COMPLETE THIS SECTION : Up to TWO POINTS will be removed for incorrect/missing information!

Answer Key

PRINTED **FIRST** NAME ———————— PRINTED **LAST** NAME ————————

Person on your **LEFT** (or **Empty** or **Aisle**) ————————

Person on your **RIGHT** (or **Empty** or **Aisle**) ————————

Class you are REGISTERED FOR (onground or hybrid) ————————

The room where most students will take the test for your class, i.e. LS A-191 for onground and PS H-152 for hybrid) ————————

YOU ARE NOT ALLOWED TO TAKE SPARE COPIES OF THIS EXAM FROM THE TESTING ROOM

- *PRINT YOUR NAME ON EACH PAGE!*
- *READ THE DIRECTIONS CAREFULLY!*
- *USE BLANK PAGES AS SCRATCH PAPER*
  - *work on blank pages will not be graded...*
- *WRITE CLEARLY!*
- *MOLECULAR MODELS ARE ALLOWED*
- *DO NOT USE RED INK*
- *DON'T CHEAT, USE COMMON SENSE!*

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

Interaction Energies, kcal/mol

Eclipsing		Gauche	
H/H	~1.0	Me/Me	~0.9
H/Me	~1.4	Et/Me	~0.95
Me/Me	~2.6	i-Pr/Me	~1.1
Et/Et	~3.1	t-Bu/Me	~2.7

Infrared Correlation Chart

NMR Correlation Charts
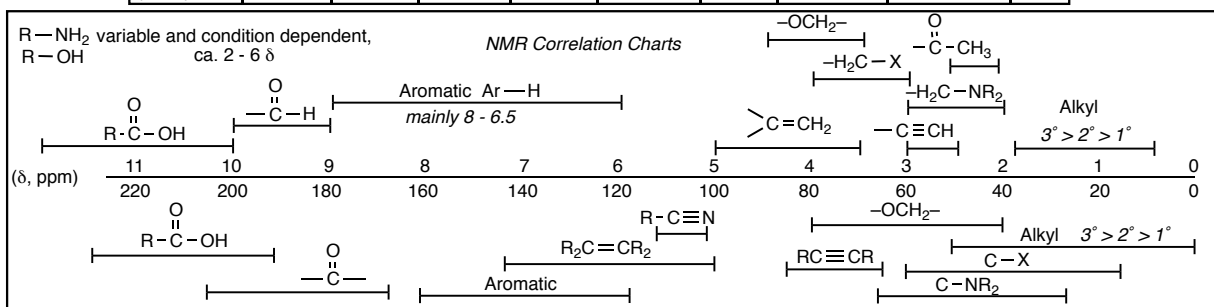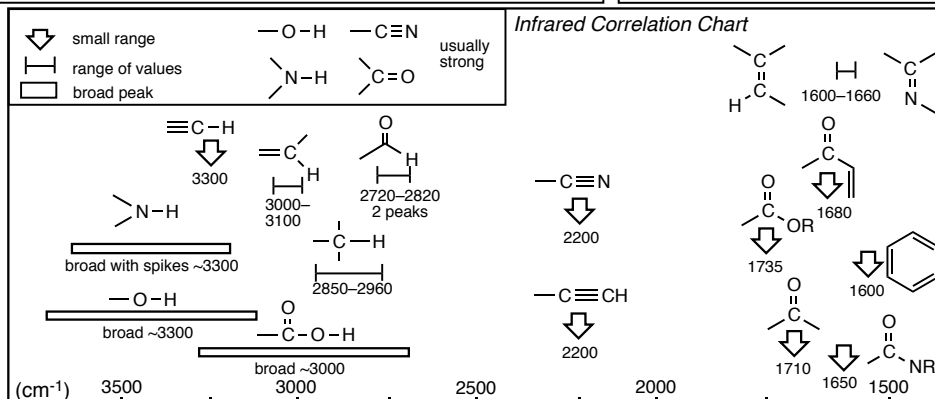
YOU MUST COMPLETE THIS PAGE WITH YOUR NAME
(EVEN THOUGH YOU ALREADY DID THIS ON THE COVER PAGE)
AND ALSO GIVE YOUR ASU OR POSTING ID NUMBER
WE NEED THIS NUMBER BECAUSE YOU WOULDN'T BELIEVE THE NUMBER OF
STUDENTS WHOSE NAMES WE CAN'T READ!

