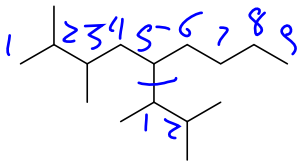
Chem 220 Exam 1 Green

Name:_____

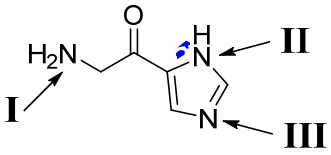
Circle the letter for the correct solution for each multiple-choice question. (2 points each)

1. Identify the correct IUPAC name for the following structure.



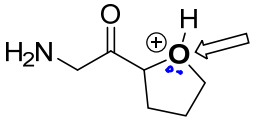
a. 5-(1,2-dimethylpropyl)-2,3-dimethylnonane
b. 5-(1,2-dimethylpropyl)-7,8-dimethylnonane
c. 5-(2-methybutyl)-2,3-dimethylnonane
d. 2,3-dimethyl-5-(2-methylbutyl)nonane

2. Which of the indicated nitrogen atoms has a delocalized lone pair?



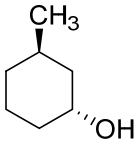
a. **I**
b. **II**
c. **III**
d. **II** and **III**

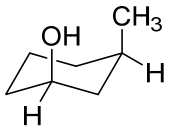
3. What is the hybridization and geometry for the indicated atom.



a. sp^3, tetrahedral
b. sp^3, trigonal pyramidal
c. sp^2, trigonal planar
d. sp^2, bent

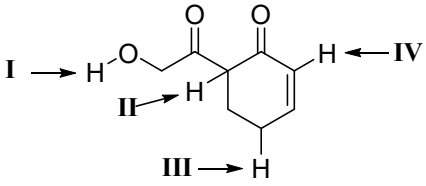
4. What is the isomeric relationship between the structures below?





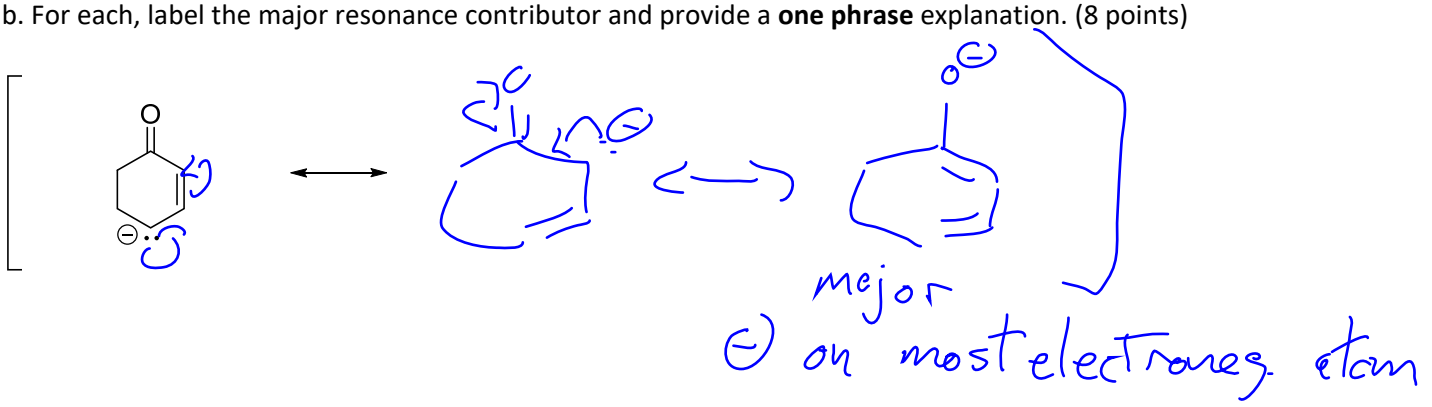
a. diastereomers
b. enantiomers
c. constitutional isomers
d. same

