CHEM 223 (2024) SI Summary Session #3

Learning Objectives: By the end of this session, students should be able to:

- Crush Exam 3!

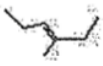
Section 1: MCQ

1. Dehydration of 1-butanol with concentrated sulfuric acid at 140◦C results in the formation of mainly trans-2-butene. According to these results, which of the following conclusions might be valid?
   a. The reaction undergoes an E2-type elimination mechanism
   b. The reaction follows a new mechanism involving the formation of a carbanion intermediate.
   c. The reaction undergoes an E1-type elimination mechanism in conjunction with a hydride shift.
   d. The reaction undergoes an E2-type elimination mechanism in conjunction with a methyl shift.
   e. The reaction undergoes an E1-type elimination mechanism with no shifting

2. Which compound is an E isomer?

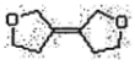
A)

B)

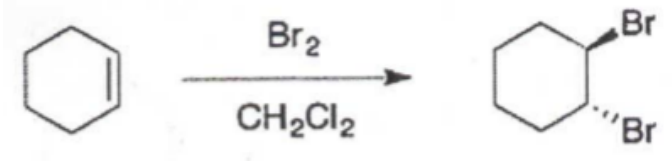


C)

D)



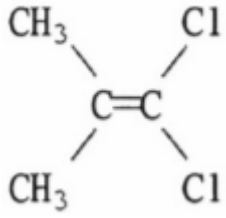
3. Classify the following reaction as Oxidation, Reduction, or Neither



   a. Oxidation
   b. Reduction
   c. Neither

4. Which occurs in an anti fashion?
   a. Hydroboration Syn
   b. Br_2 Addition anti
   c. H_2 Addition Syn
   d. Addition of H_2O in dilute acid N/A
   e. A and B

5. Which best describes the geometry around the double bond below?

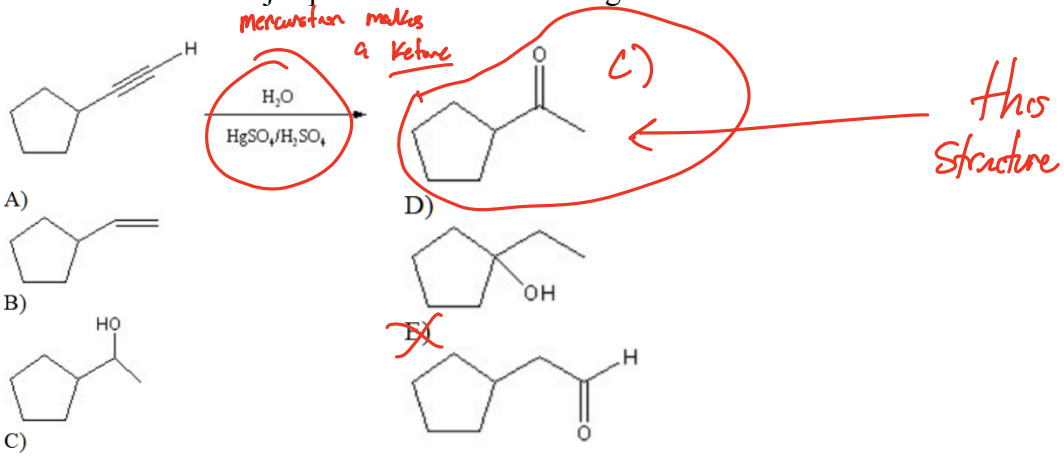


   a. E
   b. Z
   c. Neither E nor Z

6. When 2,2-dibromobutane is heated at 200°C in the presence of molten KOH, what is the major organic product?
   a. But-1-yne
   b. But-2-yne
   c. 1-bromobut-1-yne
   d. 1-bromobut-2-yne

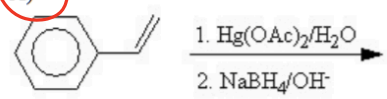
favors internal

7. What is the major product of the following reaction?

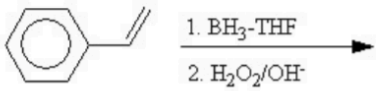


8. Which reaction will yield a secondary alcohol in good yield?

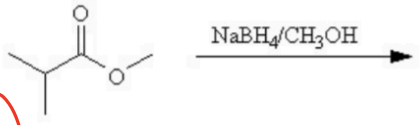
A)



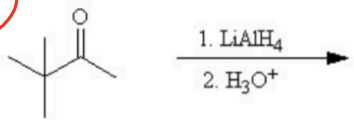
B)



C)



D)



Both A and D are correct → sorry!

