

Name: _____
Last First MI

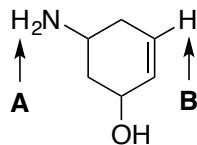
Grading Page (Exam 1):

Page	Points Possible	Points Earned
Multiple Choice (3-5)	26	
6	18	
7	18	
8	21	
9	17	
TOTAL	100	

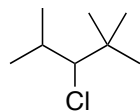
Multiple Choice

Choose the one best answer for each of the following questions. Using a pencil, record this answer on the provided Scantron sheet. (2 points each)

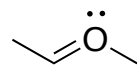
1. The approximate pK_a values for protons **A** and **B** are ____ and ____, respectively.



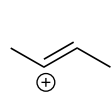
- a. 10, 44
 - b. 25, 50
 - c. 35, 44
 - d. 10, 25
 - e. 35, 50
2. What is the condensed formula for the structure below?



- a. (CH₃)₂CHCHClCH(CH₃)₂
 - b. CH₃CH(CH₃)CHClCH(CH₃)₂
 - c. (CH₃)₂CHCHClC(CH₃)₃
 - d. (CH₃)₃CCHClCH(CH₃)₃
3. What is the formal charge on the oxygen atom in the structure below?



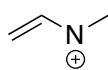
- a. -1
 - b. 0
 - c. +1
 - d. +2
4. The H-C-H bond angle in methane is closest to
- a. 90°
 - b. 109.5°
 - c. 120°
 - d. 180°
5. Which structure below is classified as an allylic carbocation?



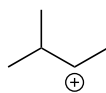
a



b



c

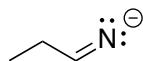


d

both b & c

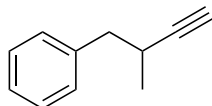
e

6. What is the hybridization of the nitrogen atom in the molecule below?



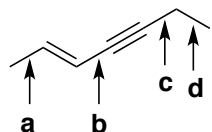
- a. s
- b. sp
- c. sp³
- d. sp²
- e. p

7. How many π -bonds are present in the structure below?

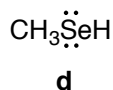
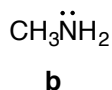
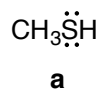


- a. One
- b. Three
- c. Four
- d. Five
- e. Six

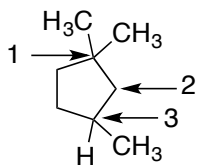
8. Which one of the indicated C-C single bonds is the longest?



9. Which species below would you expect to be the strongest base? *Hint: Think about the acidity of the conjugate acids.*

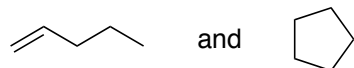


10. Carbons 1, 2, and 3 in the following structure are classified, respectively, as:



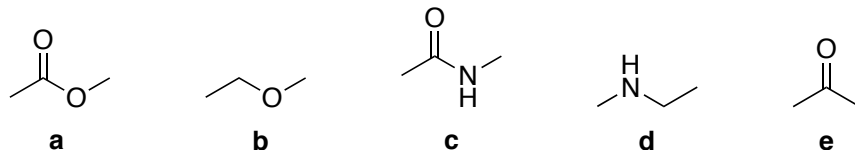
- a. tertiary, primary, secondary
- b. quaternary, primary, secondary
- c. quaternary, secondary, quaternary
- d. quaternary, primary, tertiary
- e. quaternary, secondary, tertiary

11. What is the relationship between the two structures below?

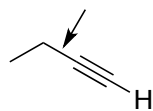


- a. Identical structures
- b. Resonance forms
- c. Constitutional isomers
- d. None of the above

12. Which species below contains an amide functional group?



13. What type of orbital overlap is involved in the indicated bond?



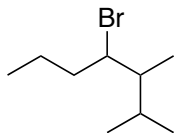
- a. $C_{sp}-C_{sp}$
- b. $C_{sp^3}-C_{sp}$
- c. $C_{sp^3}-C_p$
- d. $C_{sp^2}-C_{sp}$
- e. None of the above

Completion Section

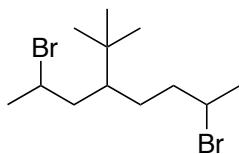
Answer the remaining questions in the spaces provided. Show all work and provide complete explanations.

14. Provide IUPAC systematic names for each of the following compounds. (3 points each)

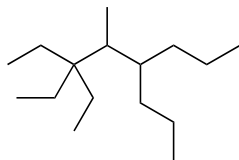
a.



b.



c.