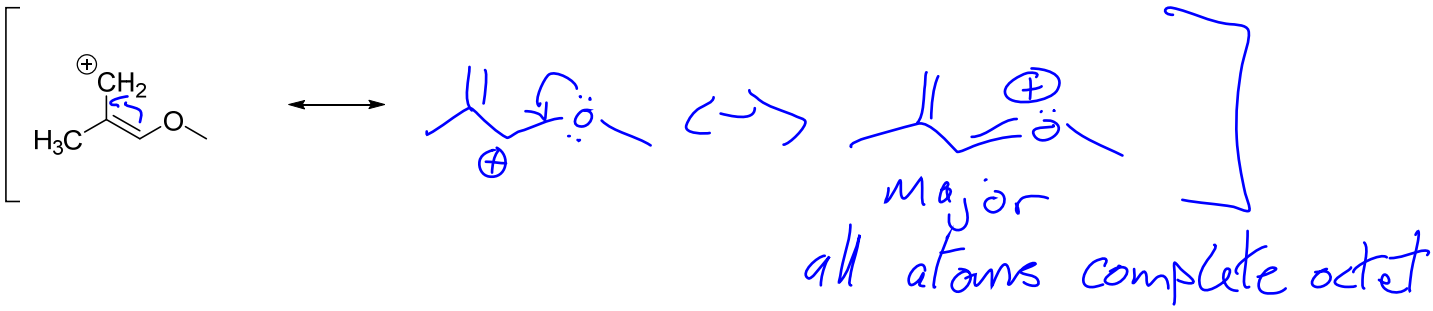
5. Identify the **MOST** and **LEAST** acidic hydrogen in the following structure.



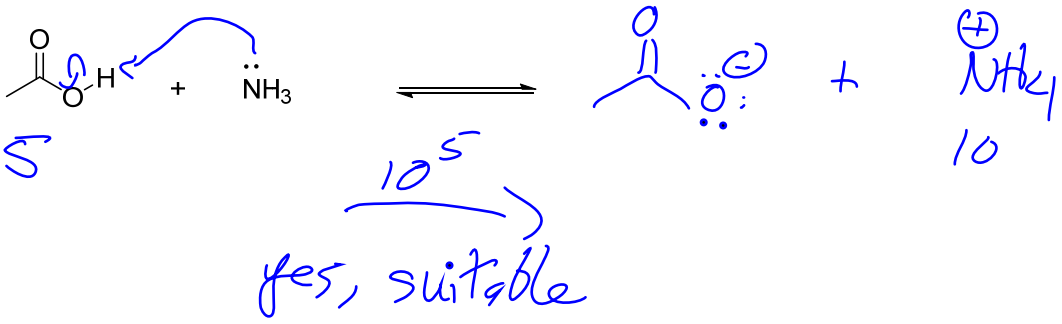
a. MOST = **I**, LEAST = **IV**
b. MOST = **II**, LEAST = **III**
c. MOST = **II**, LEAST = **IV**
d. MOST = **IV**, LEAST = **I**

6. a. Draw as many reasonable resonance structures as you can for the following molecules using correct curved arrows to show electron movement.
b. For each, label the major resonance contributor and provide a **one phrase** explanation. (8 points)

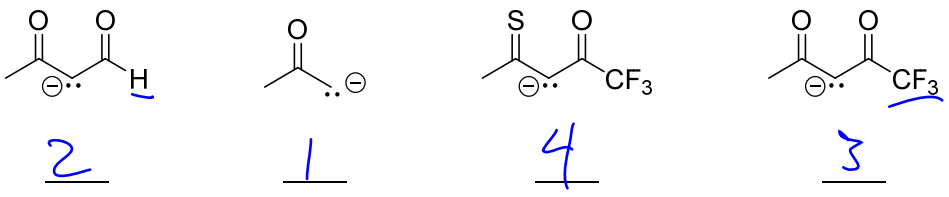




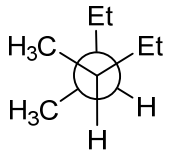
7. a. Provide products and curved arrows for the following acid base reaction.
b. Determine whether the acid Is a suitable choice for this protonation. Use **pK_a values** to justify your answer. (6 points)

