

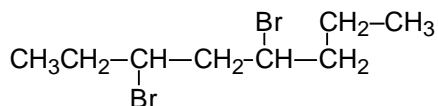
Name _____

Pledge: I have neither given nor received aid on this exam.

Signature _____

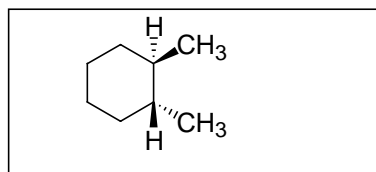
I. Nomenclature (12 points) Either give the IUPAC name for compounds or provide the structure for the indicated name.: Indicate R, S, cis, trans, E, or Z where appropriate.

1.



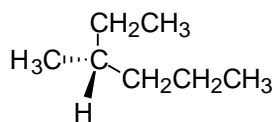
3,5-dibromooctane

2.



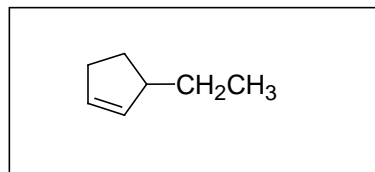
1R, 2R-1,2-dimethylcyclohexane

3.



R-3-methylhexane

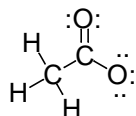
4.



3-ethylcyclopentene

5. Write valid Lewis structures for the following species. Show all nonbonding (unshared) electrons and indicate any formal charges. (6 points).

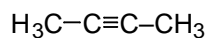
HCOO⁻ (formate ion)



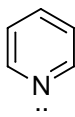
HCN

H-C≡N:

6. Give the hybridization of the indicated atoms in the species below. (6 points)



↑
sp

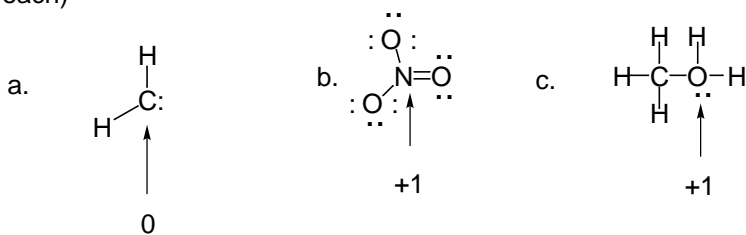


↑
sp²

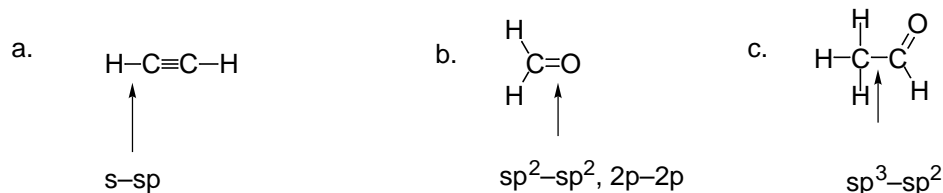


↑
sp³

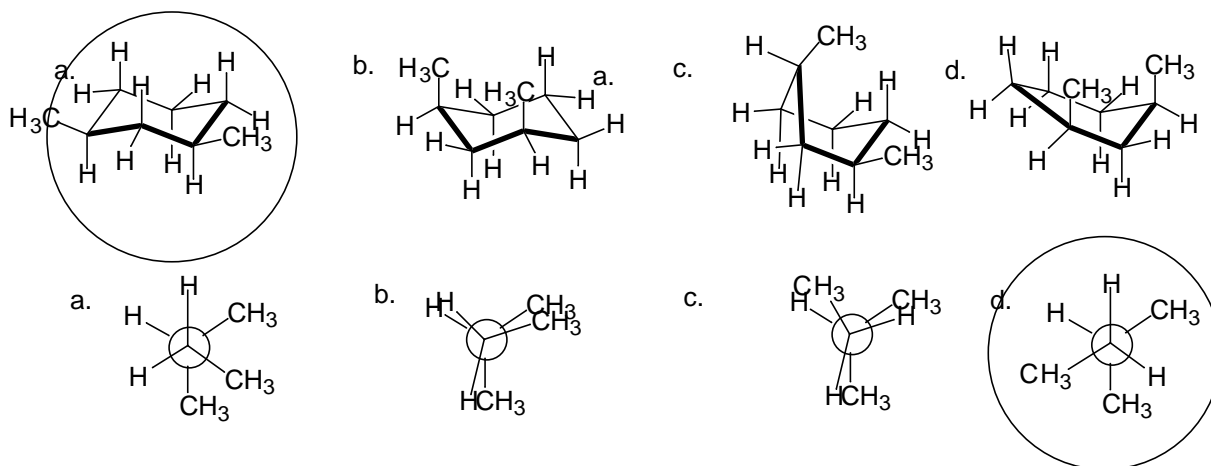
7. What is the formal charge on the indicated atoms below? All unshared electrons are shown. (2 pts each)



8. Which atomic orbitals are involved in forming the following bonds? (e.g. sp^3-sp^3) (2 points each)



9. Circle the most stable conformation of each of the groups below. (3 pts ea)

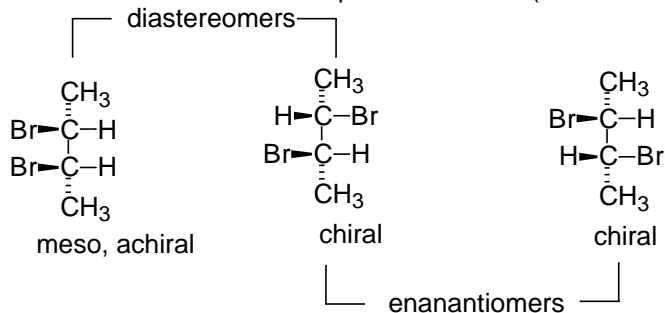


10. What two effects contribute the most to the energy of a cyclohexane boat conformation? (2 pts each)

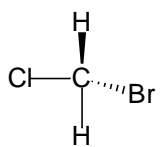
torsional strain

van der waals repulsion (flagpole hydrogens)

