

Chem 0310
Dennis P. Curran
January 30, 2009
Exam 1

Name: _____

Signature: _____

Answer all questions on this exam. If you need more space than that provided, use the back of any page.

1. _____ (20 points)

2. _____ (20 points)

3. _____ (20 points)

4. _____ (20 points)

5. _____ (20 points)

TOTAL _____ (100 points)

Suggested

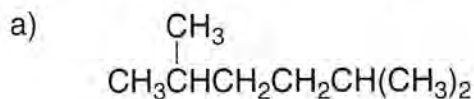
Answers

The test has **6** pages (including this cover page and Tables of BDEs on page 6). There are 5 questions. Each question has four parts. All parts are worth 5 points. Partial credit will be given. The exam ends at 10:55 am sharp.

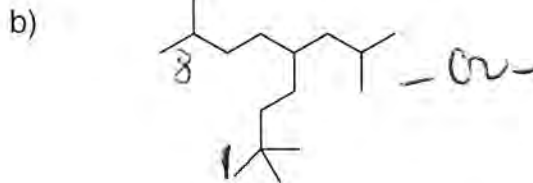
Good Luck !!!

1) Structures and Names (20 points)

Provide IUPAC names for the following alkanes.



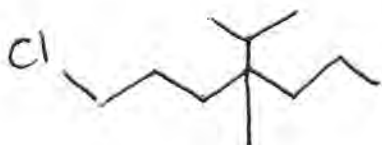
2,5-dimethylhexane



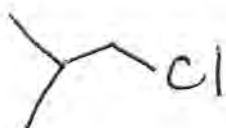
2,2,8-trimethyl-5-(2-methylpropyl)nonane

Draw clear structures for compounds with the following names. You can draw either a condensed structure (like "a" above) or a bond-line structure (like "b" above)

c) 1-chloro-4-isopropyl-4-methylheptane



d) isobutyl chloride

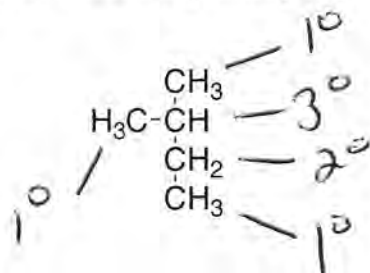


2) Short answer questions (20 points)

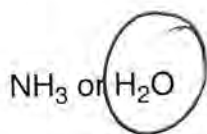
a) State the Hammond Postulate.

exothermic rxn \rightarrow early TS, resembles starting mat
 endothermic rxn \rightarrow late TS, resembles prod

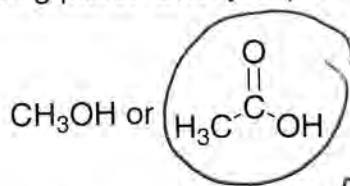
b) Indicate the primary (1°), secondary (2°) and tertiary (3°) hydrogens on the following compound.



c) Choose the *stronger acid* from the following pairs. Briefly explain your choice.

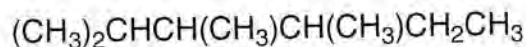
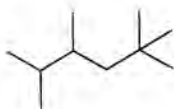
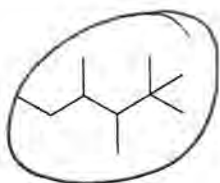
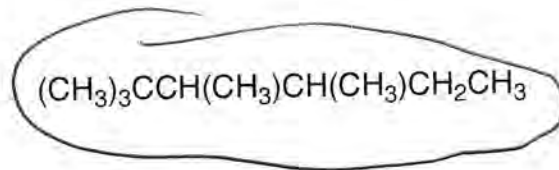
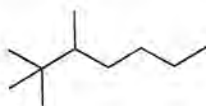
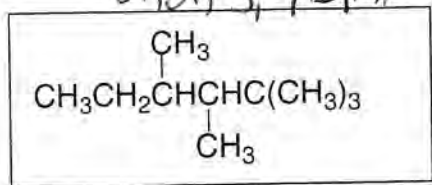


O more electronegative than N



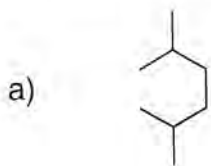
anion delocalized by resonance

d) Circle all structures that are identical to the structure in the box.

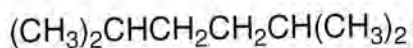


3) Isomers (20 points)

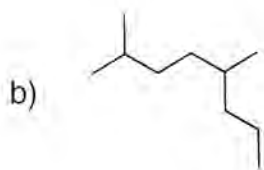
What is the relationship between the following pairs of compounds. Are they: 1) the same, 2) constitutional isomers, or 3) neither?



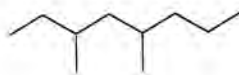
and



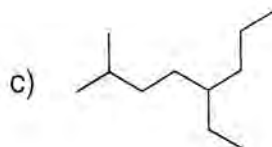
Same



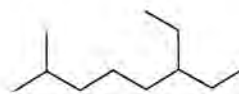
and



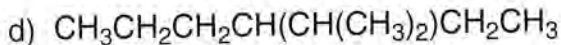
C.I.