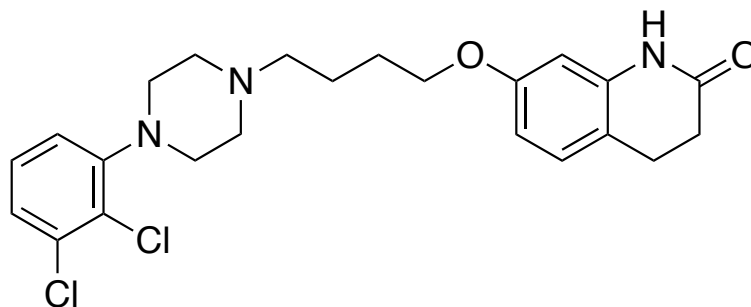


15. Convert the following IUPAC Names into skeletal structures. (2 points each)

a. 4-(1,1-dimethylethyl)heptane

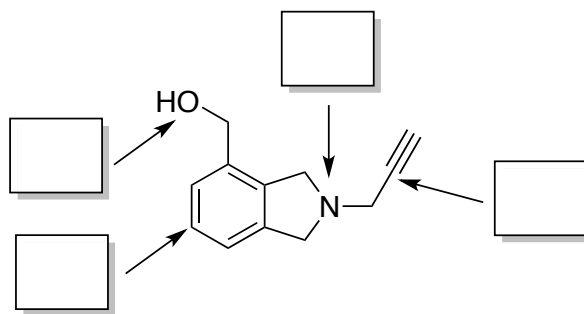
b. 2,2-dibromo-3-isopropylhexane

16. Below is the structure of abilify, an antipsychotic drug. Circle and identify five (5) different functional groups in this compound. (5 points)

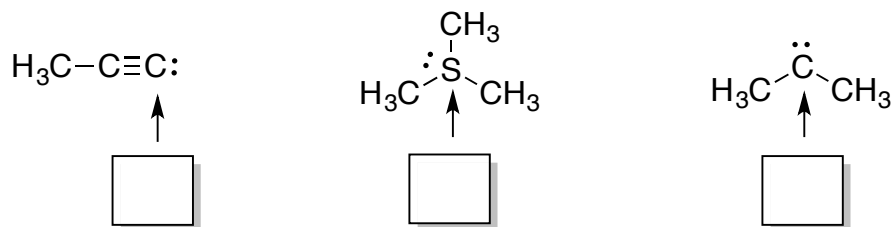


17. Draw a valid uncharged Lewis structure or skeletal structure for a compound with the molecular formula C_3H_6O . *Hint: Check octets! (5 points)*

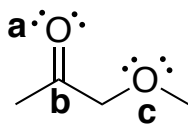
18. For the compound below, predict the hybridization for each of the indicated atoms. (4 points)



19. Determine the formal charge for each of the indicated atoms below. All atoms and lone pairs are already drawn in for you. (1 point each)



20. Consider the molecule below and answer the following questions.



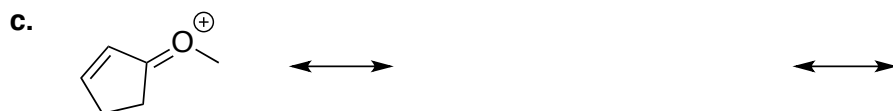
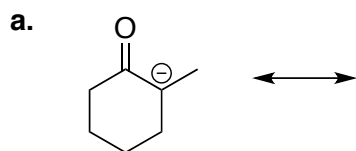
a. In what type of orbital do the lone pairs in **oxygen a** reside? (2 points)

b. What is the geometry at **carbon b**? (2 points)

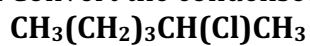
c. What is the bond angle around **oxygen c**? (2 points)

21. For each structure shown below, complete the following: (12 points)

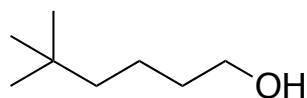
- Draw all resonance structures. (2 pts)
- Use curved arrows to show electron flow. (1 pt)
- Circle the "best" resonance structure (the major contributor to the resonance hybrid). (1 pt)



22. Convert the condensed structure below to a skeletal structure. (2 points)

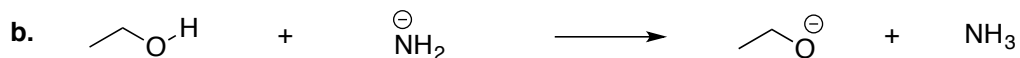
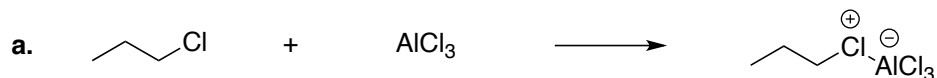


23. Convert the skeletal structure below to a condensed structure. (3 points)

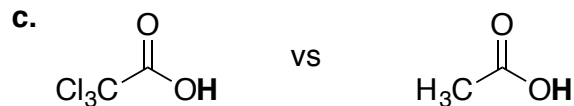
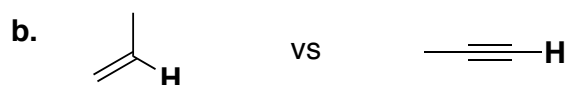
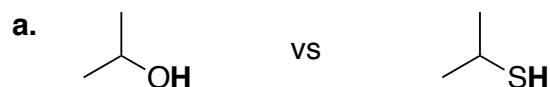


24. For each reaction shown below, add in curved arrows to the reactants to show electron flow.

Hint: it may help to draw in lone pair electrons. (2 points each)



25. For each pair, circle the compound that is most acidic. Include a brief (one sentence or less) explanation for each choice. (3 points each)



26. For each acid/base reaction below: **1.** Draw the correct products; **2.** Label the acid (A), base (B), conjugate acid (CA), and conjugate base (CB); **3.** Circle the set of equilibrium arrows that best represents the direction in which the reaction lies. (4 points each)

