

Seat No. _____

Name _____

(Please **CLEARLY PRINT** your name and **CIRCLE** your last name)

CHEMISTRY 331

EXAM I

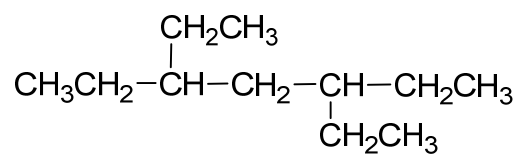
Tuesday, September 15, 2009

- I. (10 points) _____
- II. (10 points) _____
- III. (6 points) _____
- IV. (10 points) _____
- V. (8 points) _____
- VI. (8 points) _____
- VII. (8 points) _____
- VIII. (9 points) _____
- IX. (8 points) _____
- X. (12 points) _____
- XI. (9 points) _____
- XII. (2 points) _____

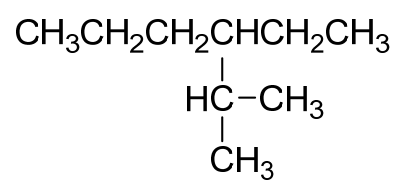
TOTAL (100 points) _____

I. (10 pts.) Provide "IUPAC-correct" names for the following compounds.

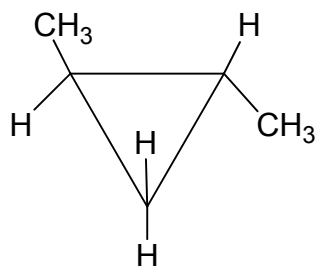
A.



B.



C.



II. (10 pts.) Provide proper structures for the following compound names.

A. trans-1-bromo-3-methylcyclobutane

B. 2-ethyl-1,4-dimethylcyclohexane
(planar ring)

C. 4-isopropylheptane

III. (6 pts.) Draw a Newman projection of the most stable conformation of 1-chloropropane sighting down the C₁-C₂ bond.

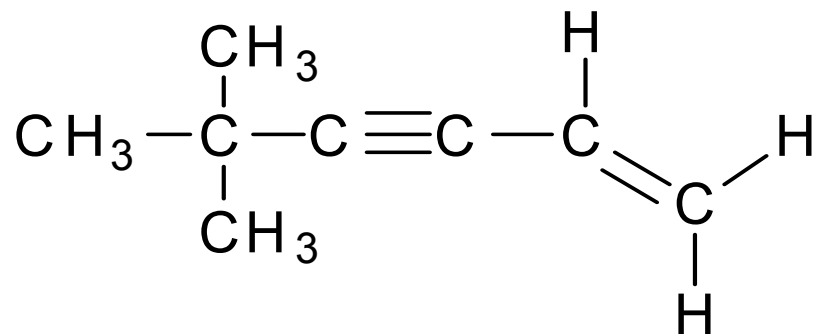
IV. (10 pts.) Draw the two chair conformations of trans-1,2-dimethylcyclohexane and circle the most stable one.

V. (8 pts.) Draw 3-D (wedge & dotted line) structures and indicate the molecular dipole moment w/ a crossed arrow ($\overset{\times}{\rightarrow}$) for the following compounds. Write $\mu=0$ next to your structure if no dipole is anticipated.

A. H_3CCl

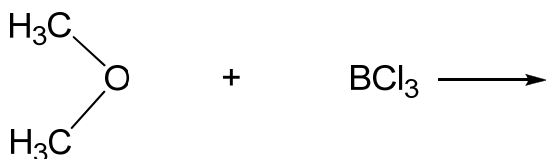
B. H_3N

VI. (8 pts.) For each carbon atom in the following structure indicate the hybridization and, if it is sp^3 , the type (1° , 2° , 3° or Q). e.g. $\text{sp}^3 - 2^\circ$. If two or more carbons are identical (symmetry related) you need only identify one of the group.

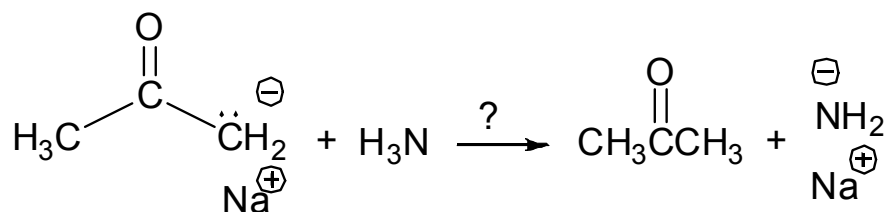


VII. (8 pts.) Draw two resonance forms of the anion (acetate ion) formed from $\text{CH}_3\text{CO}_2\text{H}$ donating a proton in a Brønsted Lowry reaction. Use curved arrow(s) to indicate e-pair movement in going from your left structure to your right.

VIII. (9 pts.) Showing the involved e's and using curved arrows to indicate e-pair movement complete this reaction. Underline the Lewis base and show any charges on the product(s).



IX. (8 pts.) Acetone has pKa 19 and ammonia has pKa 36. Will the following reaction take place in the direction indicated? _____
(Yes or No)



Circle the strongest base in the equation.

X. (12 pts) Enter the letter of the structure representing the given functional group on the left.

- | | |
|--------------------------|--|
| 1. _____ Carboxylic acid | a. $\text{CH}_3\text{CH}_2\text{CH}_3$ |
| 2. _____ Nitrile | b. CH_3CN |
| 3. _____ alcohol | c. $\begin{array}{c} \text{Br} \\ \\ \text{CH}_3\text{CHCH}_3 \end{array}$ |
| 4. _____ amine | d. $\text{H}_2\text{C}=\text{CH}_2$ |
| 5. _____ ketone | e. $(\text{CH}_3)_2\text{C}=\text{O}$ |
| 6. _____ alkyne | f. $\text{CH}_3-\text{NH}-\text{CH}_3$ |
| | g. $\text{CH}_3-\text{O}-\text{CH}_3$ |
| | h. $\text{CH}_3\text{CH}_2\text{OH}$ |
| | i. $\text{CH}_3\text{C}\equiv\text{CCH}_3$ |
| | j. $\text{HO}_2\text{C}-\text{CH}_3$ |

XI. (9 pts.) The most important noncovalent interaction in OChem (and biochem) by far is the _____ . (2 words) The bonding theory that creates covalent bonds by overlapping atomic orbitals is _____ . (3 words) The C-C σ -bond in ethane can be thought of as arising from overlap of two _____ orbitals. The most electronegative of the pair, I and F, is _____ . The dipole of CCl_4 is ca. $\mu =$ _____. BCl_3 can behave as a Lewis _____. _____ keep geckos from falling from the ceiling into sleeping boys' mouths. The Baeyer Strain Theory failed because Baeyer assumed _____ of the cycloalkanes. The higher energy of one conformation of a monosubstituted cyclohexane vs. the other is due to _____ which generate steric strain.

XII. (2 pts.) If a cat always lands on its feet, and buttered bread always lands butter-side down, what would happen if you tied buttered bread on top of a cat?