

Chemistry 333

Examination #1

September 24, 2007

Professor Charonnat

Name: _____

Be certain that your examination has six (6) 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.

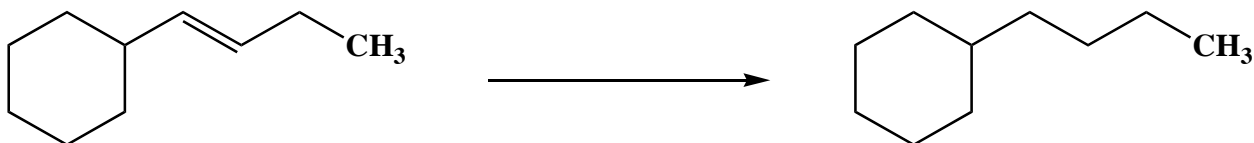
Molecular models are allowed for this examination. All electronic devices, including calculators, are unnecessary and are not allowed.

Name: _____

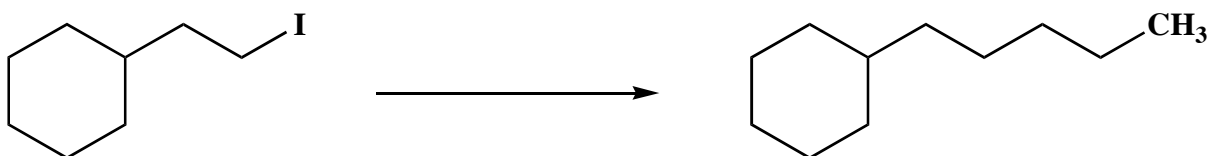
1. (15 points)

Write the specific reagent(s) necessary to effect the following three (3) transformations. Specify relative stoichiometry clearly.

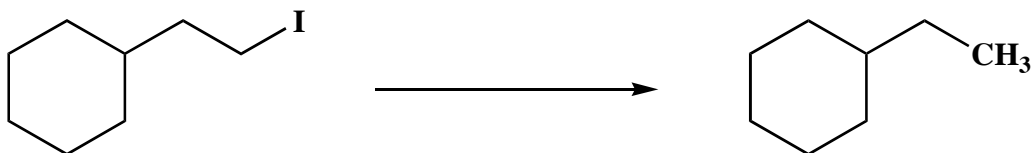
A.



B.



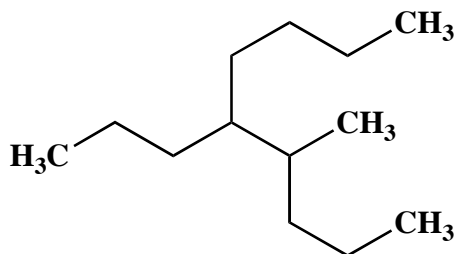
C.



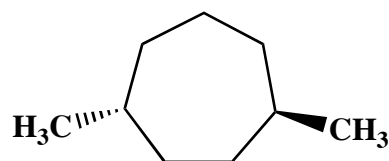
2. (15 points)

Use IUPAC nomenclature to write the systematic names of the following two (2) alkanes.

A.



B.



Name: _____

3. (30 points)

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

A. Which of the following compounds is ionic?

1. BF_3
2. MgSO_4
3. CBr_4

B. Which of the following compounds is the strongest Lowry-Brønsted acid?

1. HI
2. HF
3. HCl

C. Alkenes always contain at least two

1. sp-hybridized carbons
2. sp^2 -hybridized carbons
3. sp^3 -hybridized carbons

D. Strongly endothermic reactions have

1. early transition states
2. late transition states
3. either

E. Greater orbital overlap

1. affords stronger bonds
2. affords weaker bonds
3. has no effect on bond strength

