Chemistry 333

First Hour Examination

September 26, 1997 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.

Name:_____

1. (20 points)

Define each of the following four (4) terms precisely, succinctly and with correct grammar. Give a specific example for each term.

A. polar covalent bond

B. orbital

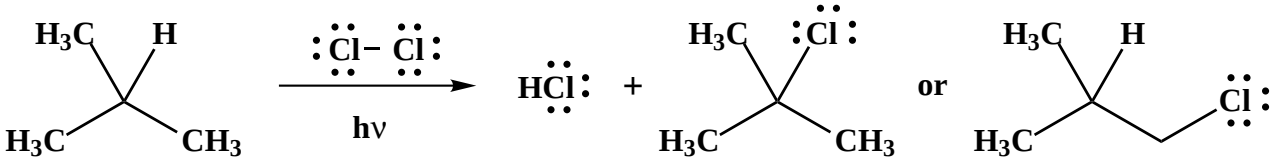
C. Lewis acid

D. late transition state

Name:_____

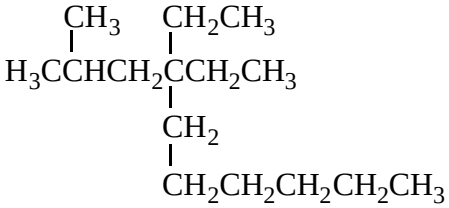
2. (25 points)

Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Draw **all** intermediates and denote **all** lone pair electrons and unpaired electrons. Clearly show at least two termination steps.



3. (10 points)

Use IUPAC nomenclature to write the systematic name of the following alkane. Denote each carbon of the alkane as primary (1°), secondary (2°), tertiary (3°) or quaternary (4°).



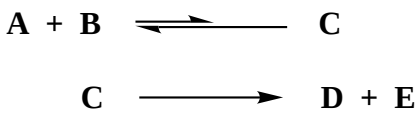
Name:_____

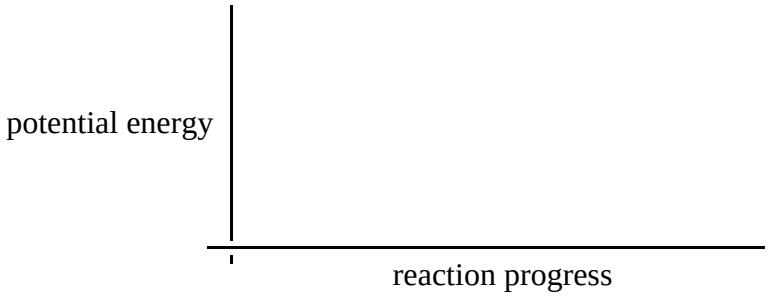
4. (20 points)

Draw the two possible chair conformations of *trans*-1,4-dimethylcyclohexane. Clearly denote all 1,3-diaxial interactions. Calculate the total strain energy for each conformation. Finally, circle the more stable conformation and estimate the ratio of the two conformations at 298 K.

5. (10 points)

Draw a potential energy curve for the following two-step sequence:



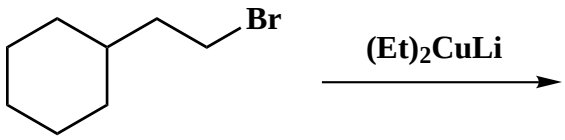


Name:_____

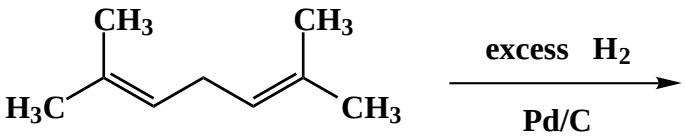
6. (15 points)

For each of the following three (3) questions denote the major organic product.

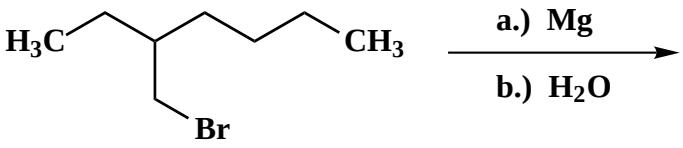
A.



B.



C.

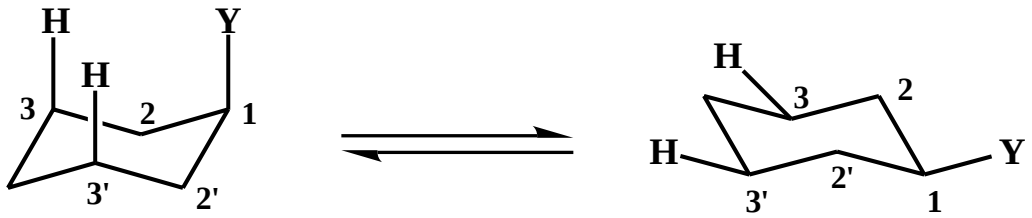


Congratulations!

1	/20
2	/25
3	/10
4	/20
5	/10
6	/15
Total:	/100

Calculated Equilibrium Values at T = 298 K

energy difference (kcal/mol)	% more stable isomer	% less stable isomer	K
0.000	50	50	1.00
0.119	55	45	1.22
0.240	60	40	1.50
0.367	65	35	1.86
0.502	70	30	2.33
0.651	75	25	3.00
0.821	80	20	4.00
1.028	85	15	5.67
1.302	90	10	9.00
1.745	95	5	19.0
2.723	99	1	99.0
4.092	99.9	0.1	999



axial Y **equatorial Y**

substituent Y	steric strain due to one H-Y 1,3-diaxial interaction (kcal/mol)	total steric strain due to two H-Y 1,3-diaxial interactions (kcal/mol)
-F	0.12	0.24
-Cl	0.25	0.50
-Br	0.25	0.50
-OH	0.50	1.0
$-CH_3$	0.90	1.8
$-CH_2CH_3$	0.95	1.9
$-CH(CH_3)_2$	1.1	2.2
$-C(CH_3)_3$	2.7	5.4
$-C_6H_5$	1.5	3.0
$-CO_2H$	0.70	1.4
$-C\equiv N$	0.1	0.2