PRINTED **ANSWER**   *PRINTED* **KEY**   *ASU ID or*
FIRST NAME _____ **LAST** NAME _____ *Posting ID* _____

Points by question

1_____/22

2_____/16

3_____/16

4_____/9

5_____/8

6_____/8

7_____/32

8_____/22

9_____/20

10_____/22

Points Removed for cover errors _____/2

**Extra Credit_____/5**

Total (incl Extra)_____/175+5

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Question 1 (22 pts.) Show how you would make the target compond on the right from the starting compound on the left. Show reagents and conditions where appropriate, and the structures of important intermediate compounds. Do not show any (arrow pushing) mechanisms. Ignore stereochemistry.

NBS/hν

Br   Mg.THF

MgBr

1. (epoxide, O)
2. H_3O^+

OH

PCC

O
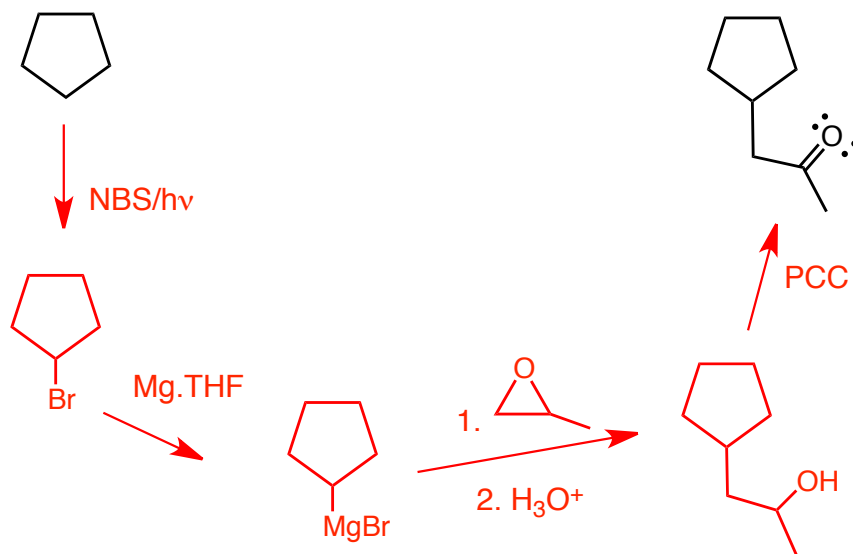
Question 2 (16 pts)
a) Give the curved arrow-pushing for the following electrocyclic ring opening reaction

heat
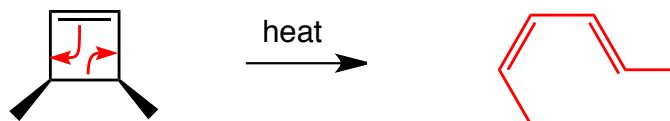
b) How many electrons are involved in the reaction? __4___

c) Will the ALLOWED reaction proceed via a Huckel or a Mobius transition state?
_____Mobius_____

d) Will the ALLOWED reaction proceed via conrotatory or disrotatory ring opening?
_____conrotatory_____

Question 3 (16 pts) Give the major organic products of the following reactions, indicate the stereochemistry using wedged/dashed bonds as appropriate and be sure to indicate the presence of any racemic mixtures.

a)

1. MCPBA

2. MeOH/HCl (cat.)

MeO OH

(±)

b)

Na+ -OEt

EtOH

OH

single enantiomer

EtO Me
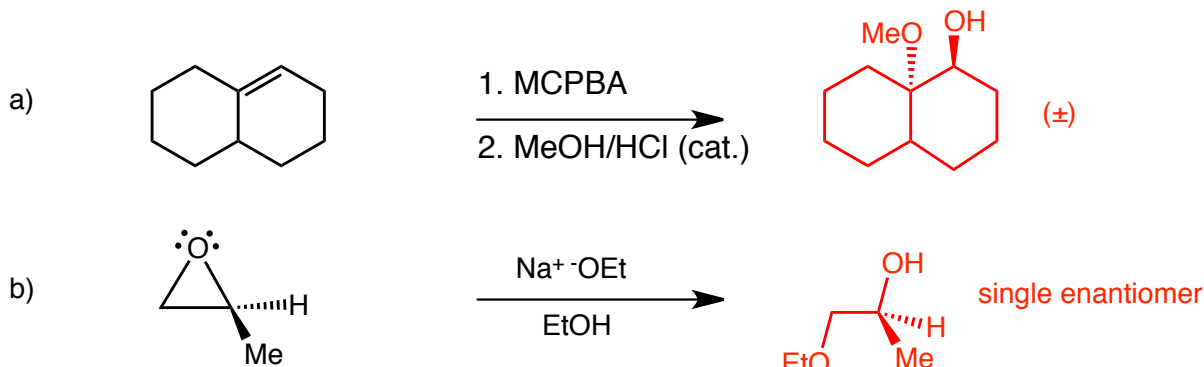
Qestion 4 (9 pts) Give the major organic product of the following reaction, indicate the stereochemistry using wedged/dashed bonds as appropriate and be sure to indicate the presence of any racemic mixtures. **State whether a solution of the product(s) would be optically active or not, with a very brief explanation.**