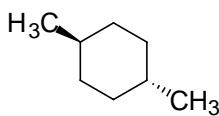
11. Draw all the possible stereoisomers of 2,3-dibromobutane. Indicate if they are chiral, meso or achiral and indicate their relationship to each other. (i.e. enantiomers, diastereomers) (6 points)



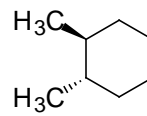
12. Label the following as chiral or achiral. (2 pts each)



achiral

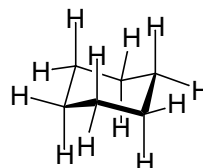
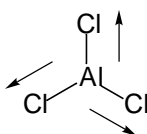
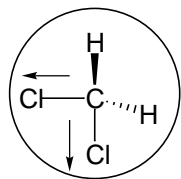


achiral



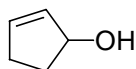
chiral

13. Indicate any polar covalent bonds in the molecules below by show the direction of the dipole. Circle the molecules with a permanent dipole moment. (6 points)



14. Draw three structural isomers of the molecular formula C_5H_8O . (6 points). Draw the structure of

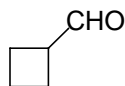
an alcohol



an ether

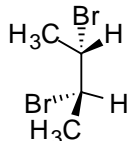
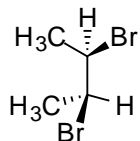


an aldehyde



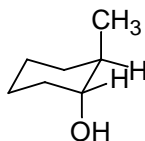
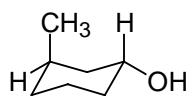
15. In the space to the right, indicate if each of the pairs of molecules below are identical compounds, enantiomers, diastereomers, structural isomers, or conformational isomers. (9 points).

a.



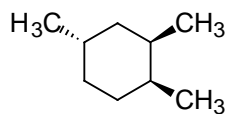
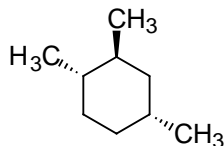
identical

b.



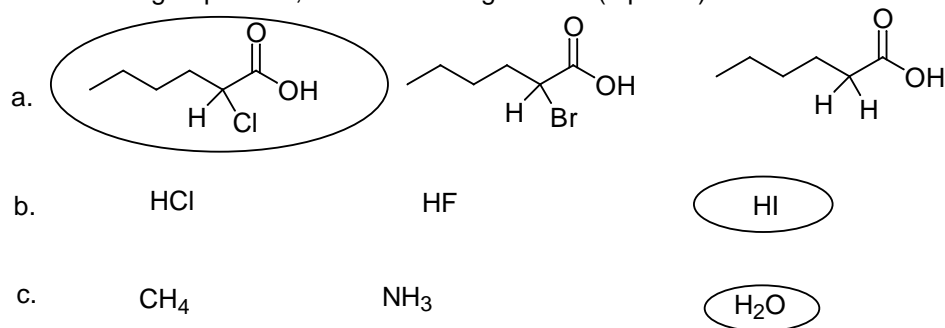
structural isomers

c.

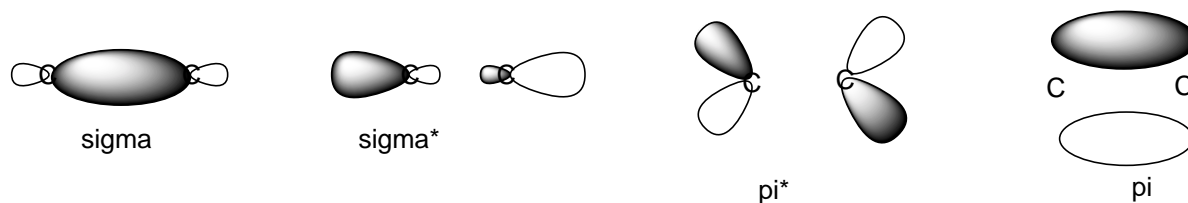


diastereomers

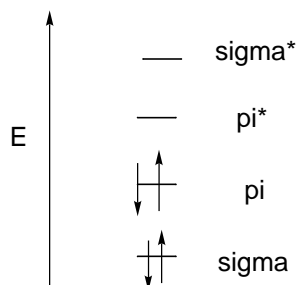
16. In each group below, circle the stronger acid. (6 points)



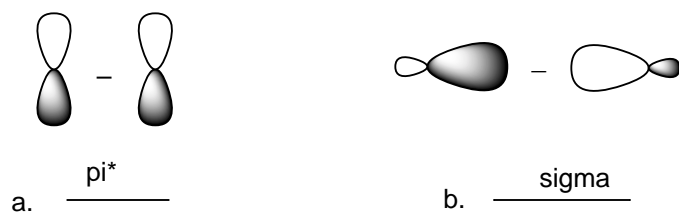
17. a. Draw and label the four molecular orbitals which are involved in the C=C double bond of ethylene (H₂C=CH₂). 4 points



b. Also show an energy diagram of the molecular orbitals of the C=C double bond of ethylene. Indicate the ground state electronic configuration. (3 points)



18. What kind of molecular orbital results (σ , σ^* , π , π^*) when the pairs of orbitals show below are combined (mathematically) in the indicated manner? (4 pts)



19. Label the following as Lewis acid or Lewis base. (2 points each)

