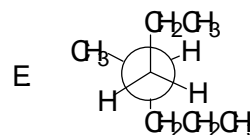
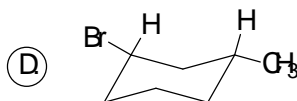
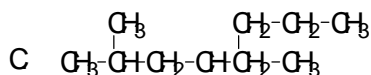
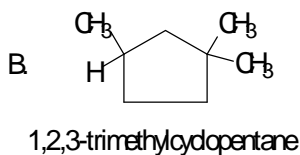
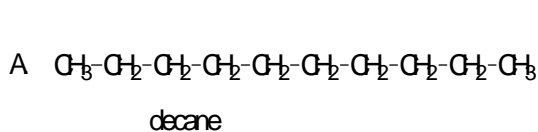


Exam # 1  
 Chemistry 2401  
 October 3, 2002

(20) I. Name each of the following compounds. Include stereochemical designations for those whose letter is circled.



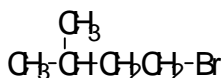
2,5-dimethyloctane

cis-1-bromo-3-methylcyclohexane

4-methylheptane

(20) II. Draw structural formulas for each of the following. There may be more than one right answer. In that case, you should draw only one of them.

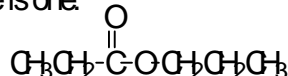
A. isopentyl bromide



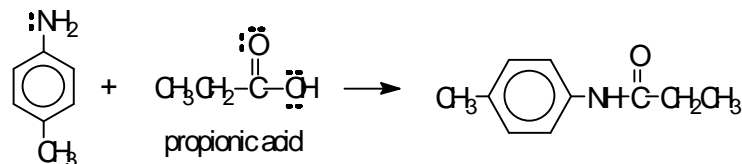
B. an ester with a molecular formula of  $\text{C}_6\text{H}_{12}\text{O}_2$ .

there are about 40 right answers

here is one.

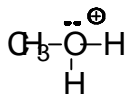


C. The amide made from p-toluidine and propionic acid.

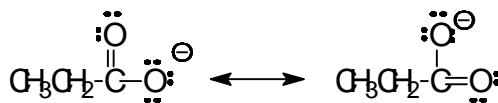


p-toluidine

D. The conjugate acid of methanol.

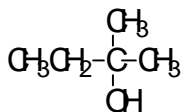


E. Two resonance structures for the conjugate base of propionic acid.

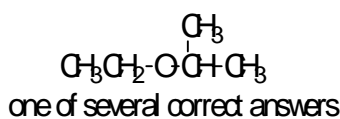


(16) II.

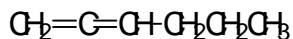
F. An alcohol ( $\text{C}_5\text{H}_{12}\text{O}$ ) in which the OH group is bonded to a tertiary carbon atom.



G. An ether that is an isomer of the alcohol in part F.

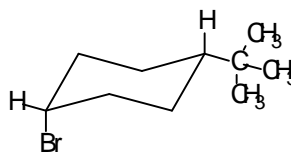


H. A hydrocarbon with a molecular formula of  $C_6H_{10}$  that contains at least one carbon of each hybrid type ( $sp^3$ ,  $sp^2$ , and  $sp$ )



trick question, must contain the two double bonds to one carbon

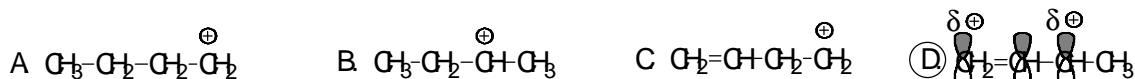
I. The lowest energy chair conformation of cis-1-bromo-4-tert-butylcyclohexane.



t-butyl must be equatorial  
this is cis since both are down

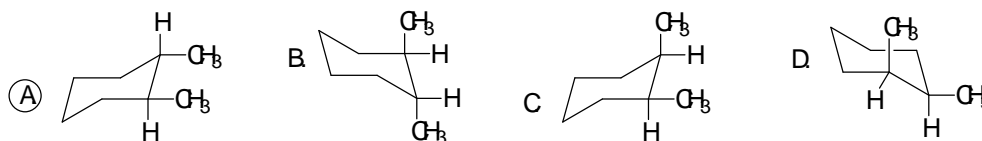
(44) III. Multiple choice: Circle the letter corresponding to the correct response.

1. Which of the following Lewis structures shown below provides the poorest description of the carbocation it is meant to represent.



The three adjacent p orbitals means that this is only one of two resonance structures.

