

PRACTICE EXAM #1

Chem21, Introduction to Organic and Biochemistry

Instructions: Don't panic. There are three (3) total pages for this exam. For every question, read all given directions and follow them completely. Clearly and logically show all your work and reasoning where applicable. Box all final answers.

1.) An aqueous solution has a $[\text{OH}^-] = 1.35 \times 10^{-6} \text{ M}$. Recall that $K_w = 1.0 \times 10^{-14}$. (16 pts)

a.) Calculate $[\text{H}_3\text{O}^+]$, in M.

b.) Calculate the pH.

c.) Is the above solution *acidic*, *neutral*, or *basic*? _____

2.) Write the *balanced* equation for the combustion of liquid heptane. You may assume that all products formed are gases. (12 pts)

3.) Consider a molecule of normal butane, C_4H_{10} in a straight-chain. Draw the Newman projections down the bond between C_2 and C_3 . (22 pts)

a.) Show the *eclipsed* conformation for butane.

b.) Show the *staggered* conformation for butane.

c.) Which of the above is *least* stable? _____

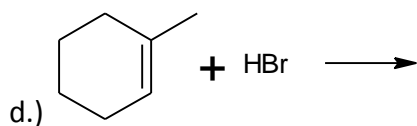
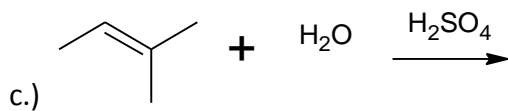
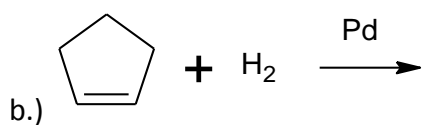
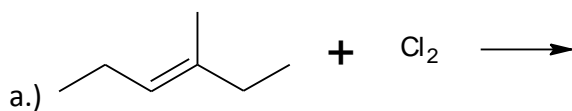
4.) Draw the line-angle structures for the following compounds. (27 pts)

a.) isopropylcyclohexane

b.) 1-sec-butyl-1-methylcyclobutane

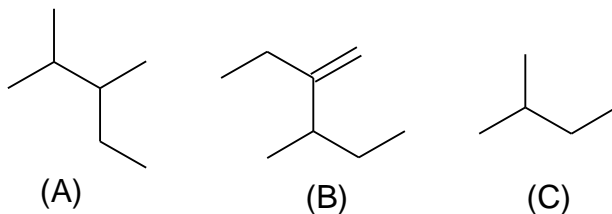
c.) Are the above compounds (a-b) *isomers* or *different* compounds? _____

5.) Give the *structures* for the products formed from the reactions listed. (40 pts, 10 pts ea)



6.) Explain why alkanes exhibit conformational isomerization, but cycloalkanes and alkenes have cis-trans isomerization (there is a DIFFERENT reason for each). (12 pts)

7.) Consider the following molecules. (24 pts)



a.) Give the correct IUPAC names for each structure.

(A) _____

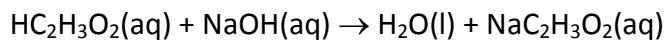
(B) _____

(C) _____

b.) Which of the above structures (A-C) are *nonpolar*? _____

c.) Which of the above structures (A-C) do you expect to have the *lowest* boiling point? Explain, including what intermolecular forces are present in each.

8.) Consider the following reaction. (12 pts)



a.) Identify the *Arrhenius base*. _____

b.) Identify the *conjugate base*. _____

c.) Identify the *Brønsted-Lowry acid*. _____

d.) Identify the *conjugate acid*. _____