H_2N

+

CF_3

heat

not optically active
racemic mixture

H_2N

(±)

CF_3
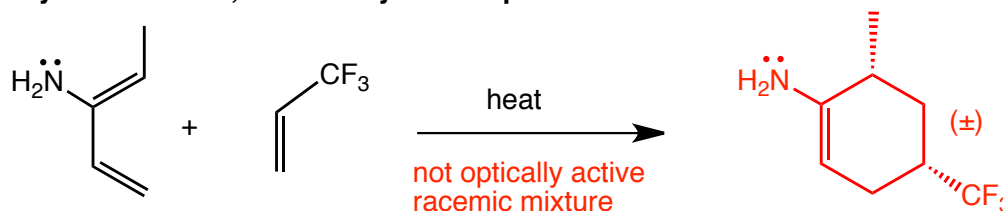
Qestion 5 (8 pts) Give the diene and dienophile that react to give the provided structure in a Diels-Alder reaction

OMe

+

CF_3

heat

OMe

CF_3

(±)
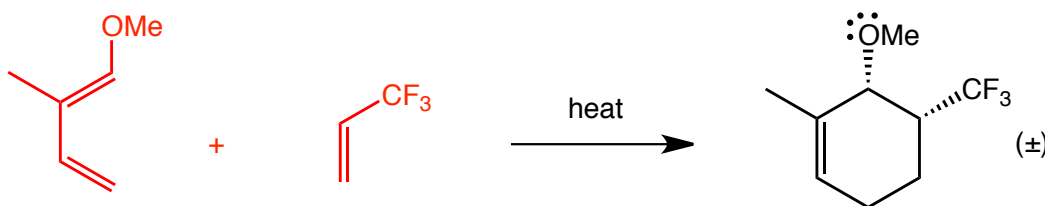
Question 6 (8 pts.) Give the missing reagents/conditions to perform the following reaction