9. Which reagents best convert 2,2-dimethylpropan-1-ol to 4,4-dimethylpentan-2-ol?

a. 1. HCl, 2. Mg, 3. CH_3CHO, 4. H_3O^+
b. 1. HCl, $ZnCl_2$, 2. Mg, 3. CH_2O, 4. H_3O^+
c. 1. $SOCl_2$, 2. Mg, 3. CH_3CHO, 4. H_3O^+
d. 1. HCl, $ZnCl_2$, 2. Mg, 3. CH_3CHO, 4. H_3O^+

HCl / $ZnCl_2$ have bad yield.

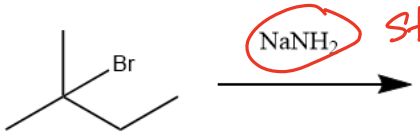
10. Which sequence of reactions best performs the following compound?

methyl shift happened → need carbocation

a. 1. $KMnO_4$, 2. $Hg(OAc)_2$, H_2O, 3. $NaBH_4$,
b. 1. $NaBH_4$, 2. H_2SO_4
c. 1. CH_3MgBr, 2. H_3O^+
d. 1. Raney Nickel, 2. CH_3MgBr, 3. H_3O^+

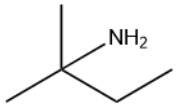
A, C, D have no carbocation

11. Identify the major product of the reaction below

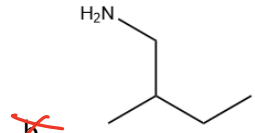


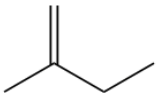
Strong base

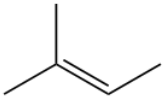
3° alkyl halide → Zaitsev product.

a. 

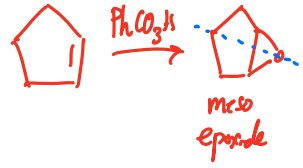
S_N2 not possible.

b. 

c. 

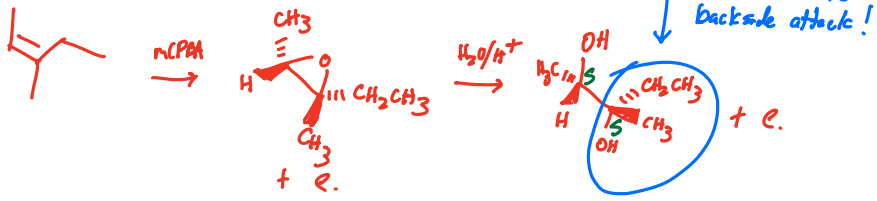
d. 

12. Treatment of cyclopentene with peroxybenzoic acid
    a. Results in oxidative cleavage of the alkene
    b. Produces an anti glycol
    c. Yields a meso epoxide
    d. Yields a racemic mixture of epoxides
    e. Produces the same product as when OsO_4 is added to alkenes



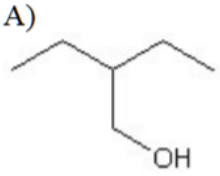
13. A reaction of an unknown alkene with MCPBA in dichloromethane followed by work-up with H2O/H^+ yielded, as the major product, a racemic mixture of (2S,3S) and (2R,3R)-3-methylpentan-2,3-diol. What is the specific structure of the alkene used in the reaction?
    a. (Z)-3-methylpent-2-ene
    b. (E)-3-methylpent-2-ene
    c. 2-methylpent-2-ene
    d. 2,3-dimethylbut-2-ene
    e. None of the above

anti → Stereochemistry was inverted b/c backside attack!

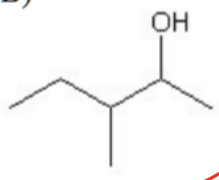


14. Acid-catalyzed dehydration of an unknown alcohol produces the following compounds. Which of the following is the alcohol?

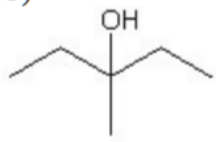
A)



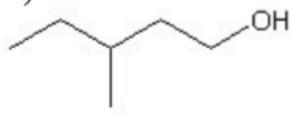
B)



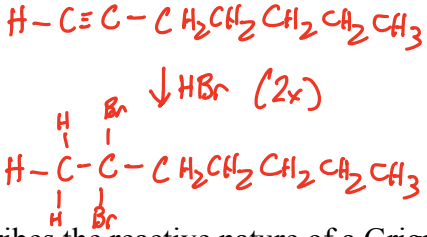
C)



D)