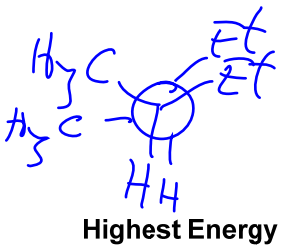


8. Rank the following bases from **MOST BASIC (1)** to **LEAST BASIC (4)**. (2 points)

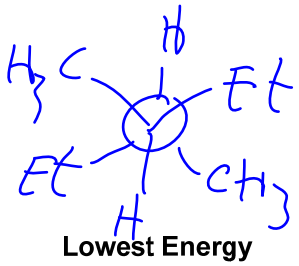


9. Starting from the Newman projecting below, draw the **HIGHEST** and **LOWEST** energy conformers. (4 points)



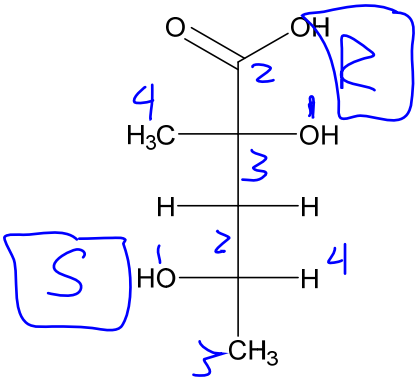


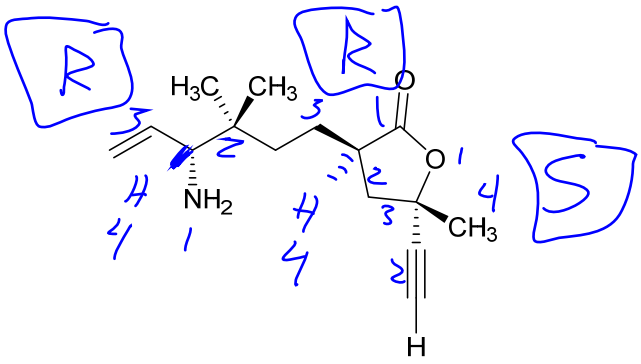
Highest Energy



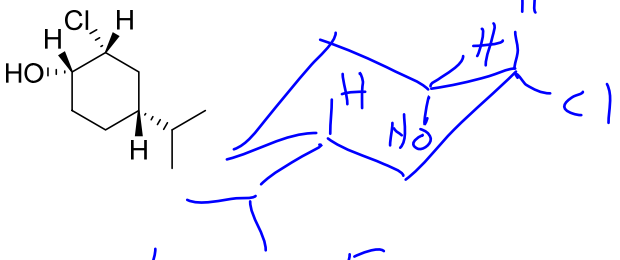
Lowest Energy

10. Assign R/S for each chiral center. Show your work by clearly labeling the priorities (1-4) around each chiral center (6 points)

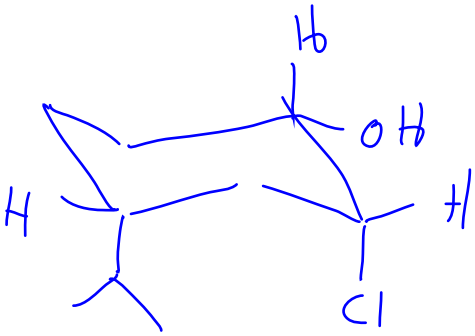




11. a. Draw both chair conformers of the following molecule.
b. Identify the lower energy conformer and provide a brief explanation for your choice. (7 points)



lower E
4Me + Cl equatorial



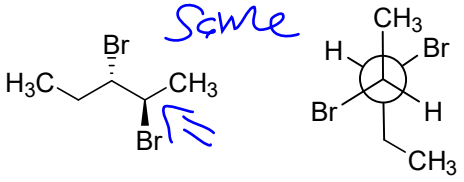
12. (R)-limonene has a specific rotation of +20.0°.
a. Determine the enantiomeric excess of a mixture, of (R)- and (S)-limonene, whose specific rotation was found to be -10°?
b. What is the percent composition for each component of the mixture? (3 points)

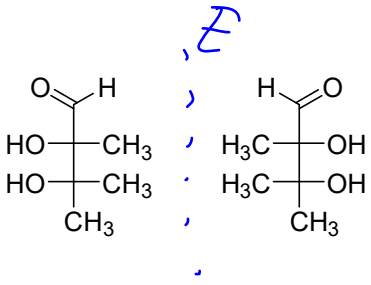
% 10/20 · 100% = 50% ee (S)

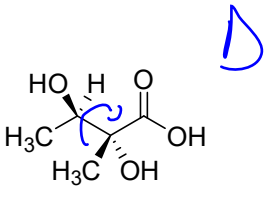
75% S
25% R

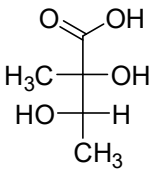
50% racemic
−
25% S 25% R

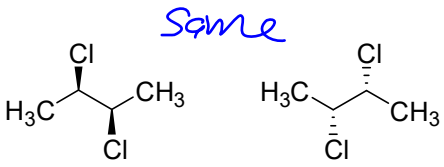
13. Identify the relationship between each pair of compounds as constitutional isomers (C), enantiomers (E), diastereomers (D) or the same. (4 points)











14. a. Circle the structure which corresponds to the following IR spectrum.
b. Show your work by clearly annotating all identifiable functional groups in the diagnostic region. (5 points)