OH

1. Na+ −H

2. EtBr

O
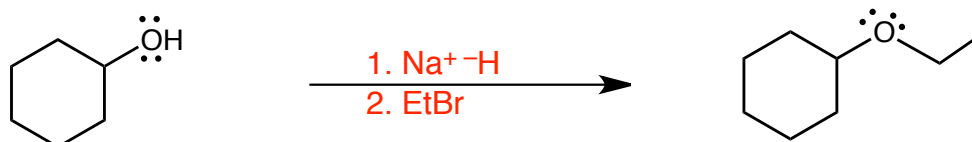
Question 7 (32 pts.)
a) provide a curved arrow-pushing mechanism for formation of both products of the following reaction, indicate the Lewis acid/base at each step, LA/LB, and whether they are also Bronsted acids/bases, BA/BB. **Show all important resonance contributors for the intermediates.**
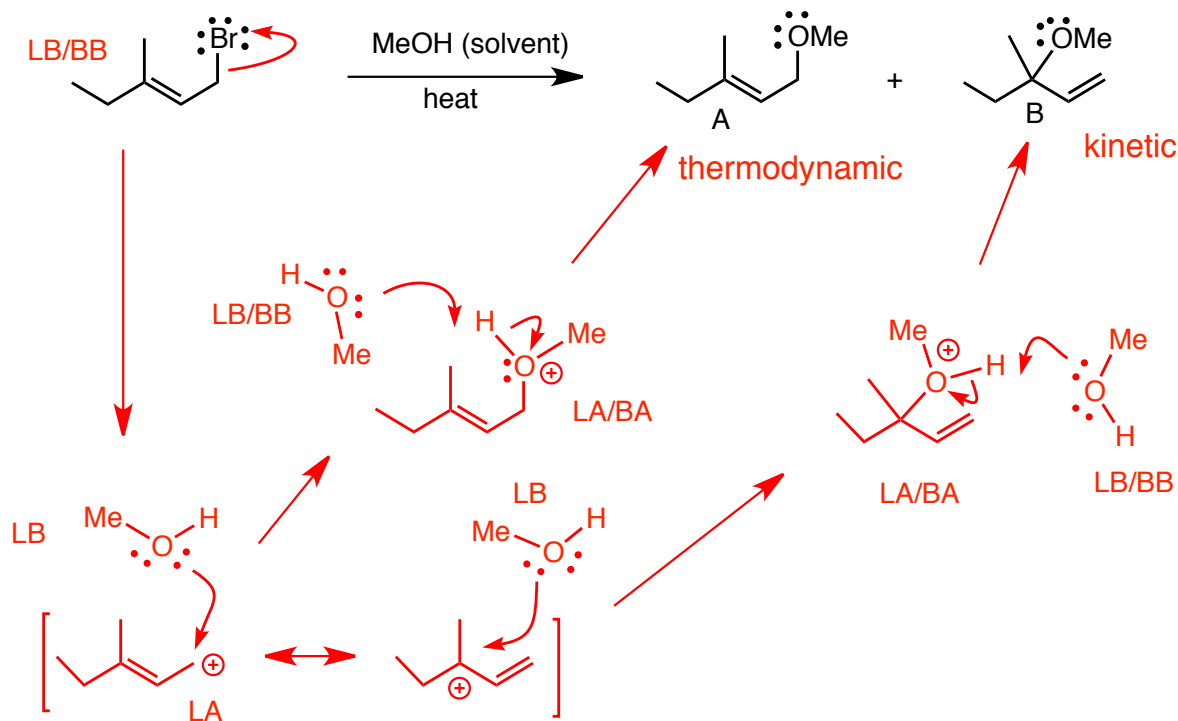

b) give the number of steps in your mechanism for product A   _____3_____
    give the number of steps in your mechanism for product B   _____3_____

c) Indicate which product would be formed under conditions of kinetic control and which would be formed under conditions of thermodynamic control, AND, which would be the major product at high temperatures AND at low temperatures, **give a BRIEF explanation**

at high temperatures the reactions are reversible and the thermodynamic product would be the major product, at low temperature the reactions are irrversible and the kinetic product would be the major

Question 8 (22 pts.)

a) For the C-C bonds in the provided structure indicated by the arrow, give the Grignard reagent and the structure it would react with to make that bond. Put the structures in the relevant boxes (the acid workup step is already included for you). Ignore stereochemistry in these problems.
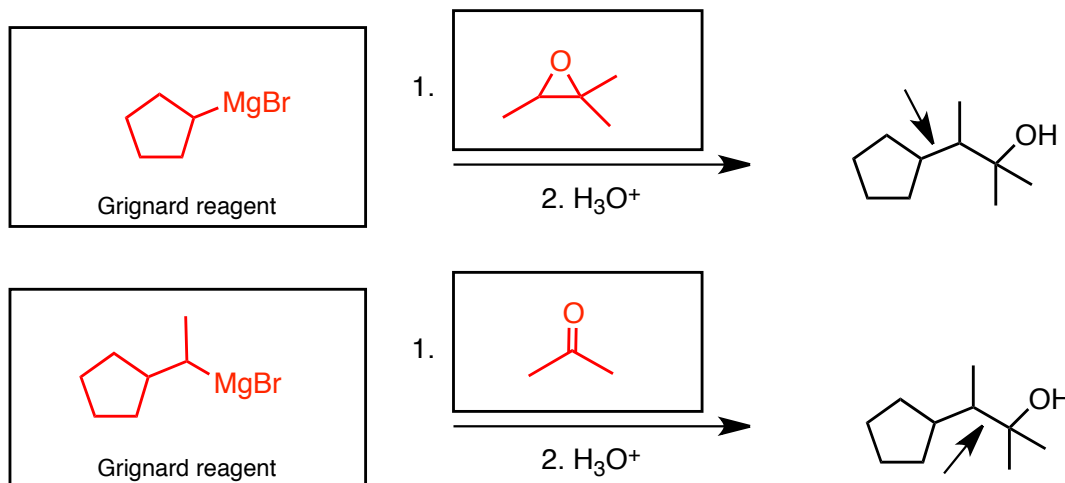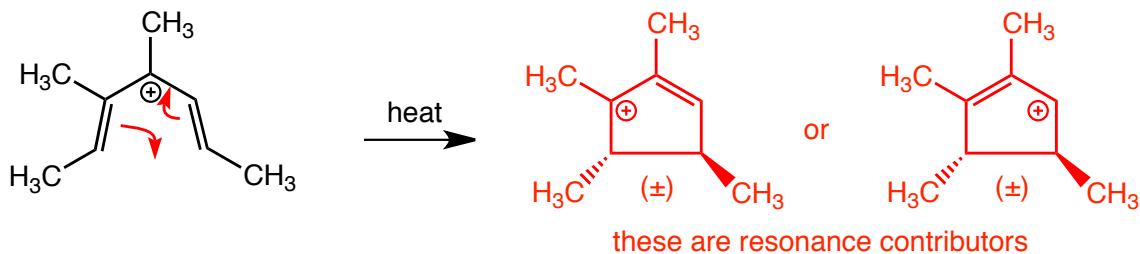
b) BRIEFLY explain why the bond indicated in the structure below could not be made in a Grignard reaction
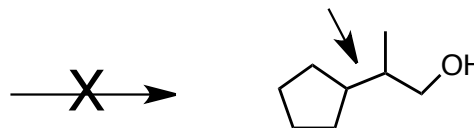
it would have to attack the most substituted end of an epoxide

