

EXAM 1
CHEMISTRY 225b
Friday, February 3, 2006

NAME (print): _____

TA: _____ Sect. Day: _____ Sect. Time: _____ Course ID: _____

Take a few moments to look over the exam. Answer each question on the exam paper.

No calculators. Important clues and structures are in **bold**.

Do all **preliminary** drawing or computations on the work sheets at the end of the exam. The work sheets will not be graded.

The exam is 55 minutes.

STOP writing and hand in your exam when you are asked to do so.

REMEMBER: Neatness is to your advantage.

Your grade will be posted this afternoon on the course Bulletinboard using the red ID number above. Remember this number for the rest of the term.

1. (20pts) Conformation _____

2. (25 pts) Potpourri _____

3. (15 pts) Resonance (Do 1 of 3) _____

4. (15 pts) Bonding (Do 1 of 2) _____

5. (25 pts) Thermochemistry _____

Total (100 pts)

1. **Conformation:** (20 pts) For the eclipsed and staggered conformations of 2-methylpentane viewed along the C2-C3 sigma bond, **draw a Newman projection** of the **most** stable eclipsed and staggered conformations. Place the appropriate energies in the Newman projections below. [Use the **circles** as

d) **Circle** the species with sp^3 hybridization

NH_4^+ ethylene BF_4^- ethane BeH_2

e) **Circle** the compounds with net dipole moments

$BrCH_2CH_2Br$ CH_2Br_2 trans- $BrCH=CHBr$ CBr_4 $HCBBr_3$

3. **Resonance:** (20 pts.) The concept of resonance plays an important role in organic chemistry. Explain and illustrate the role of resonance in **one** of the following cases. Use orbitals in your explanations.
- The relative acidity of methanol vs. acetic acid
 - The enhanced ability of $CH_2=CHCH_2Br$ to ionize to $R^+ Br^-$
 - Stabilization of the carbocation $RCHOCH_3$
4. **Bonding:** (15 pts) Provide a molecular orbital representation of **one** of the following compounds. Include pi-bonds, p-orbitals, etc. Provide necessary commentary about hybridization.
- allene (1,2-propadiene) $CH_2=C=CH_2$
 - methylacetylene (1-propyne) CH_3CCH
5. **Thermochemistry:** (25 pts) Alkane **A**, C_5H_{12} gives a **single** free radical monochlorination product **B**. No other monochlorinated products are possible. The overall heat of the reaction is $\Delta H^\circ_{rxn} = -29$ kcal/mol. BDEs: $Cl_2 = 58$ kcal/mol; $HCl = 103$ kcal/mol; R-H: (primary) = 101 kcal/mol, (secondary) = 99 kcal/mol, (tertiary) = 97 kcal/mol.
- What are the structures and IUPAC names of alkanes **A** and **B**?
 - Show the propagation steps for this reaction.
 - Calculate the heat of each propagation step and the BDE of R-Cl. **Illustrate and show work.**

Work Sheets

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