Chem 14D Exam #2

Nov 15, 2021

I hereby state that I have neither given nor received aid to or from other students during this exam. I vouch for the honesty and integrity of each and every answer given.

Claire Hathaway [redacted]

Signature

Claire Hathaway

Name

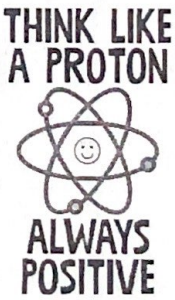
TA (circle one):

Jason Williams (Jason Wang) Jacqueline Bustamante Carlos Cruz

Score:

Question 1 (Multiple choice)	15 /15
Question 2 (Mechanism)	15 /20
Question 3 (Retrosynthesis)	20 /20
Question 4 (Fill in the boxes)	16 /18
Question 5, 6 (Diels–Alder and EAS)	24 /24
Student ID on every page	3 /3
Total	/100
Extra credit	3 /3
Total with extra credit	96

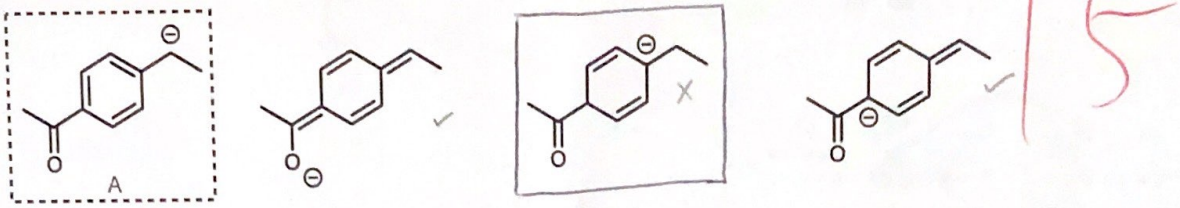
1. Write your student ID on every page.
2. Answers written on the back of the exam will not be graded.
3. Where applicable, provide answers with a clear indication of stereochemistry. Answers without a clear indication of stereochemistry will be given partial or no credit. Similarly ambiguous and/or unnecessary stereochemical information will be penalized as well.
5. This exam is designed to challenge you to think rationally and critically so that you arrive at the most logical answers.
6. You have two hours for this exam. Good luck!



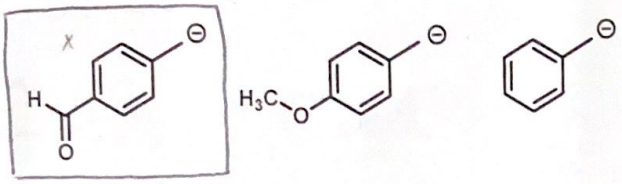
[redacted]

1. Circle the correct answer (one answer is correct in each). (3 pts each)

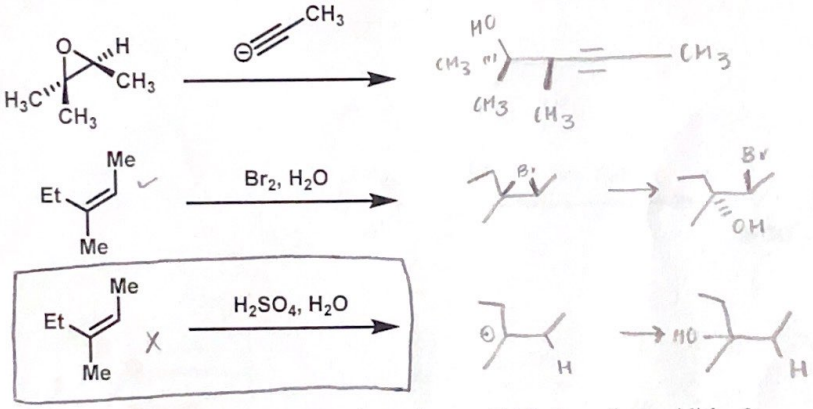
a. Which of these is not a correct resonance structure of compound A?



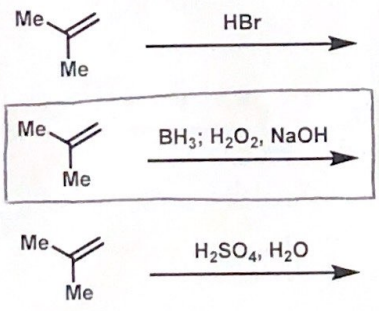
b. Which of these is the most stable anion?



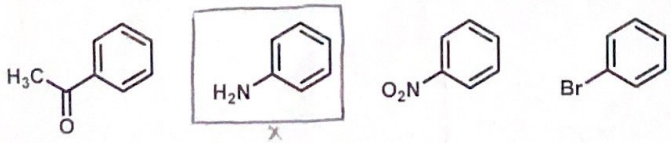
c. Which of these reactions does not include an inversion of stereochemistry (in at least one step of the reaction)?



d. Which of these reactions goes through an anti-Markovnikov addition?