Question 9 (20 pts) The following cation undergoes an electrocyclic ring closure reaction

heat

or

these are resonance contributors

a) Give the curved arrow-pushing and the product of the reaction, and indicate whether the product is achiral, a racemic mixture or a meso compound

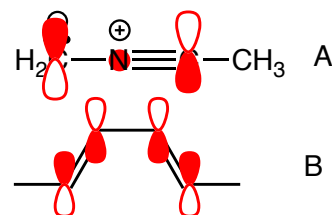b) Draw the HOMO of the reactant on TOP OF THE STRUCTURE below
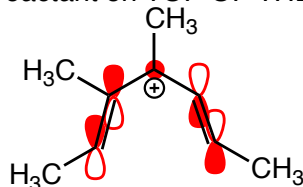
c) Does the allowed reaction proceed via a conrotatory or a disrotatory ring closure? Conrotatory

Question 10 (22 pts.) In this question you are going to work out whether the reaction **SHOWN** would be allowed or forbidden *based on the rules for pericyclic reactions*
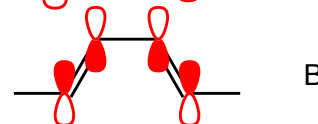For this reaction.......
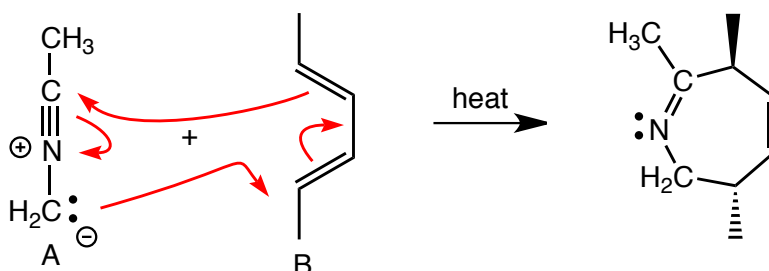
a) Draw the arrow-pushing to account for the bond breaking/making

b) Draw the HOMO of reactant **A on TOP of the structure** ⟶
re-drawn for you here

c) Draw the LUMO of reactant **B on TOP of the structure** ⟶
re-drawn for you here

d) Would an ALLOWED reaction between these two species be suprafacial/suprafacial or suprafacial/antarafacial?   suprafacial/antarafacial

e) Would an ALLOWED reaction between these two species proceed via a Huckel or a Mobius transition state?   Möbius

f) Assuming the reaction is SUPRAFACIAL for reactant A, is THE REACTION SHOWN above allowed or forbidden?   Allowed

Extra Credit (5 pts) Which of the following chemical properties enables the pharmacologiocal activity of the drug olanzapine?

aromatic   non-aromatic   anti-aromatic