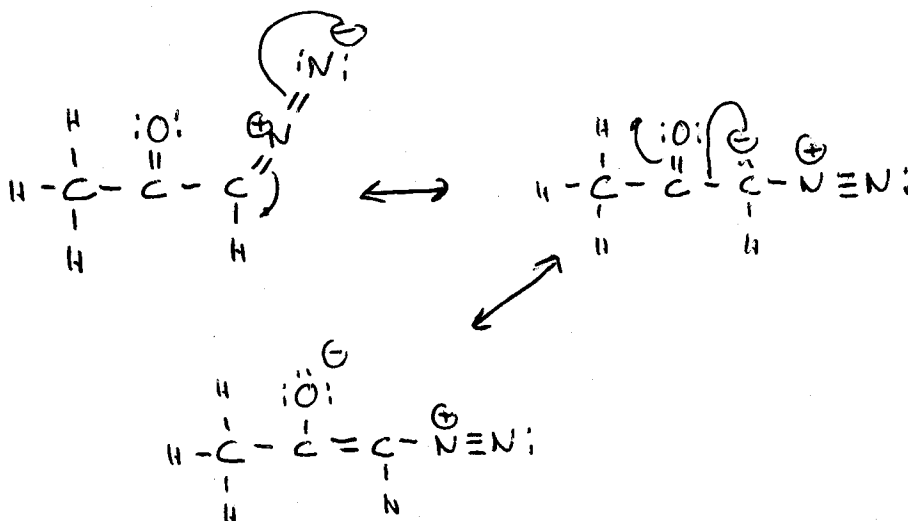
b. CH_3N_2^+



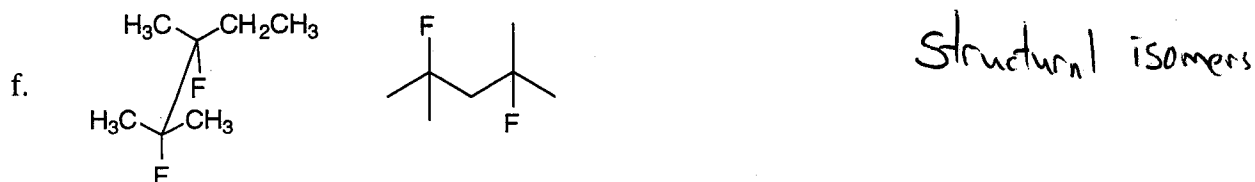
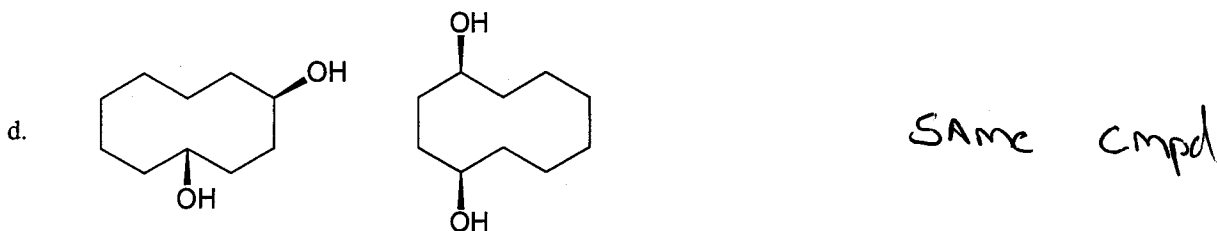
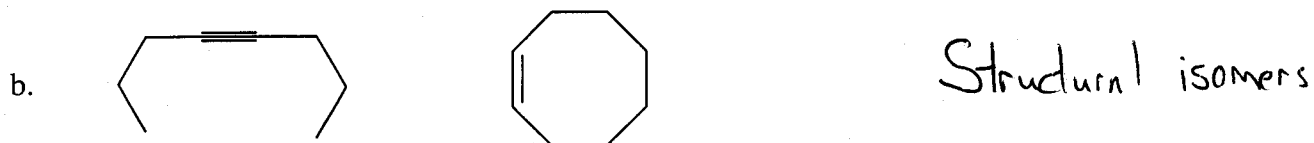
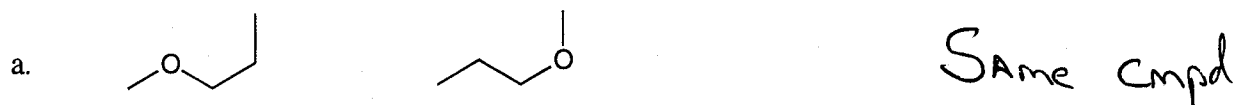
c. NaBH_4



