DEPARTMENT OF CHEMISTRY
UNIVERSITY OF PENNSYLVANIA

CHEMISTRY 241, Fall 2007

ORGANIC CHEMISTRY WORKSHOP

Problem Set II.

1. Write structural formulas for the five isomeric hexanes (C_6H_{14}) and then:

   a) name them by the IUPAC system
   b) Identify all primary (1°), secondary (2°), tertiary (3°) and quaternary carbon atoms as well as all the 1°, 2°, and 3° hydrogen atoms.

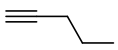
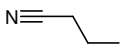
2. Draw the structures that correspond with each name. (Hint: Try to draw line-angle formulae since these are easier and faster to draw than others...)

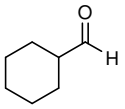
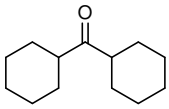
   a) 2-bromononane
   b) *t*-butylcyclooctane
   c) 2,2-dimethylpropane
   d) 2,2-dichloro-3-methylbutane
   e) cyclobutylcyclopentane
   f) *cis*-1-isopropyl-4-methyl-cyclohexane
   g) bicyclo[4.1.0]heptane
   h) bicyclo[4.4.1] undecane

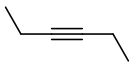
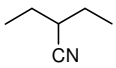
3. Draw the structures of the following groups, and give their more common names:

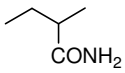
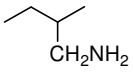
   a) (1-methylethyl) group
   b) (2-methylpropyl) group
   c) (1-methylpropyl) group
   d) (1,1-dimethylethyl) group

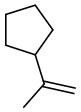
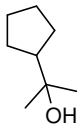
4. Consider the following pairs of organic molecules. Using only IR spectroscopy list the characteristic infrared absorption frequencies that would allow you to distinguish between these molecules. (Hint: You may want to start out with putting down the characteristic IR frequencies for each of the compounds side-by-side and then see in what way their peaks differ.)

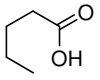
a)  and 

b)  and 

c)  and 

d)  and 

e)  and 

f)  and 

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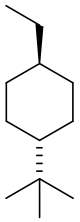
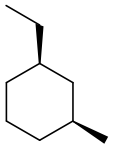
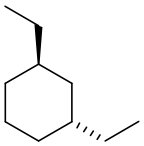
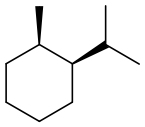
5. Draw the staggered conformations (Newman Projection) of 2,3-dimethylbutane in order of increasing energy.

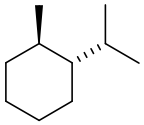
6. Draw the two chair conformations of each compound, and label the substituents as axial and equatorial. In each case determine which conformation is more stable.

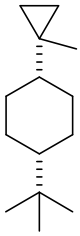
a) 

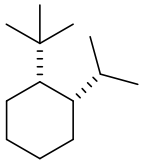
b) 

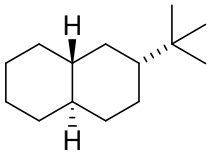
c) 

d) 

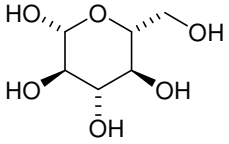
e) 

f) 

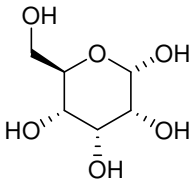
g) 

h) 

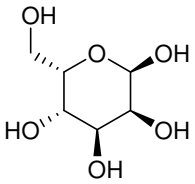
7. Draw the most stable chair conformation for the following carbohydrates.



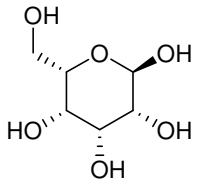
D-glucopyranose



D-allopyranose



L-gulopyranose



L-talopyranose