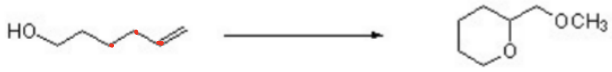


15. What is the major organic product that results when 1-heptyne is treated with 2 equivalents of HBr?
    a. 2,3-dibromo-1-heptene
    b. 2,3-dibromo-2-heptene
    c. 1,2-dibromoheptane
    d. 2,2-dibromoheptane
    e. 1,1-dibromoheptane



16. Which of the following best describes the reactive nature of a Grignard reagent?
    a. Free radical
    b. Electrophile
    c. Nucleophile
    d. Carbene

17. Which of the following reactions will complete the given transformation?



I. 1) Br_2, 2) $NaOCH_3$
II. 1) $Hg(OAc)_2$, 2) $NaBH_4$, 3) $NaOCH_3$
III. 1) Br_2, CH_3OH, 2) NaH
IV. 1) mCPBA, H^+, 2) Na^0, 3) CH_3I

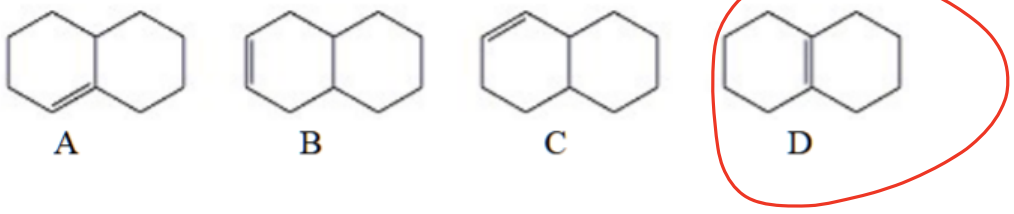
- II doesn't work b/c no Leaving grp on CH_3.
- III doesn't work b/c CH_3OH will not react w/ 1° alkyl bromide (CH_2Br)
- IV doesn't work b/c acid will interfere w/ the π bond.

a. I only
b. II and III
c. I and IV
d. I, II and IV
e. None of the above

18. Reaction of ethylmagnesium bromide with which of the following compounds yields a primary alcohol after quenching with aqueous acid?

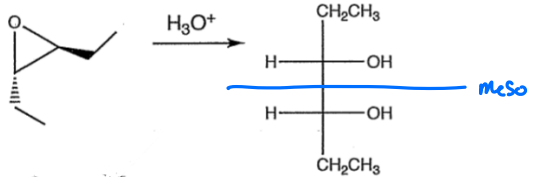
a. CH_3CHO
b. $(CH_3)_2CO$
c. Ethylene oxide → this is an epoxide
d. None of the above