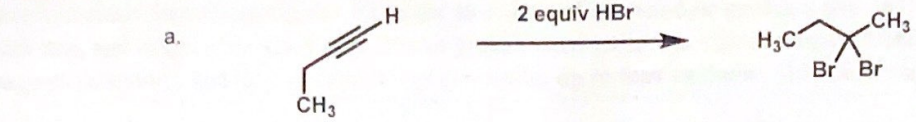
e. Which of these would react fastest in an electrophilic aromatic substitution reaction?

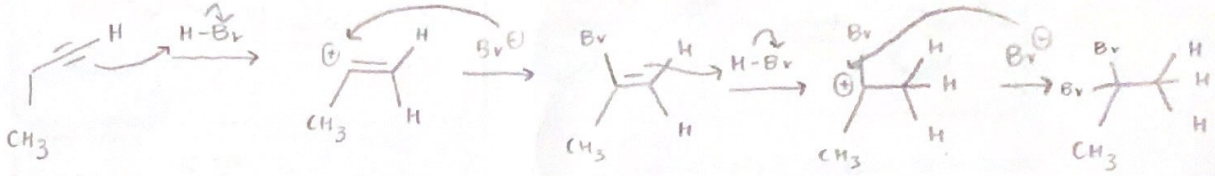


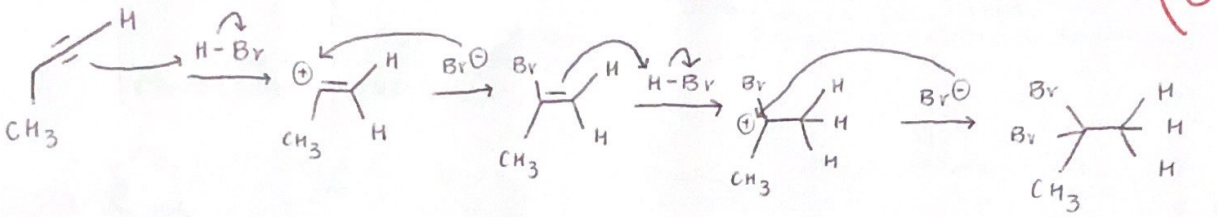
[redacted]

2. Draw the mechanisms for the reactions below. (10 pts each)

a.

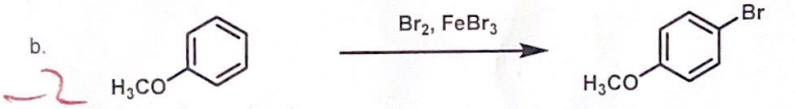




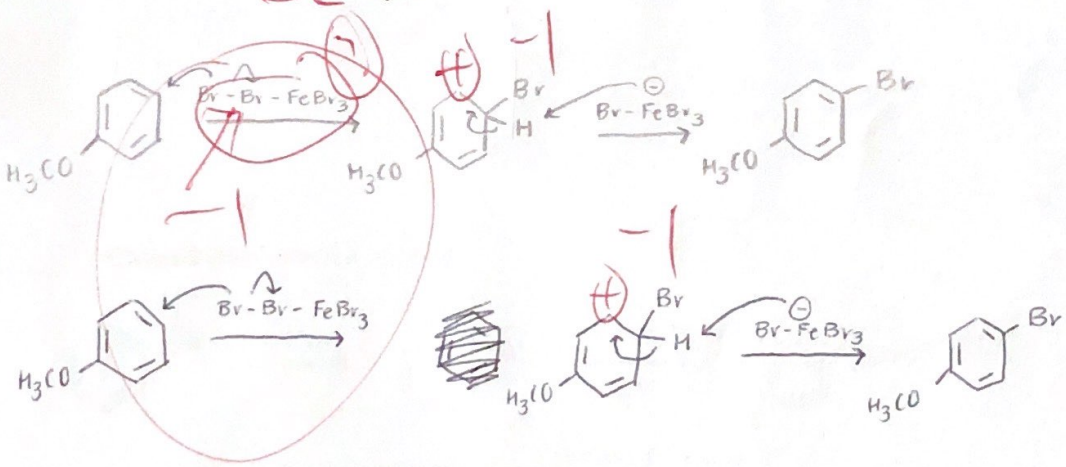


10

b.