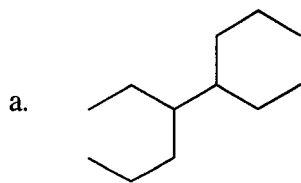
d. $\text{CH}_3\text{COCHN}_2$ (no ring)



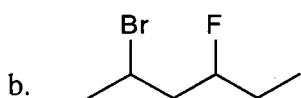
2 (24 Points). Provide the relationship which best describes the following pairs of compounds from the following choices: Same compound, different compounds, resonance structures, structural isomers, or geometric (cis/trans) isomers.



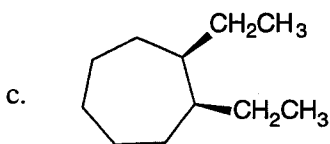
3 (20 Points). Give the systematic (IUPAC) names for the structures given below.



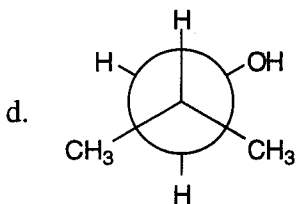
4,5-diethyloctane



2-bromo-4-fluorohexane



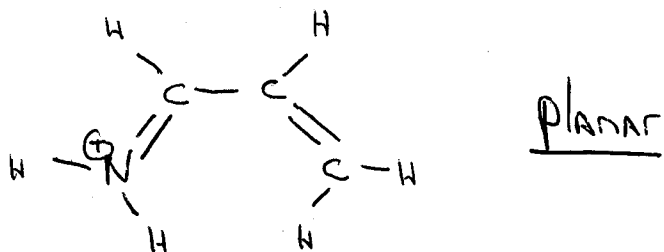
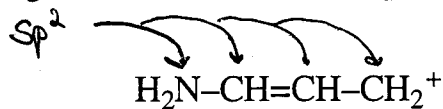
cis-1,2-diethylcycloheptane



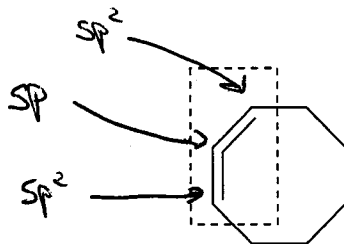
2-methyl-1-propanol

5 (20 Points).

a. Indicate the hybridization at the nitrogen atom and all three carbons of the molecule below. Also, provide a 3-dimensional drawing of the structure of this compound (i.e. show its geometry).

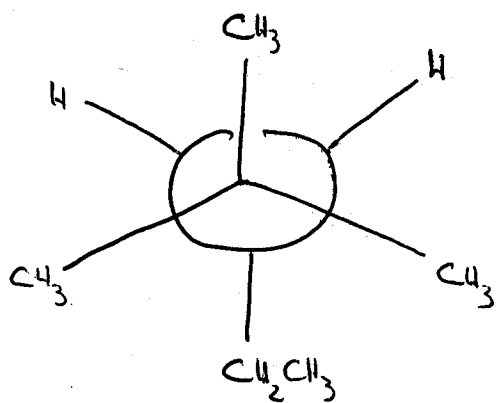
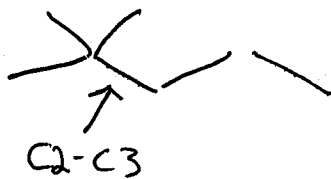


b. Consider the species below and indicate the hybridization of the carbon atoms enclosed in the box and explain why this molecule is strained in a single sentence.

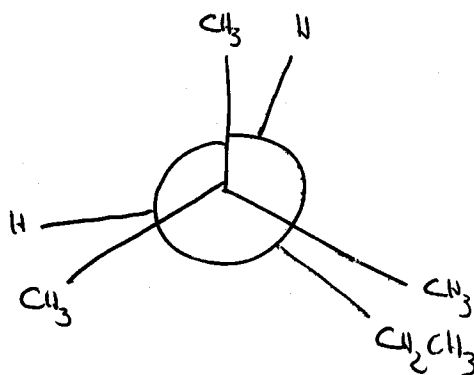


Hard to adopt a linear geometry at the sp -hybridized carbon because of the ring.

6 (10 Points). Consider 2,2-dimethylpentane and draw a Newman projection for the most and least stable conformers looking down the C2-C3 bond.



staggered
(most stable)



eclipsed
(least stable)