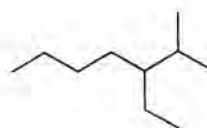
and



C.I.



and



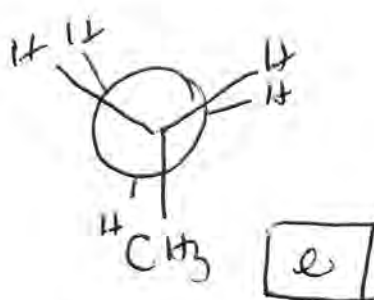
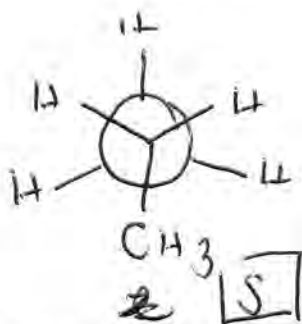
Neither

4) Conformations (20 points)

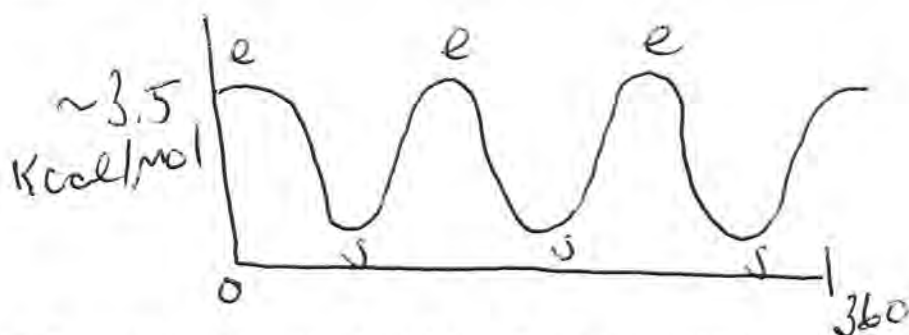
a) Define conformational isomers.

Same connectivity, temporary shapes of molecules that differ by rotation about σ -bonds

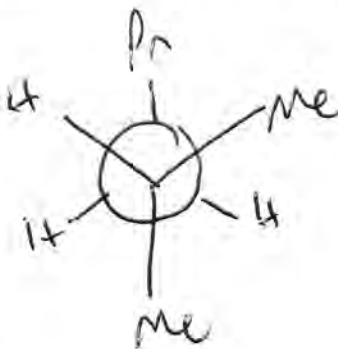
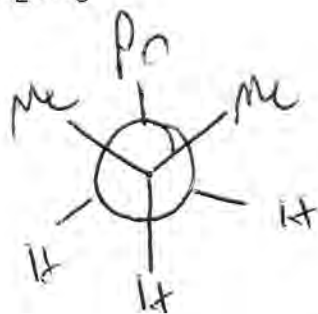
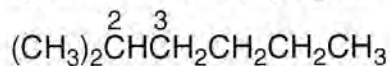
b) Draw Newman projections of the C-C bond of propane ($\text{CH}_3\text{CH}_2\text{CH}_3$) in both eclipsed and staggered conformations.



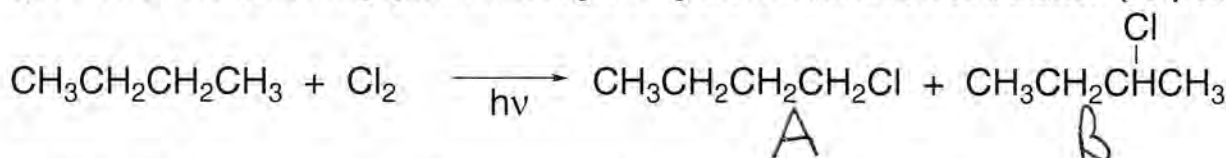
c) Draw a reaction coordinate diagram for the bond rotation in "b". Locate on your diagram the eclipsed and staggered conformations and show the energy difference between them (in kcal/mol).



d) Draw Newman projections for all the staggered isomers of the C2-C3 bond of 2-methylhexane.

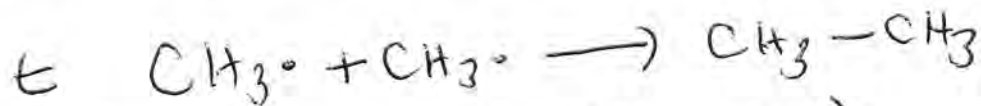
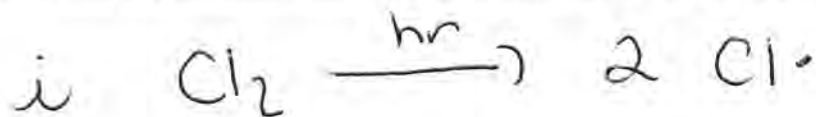


5) Answer the following questions regarding the chlorination of butane. (20 points)



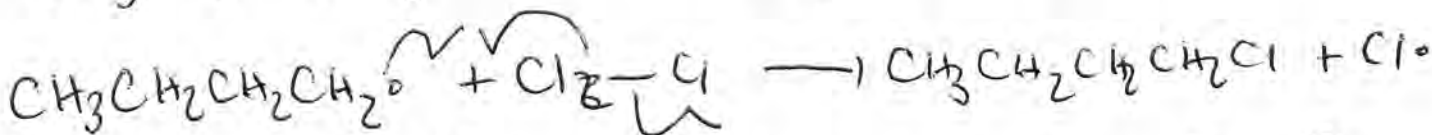
(+HCl)

a) Write the initiation step and *one* termination step for this reaction.



(or $\text{CH}_3\cdot + \text{Cl}\cdot$ or $\text{Cl}\cdot + \text{Cl}\cdot$)

b) Write the propagation steps for *one* (not both) of the products. Use arrows to show electron movement.



(also could draw w $\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HCH}_3$)

c) Using the tables of bond dissociation energies on the next page, calculate the ΔH° for *one* (not both) of the products. Is the reaction exothermic or endothermic?

A	+ 101	}	-29	kcal/mol	B	+ 98.5	}	-30.5	kcal/mol
	+ 58					+ 58			
	- 85					- 84			
	- 103					- 103			

d) Which product is favored? Briefly explain why.

B is favored; breaking C-H bond is weaker; rxn is more exothermic