

Chemistry 333

Examination #1

February 27, 2006

Professor Charonnat

Name: _____

Be certain that your examination has five (5) pages including this one.

Put your name on **each** page of this examination booklet.

By putting your name on this examination booklet you agree to abide by California State University, Northridge policies of academic honesty and integrity.

Molecular models are allowed for this examination. All electronic devices, including calculators, are unnecessary and are not allowed.

Name: _____

1. (20 points)

Answer the following two (2) questions precisely, succinctly and with correct grammar.

A. Consider a one-step reaction with an early transition state. Is the transition state structurally similar to the product or the starting material? State your reasoning and draw a reaction-energy diagram (graph of potential energy versus reaction progress) to illustrate your answer.



B. Explain why a chemical species with three hybrid orbitals is trigonal, not tetrahedral.

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2. (25 points)

Circle the number that corresponds to the correct answer for each of the following six (6) questions.

A. If two electrons exist in the same orbital, their spins

1. always are identical
2. sometimes are identical
3. never are identical

B. When orbitals overlap to form a bond, greater overlap leads to

1. decreased bond strength
2. increased bond strength
3. the same bond strength

C. Which covalent bonds contain electron density that is cylindrically symmetrical about the internuclear axis?

1. sigma
2. pi
3. sigma and pi

D. Resonance structures

1. never are in equilibrium with each other
2. usually are in equilibrium with each other
3. always are in equilibrium with each other

E. Covalent bond homolysis affords

1. ions
2. radicals
3. ions and radicals

F. The lowest-energy conformation of *trans*-1-ethyl-3-methylcyclohexane has

1. no 1,3-diaxial interactions
2. two methyl/hydrogen 1,3-diaxial interactions
3. two ethyl/hydrogen 1,3-diaxial interactions

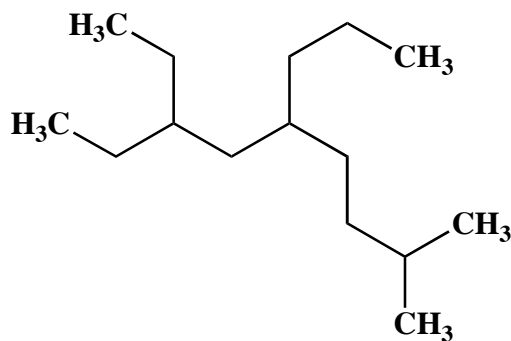
Name: _____

3. (20 points)

The photochemical, free-radical bromination of *n*-pentane affords a mixture of hydrogen bromide, 1-bromopentane, 2-bromopentane and 3-bromopentane. Use the curved-arrow notation to draw the mechanism for the formation of hydrogen bromide and 3-bromopentane. Show **all** intermediates and denote **all** lone pairs and unpaired electrons. Write at least one likely termination step.

4. (10 points)

Use IUPAC nomenclature to write the systematic name of the following alkane.



Name: _____

5. (25 points)

Draw a Newman projection of the least stable conformation of 2,2,3-trimethylbutane that is formed by rotation about the C2-C3 bond. Draw a second Newman projection of the most stable conformation of 2,2,3-trimethylbutane that is formed by rotation about the C2-C3 bond. Then identify all sources of strain and calculate the total strain energy for each conformation. Finally, determine the energy difference between the two conformations.



least stable



most stable

Congratulations!

1	/20
2	/25
3	/20
4	/10
5	/25
Total:	/100