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

Points by question

- 1 _____ /11
- 2 _____ /24
- 3 _____ /18
- 4 _____ /18
- 5 _____ /32
- 6 _____ /30
- 7 _____ /20
- 8 _____ /22

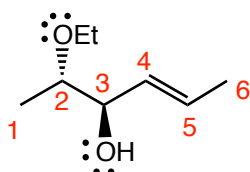
Points Removed for cover errors ____/2

Extra Credit ____/5

Total (incl Extra) _____/175+5

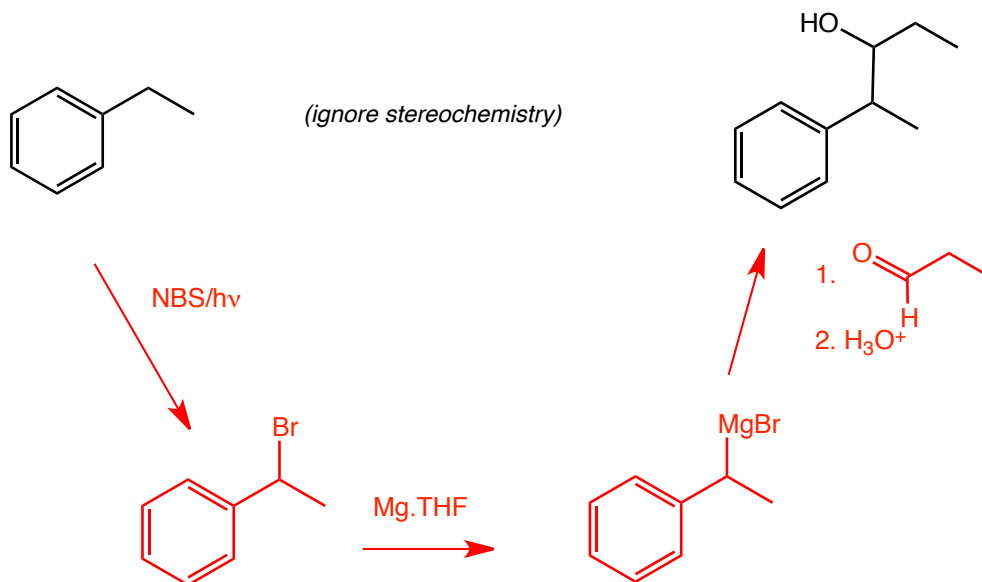
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Question 1 (11 pts.) Give the IUPAC name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.

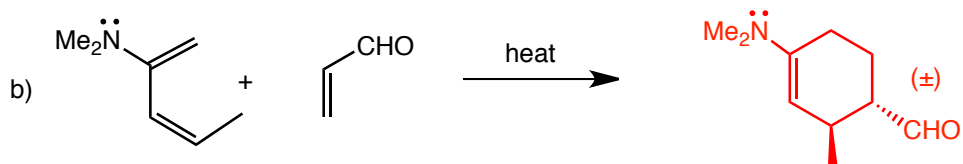
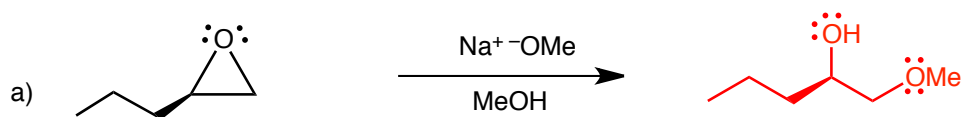


(2S)-ethoxyhex-(4E)-en-(3R)-ol

Question 2 (24 pts.) Show how you would make the target compound 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.