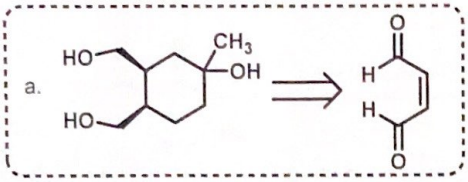


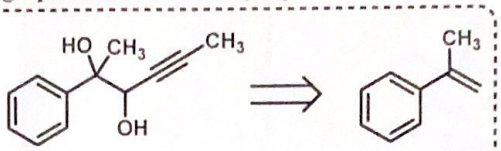
5

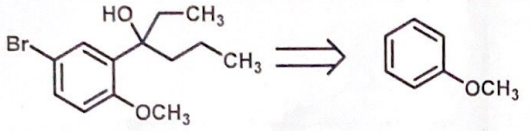


[redacted]

3. Choose **TWO of the three** options. Propose a **forward** synthesis for the molecules below (you do not have to include the retrosynthesis). Draw the structures of intermediate products that can be isolated after each step, and reagents for each step. Do *not* provide mechanisms or curved arrows. You may use any reagents necessary, and may add fragments containing **up to four carbons**. (10 points each)

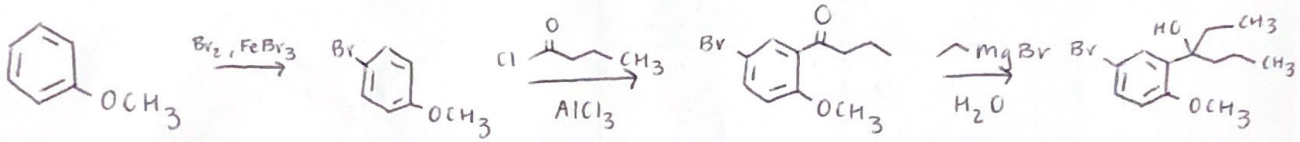
a. 

b. 

c. 

Hints:
- Each of these syntheses can be completed in 3 steps, but you may use more steps.
- The starting materials are on the right and the products are on the left.
- You do not need to indicate stereochemistry.

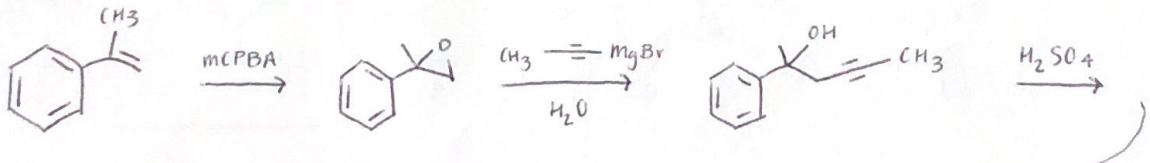
Choice 1 (circle one): a or **b** or **c**



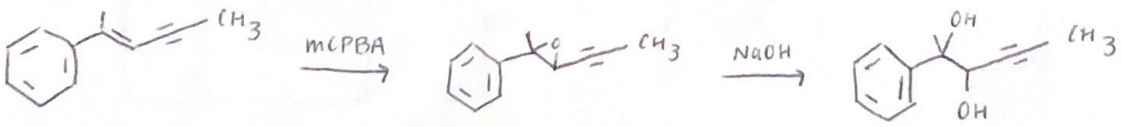
✓

10

Choice 2 (circle one): a or **b** or **c**



continues here

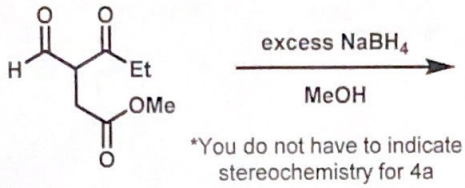


10

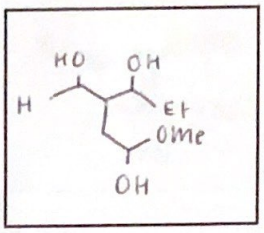
[redacted]

4. Fill in the starting materials, products, or reactants for the following reactions. Indicate stereochemistry. If a racemic mixture of products is formed, indicate this (e.g., by writing "racemic"). (3 pts each)

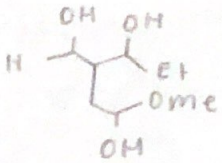
a.



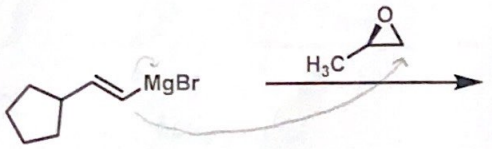
*You do not have to indicate stereochemistry for 4a

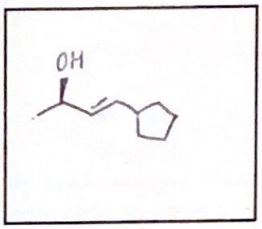


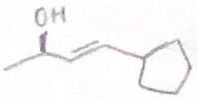
-2



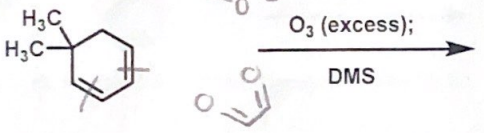
b.

