CHEMISTRY 61
Exam 1
Dr. M.T. Crimmins
September 21, 1999

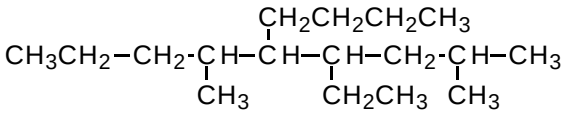
Name_____

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

Signature_____

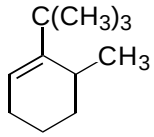
I. Nomeclature (12 points) Give the IPUAC name for the following compounds: Indicate R, S, cis, trans, E, or Z where appropriate.

1.



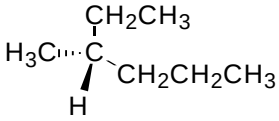
5-n-butyl-4-ethyl-2,6-dimethylnonane

2.



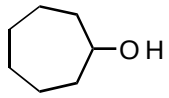
1-t-butyl-6-methylcyclohexene_____

3.



(R)-3-methylhexane_____

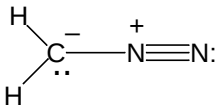
4.

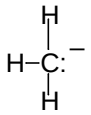


cycloheptanol_____

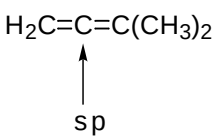
5. A. Write valid Lewis structures for the following species. Show all nonbonding (unshared) electrons and indicate any formal charges . (6 points).

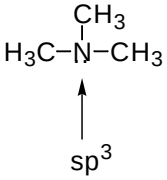
CH_2N_2 CH_3^-

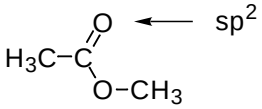




6. Give the hybridization of the indicated atoms in the species below (6 points)

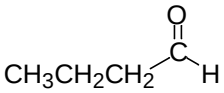


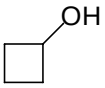


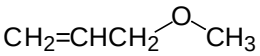


7. Write structures for the each of the following having a molecular formula of C_4H_8O (6 points).

a. a n aldehyde b. a cyclic alcohol c. an ether

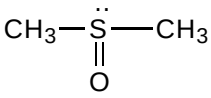






8. What intermolecular forces exist between molecules of each of the following. (6 points).

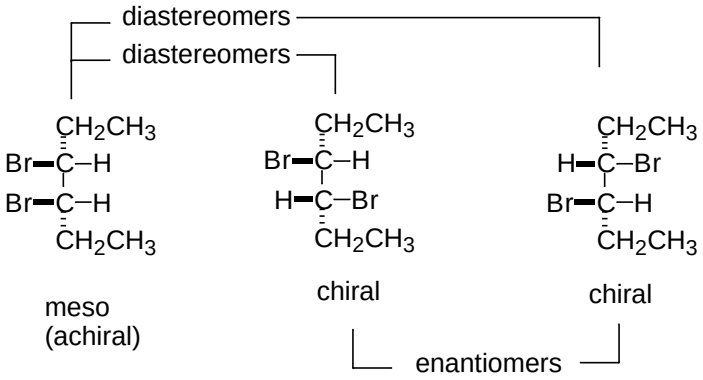
a. $CH_3CH_2CH_2CH_2CH_3$ ____van der waals__ _____

b. 

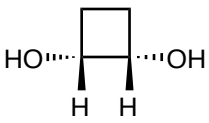
_ ___dipole-dipole_____

c. CH_3CH_2OH ____hydrogen bonding_____

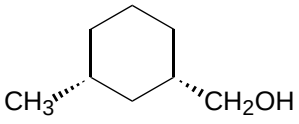
9. Draw all the possible stereoisomers of 3,4-dibromohexane. Indicate if they are chiral, meso or achiral and indicate their relationship to each other. (i.e. enantiomers, diastereomers) (8 points)



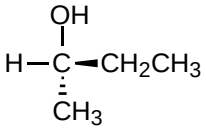
10. Label the following molecules as chiral or achiral.



_____achiral__ _

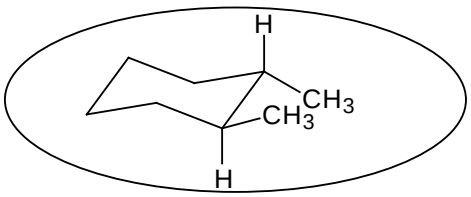


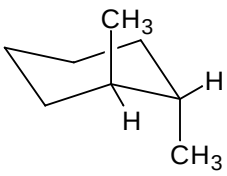
___chiral__ _____



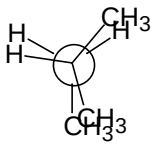
_ _chiral_____

11. Draw both chair conformations of trans-1,2-dimethylcyclohexane. If one is more stable than the other, circle it. (6 points)

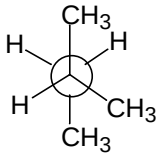




12. Draw Newman projections of the most stable and least stable conformations about the C2-C3 bond of 2,3-dimethylbutane. (6 points).

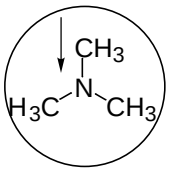


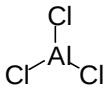
least



most

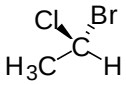
13. Circle the molecule(s) which have a permanent dipole. In those which have a permanent dipole, show the direction of the overall dipole. (6 points)

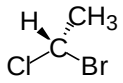




14. In the space to the right, indicate if each of the pairs of molecules below are identical compounds, enantiomers, diastereomers, structural isomers, or conformational isomers. (9 points).

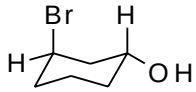
a.

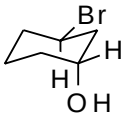




_____enantiomers_____

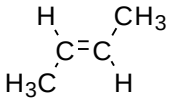
b.

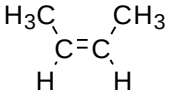




__conformational isomers_____

c.





_____diastereomers_____

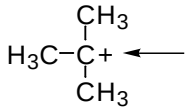
15. What effect(s) cause cyclobutane and cyclopentane to be non-planar? (3 pts)

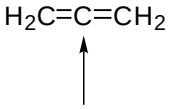
bond angle strain and torsional strain

16. Label the species below as Lewis Acids or Lewis Bases (6 points)

H_3C^+	$H_2C=CH_2$	BCl_3
_____Lewis acid_____	_Lewis base____	___Lewis acid___

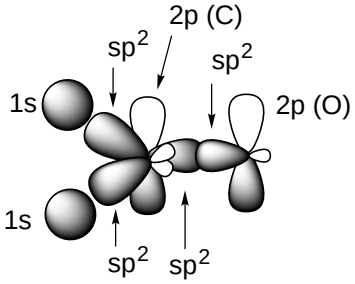
17. Indicate the geometry of carbon in the molecules below (e.g. trigonal bipyramidal). (6 points)



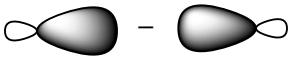


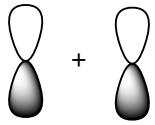
____planar_____ _____linear_____

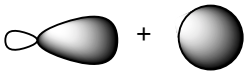
18. Draw and label the atomic orbitals which combine to form the molecular orbitals of formaldehyde, $H_2C{=}O$. . (6 points)



19. What kind of molecular orbital results (σ, σ^*, π, π^*) results when the pairs of orbitals show below are combined (mathematically) in the indicated manner? (6 pts)







a. ___sigma *___ b. ___pi___ c. ___sigma___