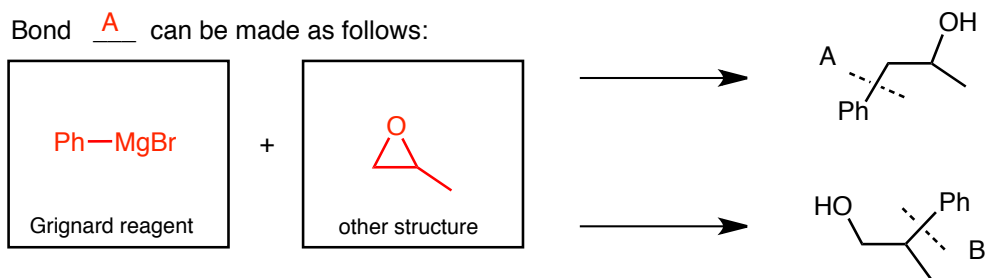
Question 3 (18 pts) Give the major organic products of the following reactions, indicate the stereochemistry using wedged/dashed bonds as appropriate and be sure to indicate the presence of any racemic mixtures.



Question 4 (18 pts.) For the following structure:

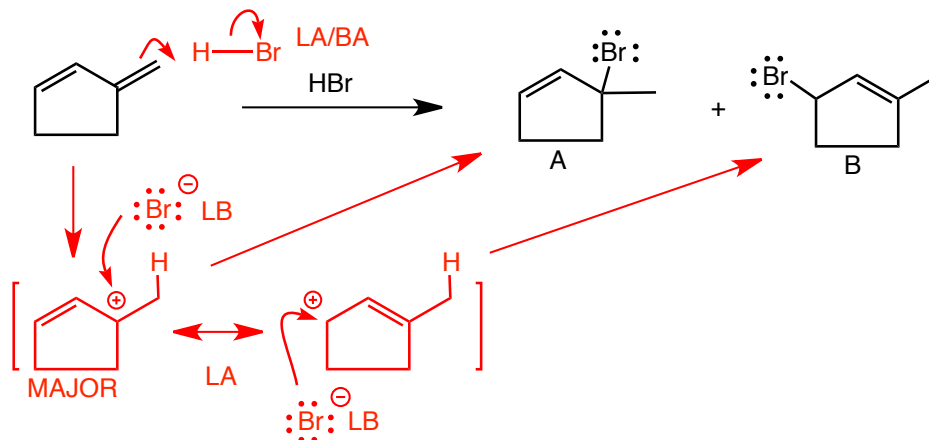
1. Decide which of the bonds A and B it is possible to make in a Grignard reaction
2. Indicate which bond you can make in a Grignard reaction, A or B, and give the Grignard reagent and the structure it would react with in the provided boxes (you can ignore the H_3O^+ acid workup step)
3. Briefly state why the other bond (A or B) cannot be made.

Bond A can be made as follows:



The problem with making bond B is: **the Grignard would have to attack the most substituted side of an epoxide**

Question 5 (32 pts.) For the following reaction, give a full curved-arrow pushing mechanism for formation of BOTH products and indicate the Lewis acid and base at each step (LA or LB) and whether they are also Bronsted acids and bases (BA or BB). Include all reasonable resonance contributors for any intermediates AND INDICATE THE MAJOR RESONANCE CONTRIBUTOR IF APPROPRIATE!!



number of steps in the mechanism for product A 2

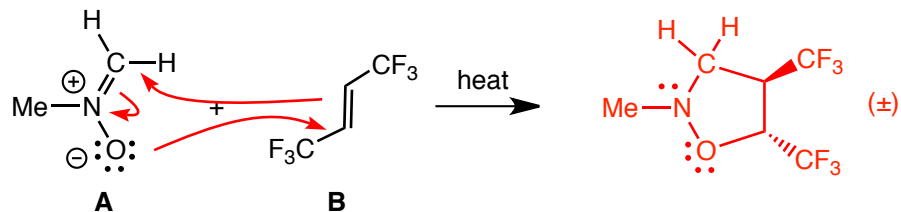
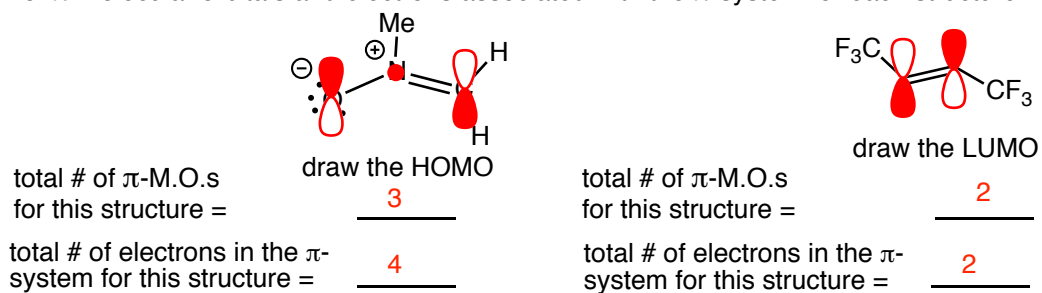
number of steps in the mechanism for product B 2