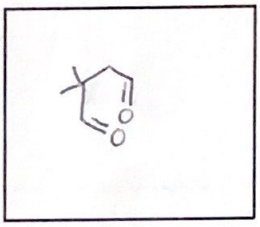




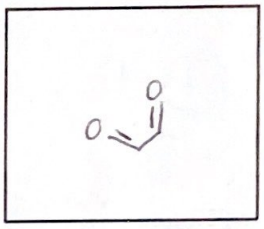


c.

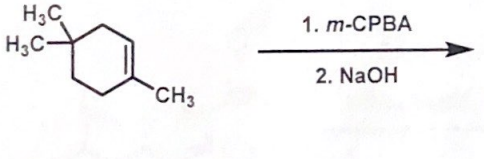


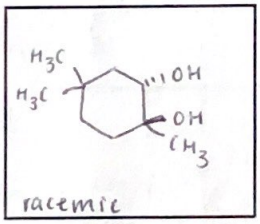


+



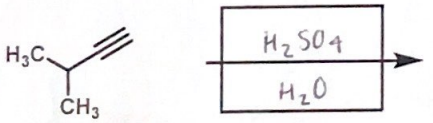
d.

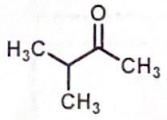




racemic

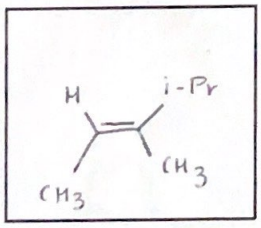
e.

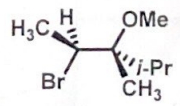


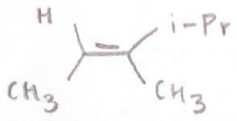


H_2SO_4
H_2O

f.

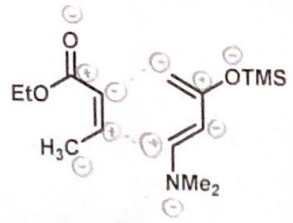


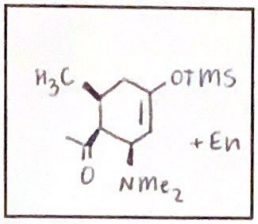


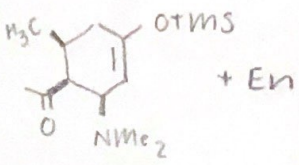


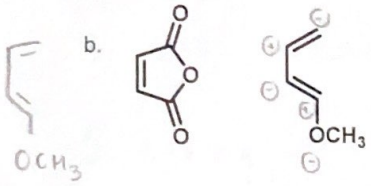
+16

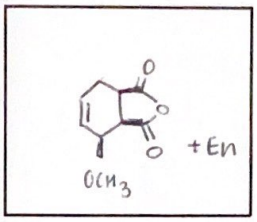
5. Draw the products of the following Diels–Alder reactions. Pay close attention to the regioselectivity, and indicate stereochemistry where relevant. If enantiomers are formed, indicate this. (4 pts each)

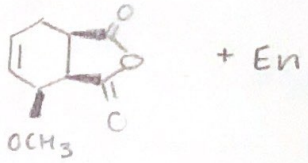
a. 





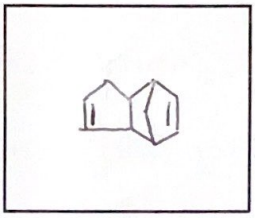
b. 

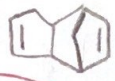




c. 

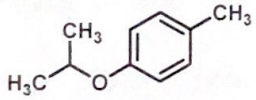
*you do not have to indicate stereochemistry for 5c

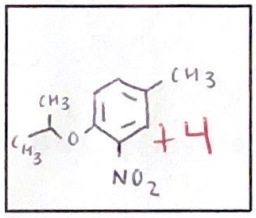


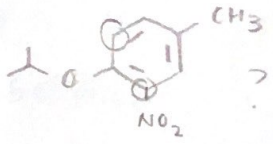


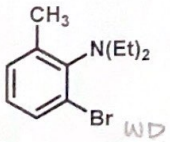
+12

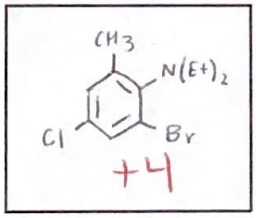
6. Draw the major product of the following reactions. (4 pts each)

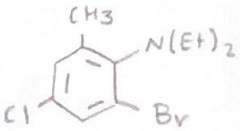
a. 

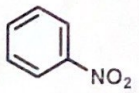


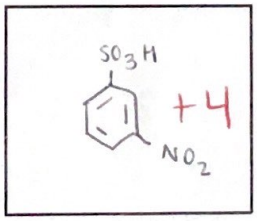


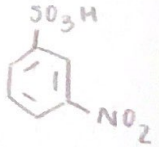
b. 





c. 





+12