

Name: _____

Chemistry 114
Exam 1, February 11, 2004

General Instructions: Read each question carefully and answer each question in the expected format, using proper English grammar, punctuation and spelling. Show your work on calculation problems and include units where appropriate.

A. Definitions (2 points each)

1. combustion–
2. functional group–
3. _____ is a compound composed only of hydrogen and carbon
4. primary carbon–
5. sigma (σ) bond–
6. _____ is the body of chemists responsible for nomenclature (naming) rules
7. alkene–
8. molecular formula–
9. _____ is a bond that is more reactive because the electrons are shared “sideways” instead of head-to-head
10. _____ is a carbon attached to two other carbons

B. Concepts and Applications Thereof

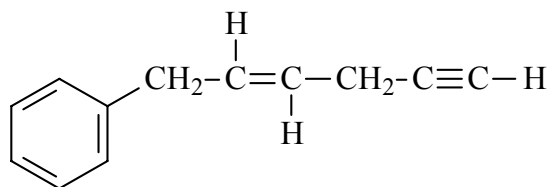
11. Indicate the number of bonds formed by each of the following atoms. (5 points)

Atom	Number of Bonds
Carbon	_____
Hydrogen	_____
Oxygen	_____
Nitrogen	_____
Chlorine	_____

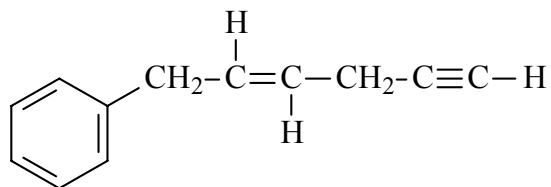
12. Indicate which of the following bonds are polar or nonpolar. (5 points)

Bond	Polar or nonpolar
C-O	_____
C-H	_____
O-H	_____
N-H	_____
C-N	_____

13. Given the following molecule, label *each* carbon with “a” if it is sp^3 hybridized, “b” if it is sp^2 hybridized and “c” if it is sp hybridized. (5 points)

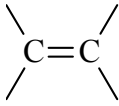
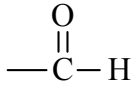


14. Given the following molecule, label *each* carbon with “a” if it is a primary carbon, “b” if it is a secondary carbon, “c” if it is a tertiary carbon, and “d” if it is a quaternary carbon. (5 points)

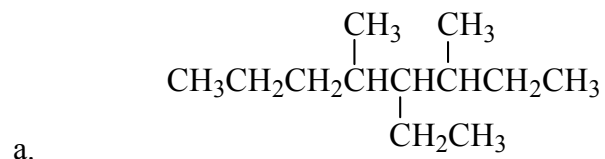


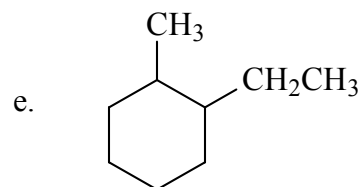
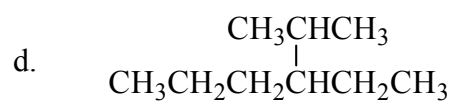
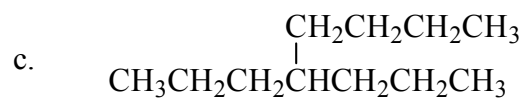
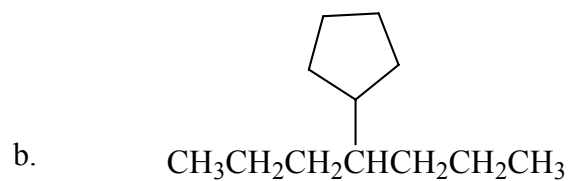
15. A molecule has a formula of C_6H_{14} . Draw the complete structural formula, the condensed formula, and the line formula of any one isomer of the compound. (5 points)

16. Complete the following table of functional groups. (5 points)

<u>Name</u>	<u>Functional Group</u>
Alcohol	_____
_____	
Ether	_____
_____	
Ketone	_____

17. Name the following molecules, for which a structure is given. (15 points)





18. Draw the structure of the following molecules, for which a systematic name is given. (15 points)

a. 2-methylbutane

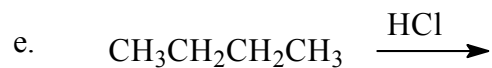
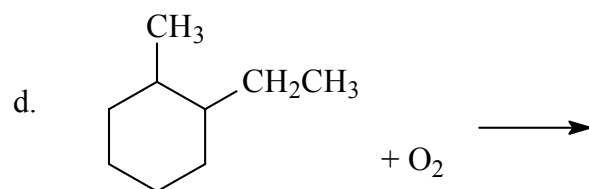
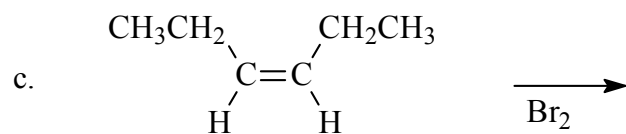
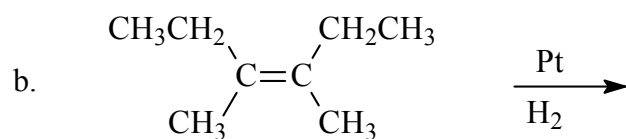
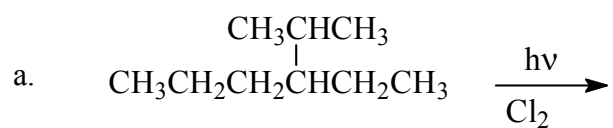
b. 3-*t*-butyl-2,3-dimethylhexane

c. *trans*-2-methyl-3-pentene

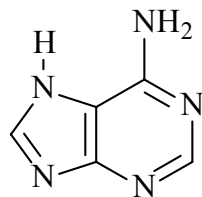
d. methylcyclopentane

e. 5-methyl-1,4-hexadiene

19. Predict the product of the following reactions. If no reaction occurs, write "NR." Be sure the reactions are balanced. If more than one product occurs, indicate only one of them but write others exist. Name the molecule(s) you arrive at as products. (15 points)



20. For the following molecule, give the complete structural formula, the molecular formula and the molecular weight. (5 points)



Bonus question (for a maximum of 5 extra credit points). In class, I used acetylene (ethyne) as an example, which is used as fuel for metal-cutting torches. What chemical reason is there for using acetylene instead of propane or some other fuel?