b) Indicate which product, A or B, would be formed under thermodynamically controlled conditions and which would be formed under kinetically controlled conditions and give a BRIEF explanation of the role of temperature in determining kinetic and thermodynamic control

kinetic = A, thermodynamic = B, B is more likely to be formed at HIGH temperature since higher temperature enables **REVERSIBLE** reactions and allows the reaction to explore the entire reaction energy surface and find the lowest energy product, at low temperatures the reactions are irreversible and the fastest formed product is the major product

Question 6 (30 pts)

a) Give the curved arrow-pushing and the allowed product for the following cycloaddition reaction. Be sure to completely describe the stereochemistry in the product.

b) ON TOP of the structures as indicated, draw the requested F.M.O.s and give the total number of π -molecular orbitals and electrons associated with the π -system for each structure.

c) Is the ALLOWED reaction suprafacial or antarafacial with respect to reactant A?

suprafacial

d) Is the ALLOWED reaction suprafacial or antarafacial with respect to reactant B?

suprafacial

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

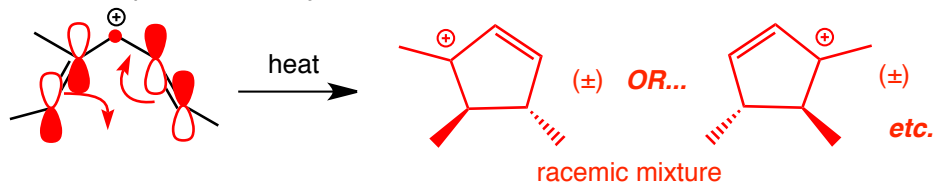
aromatic

non-aromatic

anti-aromatic

Question 7 (20 pts)

a) Give the curved arrow-pushing and the allowed product for the following electrocyclic ring closure reaction, indicate the stereochemistry using wedged/dashed bonds as appropriate and be sure to indicate the presence of any racemic mixtures.

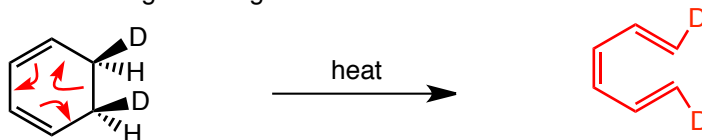


b) ON TOP OF THE STRUCTURE, draw the HOMO of the reactant cation

c) To form YOUR ALLOWED product, did the reaction proceed via a conrotatory or a disrotatory ring closure? conrotatory

Question 8 (22 pts). For the following electrocyclic ring-opening reaction

a) Give the product, including stereochemistry and draw the curved arrow-pushing that describes bond making/breaking



b) give the number of electrons involved in the reaction

6

c) For the number of electrons you gave in the answer to b) above, would that many electrons in a **Huckel** loop be aromatic, nonaromatic or antiaromatic?

aromatic

d) For the number of electrons you gave in the answer to b) above, would that many electrons in a **Mobius** loop be aromatic, nonaromatic or antiaromatic?

antiaromatic

e) State whether the allowed reaction would proceed via a Huckel or a Mobius transition state

Hückel

f) State whether the allowed reaction is conrotatory or disrotatory

Disrotatory

e) Is the transition state for the allowed reaction, aromatic, nonaromatic or anti-aromatic?

aromatic