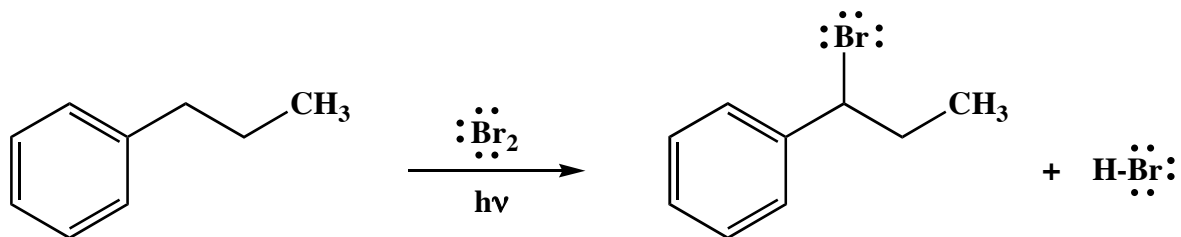
F. Which of the following pairs of orbitals is degenerate?

1. $2s, 2p_z$
2. $1s, 2s$
3. $2p_x, 2p_y$

Name: _____

4. (20 points)

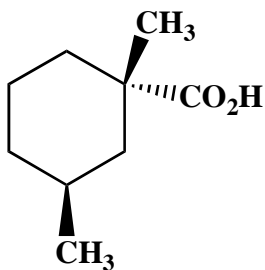
Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Be certain to show all intermediates and unshared electrons. Draw at least one termination step.



Name: _____

5. (20 points)

Draw the two possible chair conformations of the following trisubstituted cyclohexane. Clearly denote all 1,3-diaxial interactions for both conformations. Calculate the total strain for each conformation. Then put a star next to the more stable conformation. Finally, determine the approximate ratio of the two conformations at 298 K. (See the tables on page 6 for reference. Additional note: a methyl/methyl 1,3-diaxial interaction is 15.5 kJ/mol.)



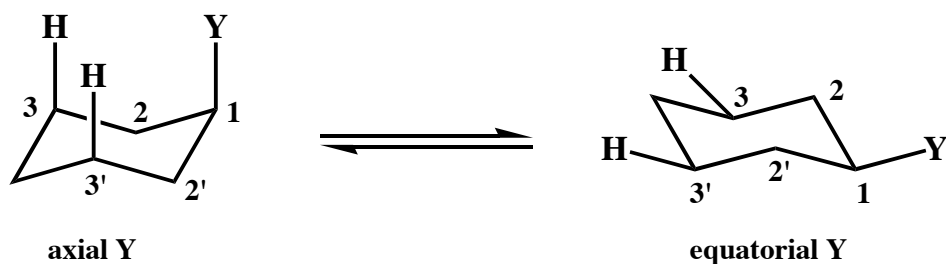
Congratulations!

1	/15
2	/15
3	/30
4	/20
5	/20
total:	/100

Name: _____

Calculated Equilibrium Values at T = 298 K

<u>energy difference (kJ/mol)</u>	<u>% more stable isomer</u>	<u>% less stable isomer</u>	<u>K</u>
0.000	50	50	1.00
0.497	55	45	1.22
1.00	60	40	1.50
1.53	65	35	1.86
2.10	70	30	2.33
2.72	75	25	3.00
3.43	80	20	4.00
4.30	85	15	5.67
5.44	90	10	9.00
7.30	95	5	19.0
11.4	99	1	99.0
17.1	99.9	0.1	999



<u>substituent Y</u>	<u>total strain due to two H-Y 1,3-diaxial interactions (kJ/mol)</u>	<u>strain due to one H-Y 1,3-diaxial interaction (kJ/mol)</u>
-F	1.4	0.70
-Cl	2.4	1.2
-Br	2.4	1.2
-OH	4.4	2.2
-CH ₃	7.3	3.7
-CH ₂ CH ₃	7.5	3.8
-CH(CH ₃) ₂	9.2	4.6
-C(CH ₃) ₃	20.	10.
-Ph	12	6.0
-CO ₂ H	5.9	3.0
-CO ₂ CH ₃	5.2	2.6
-CH=CH ₂	7.0	3.5
-C≡CH	2.0	1.0
-C≡N	0.8	0.4