2. Which of the conformations of 1,2-dimethylcyclohexane is lowest in energy?



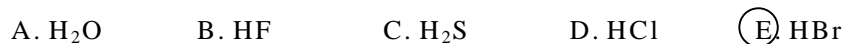
The conformation in A has both methyl groups equatorial

3. Which of the following is the strongest base?



since  $CH_4$  is the weakest acid (electronegativity), it has the strongest conjugate base.

4. Which of the following is the strongest acid?



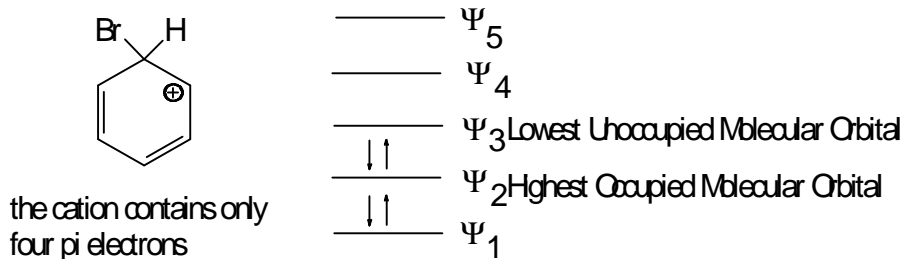
$Br^-$  is very large, therefore very stable and easy to form

5. Recall that hybrid orbitals that possess more "s" character are shorter and therefore electrons in those orbitals are closer to the nucleus of that atom. Given that, which of the following would be the weakest Lewis base (poorest electron pair donor)?



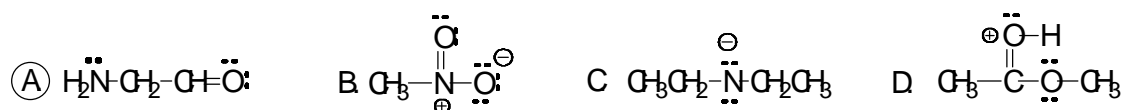
the shorter, fatter  $sp$  hybrid orbital in acetonitrile holds the electron pair closer to the N

6. If the carbocation shown below has the molecular orbital diagram indicated, then which of the following statements is true. By the way, the cation is not paramagnetic.

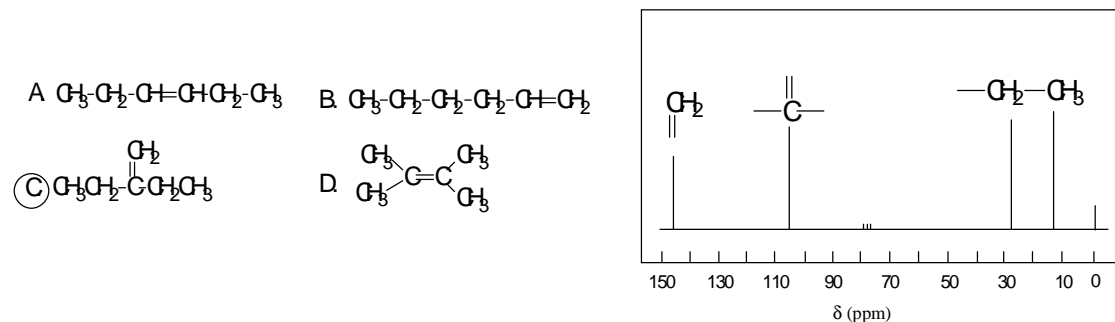


- A. The LUMO is  $\Psi_3$  and the HOMO is  $\Psi_2$ .      B. The LUMO is  $\Psi_2$  and the HOMO is  $\Psi_3$ .  
 C. The LUMO is  $\Psi_4$  and the HOMO is  $\Psi_2$ .      B. The LUMO is  $\Psi_2$  and the HOMO is  $\Psi_1$ .

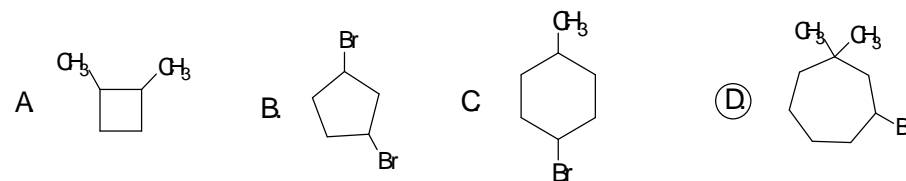
7. Which of the following does not contain an atom with a formal charge?



8. Which of the compounds below would produce the  $^{13}\text{C}$  NMR spectrum shown?



9. Which of the following cycloalkanes does not exist in stereoisomeric forms?



only one carbon in the ring has two different groups attached

10. Cyclopropane rings are relatively high in energy because they have