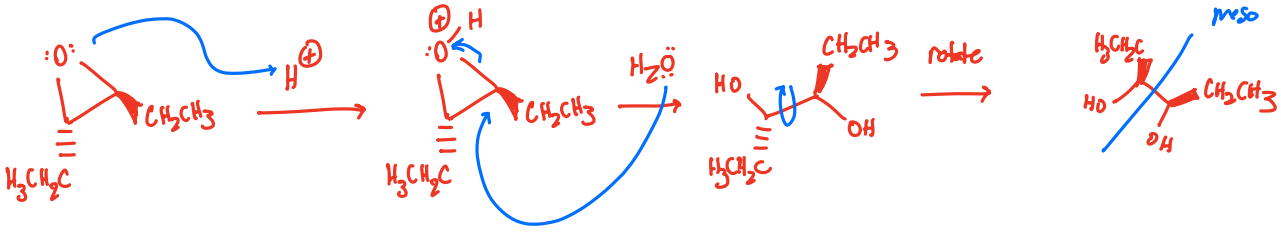
19. Circle the most stable alkene



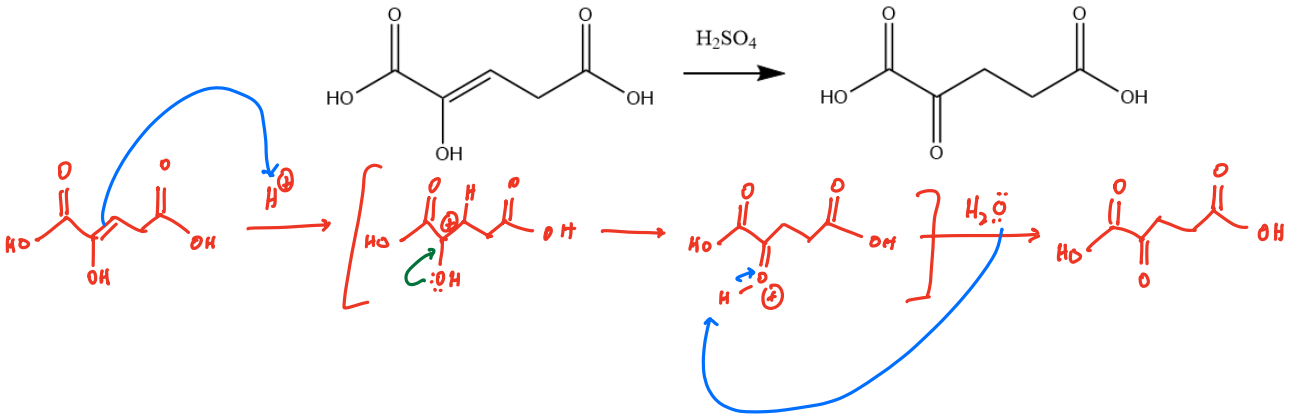
Section 3: FRQ

20. Provide a mechanism for the following reaction



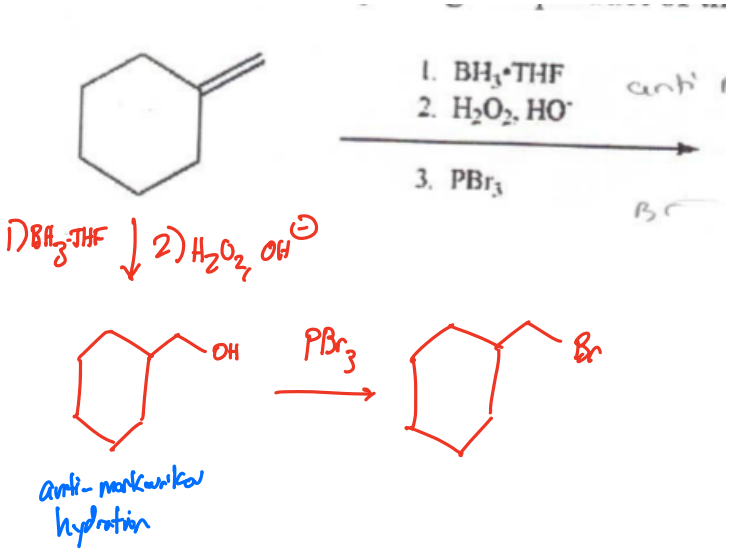


21. Provide a mechanism for the following reaction

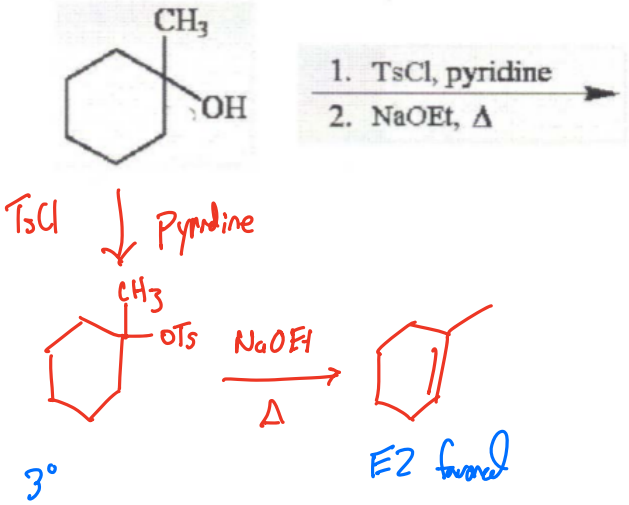


22. Provide the major organic product for the set of reagents below

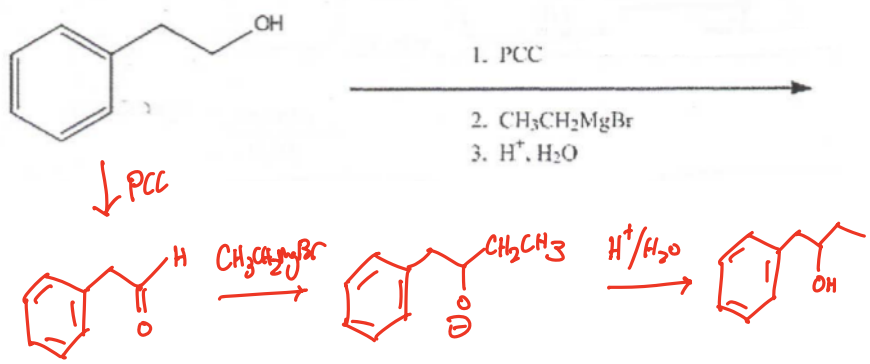
a.



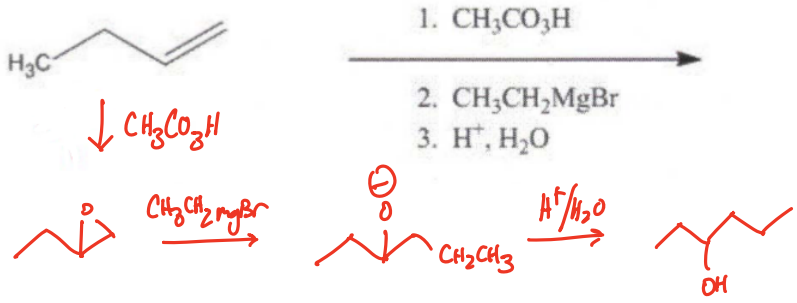
b.



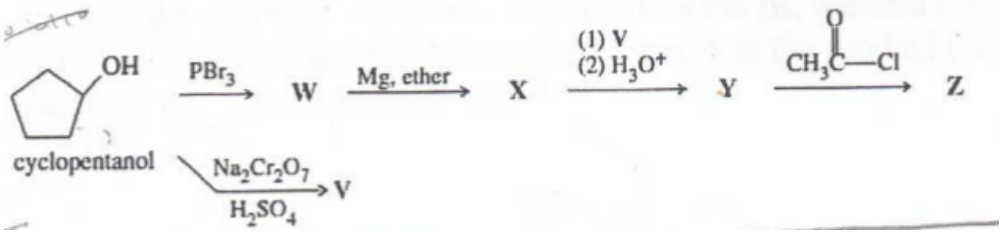
c.



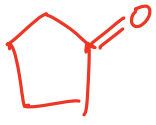
d.



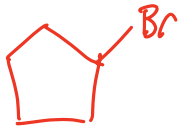
23. Provide structures for V-Z.



V:

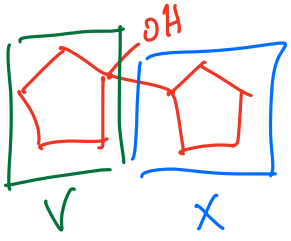


W:

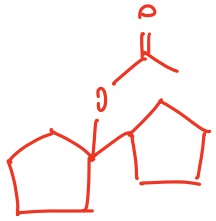


X:

Y:

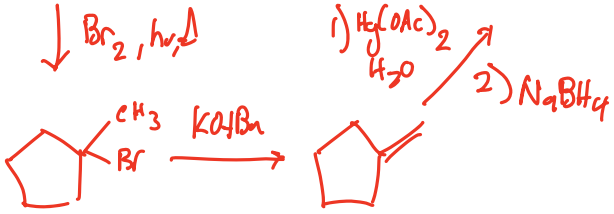


Z:

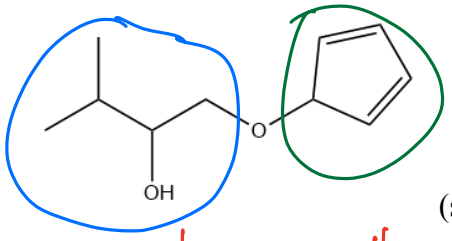


24. Provide a synthesis to perform the following conversions

a.



b.

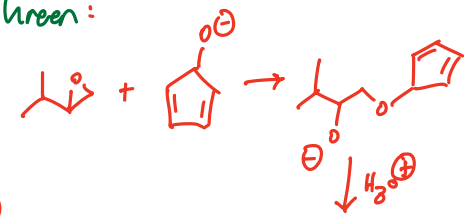


break up ethers

(starting from any alkane or alkene you need)

Blue compound:

Blue + Green:

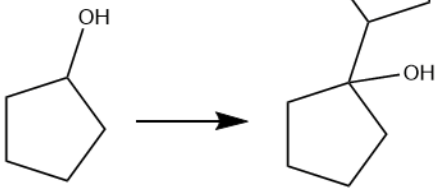


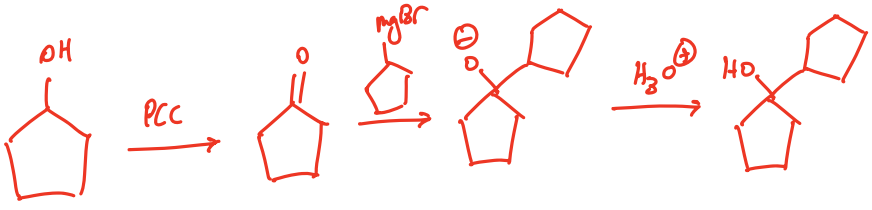
Green Compound:

allylic Bromination

This is just #23! But modified.

c.





Thank you all for a great semester! Good luck in your future classes :)