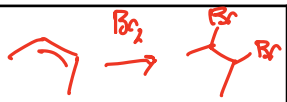
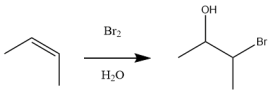
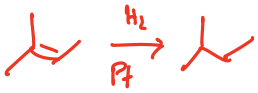
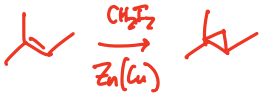
CHEM 223 (2024) SI Session #17

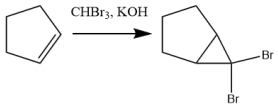
Learning Objectives: By the end of this session, students should be able to:

- Predict products and draw mechanisms for addition reactions
- Predict products and draw mechanisms for alkyne reactions

Recoup Continued

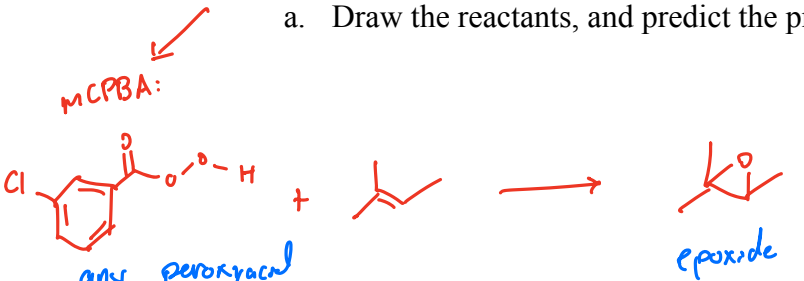
Fill in the table with the appropriate reaction name, description, reaction example, and/or stereochemistry.

Halogen addition	Adds 2 halogens across a double bond		Anti (ring opening)
Halohydrin formation	Adds a halogen and OH across a double bond. OH goes to more subs side.		Anti (ring opening)
Catalytic Hydrogenation	Adds H_2 across double bond.		Syn
Simmon's Smith	Adds a cyclopropane group across a double bond		Syn

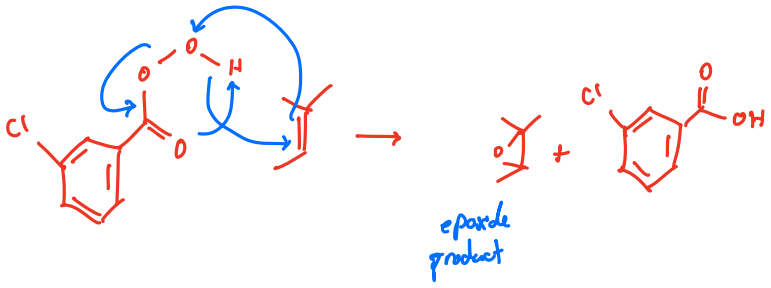
Alpha Elimination	Adds CX_2 across a double bond.		Syn

Section 1: Reactions involving oxygen

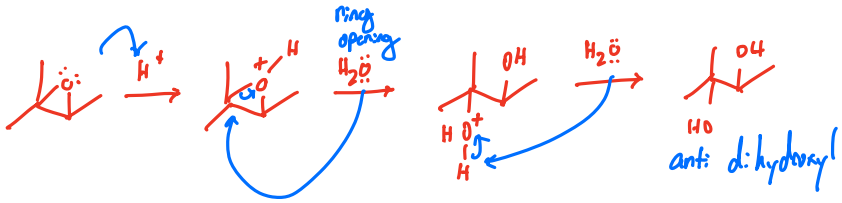
1. Meta-chloroperoxybenzoic acid is added to 2-methylbut-2-ene.
   a. Draw the reactants, and predict the product.



   b. Draw a mechanism to explain the production of the product.

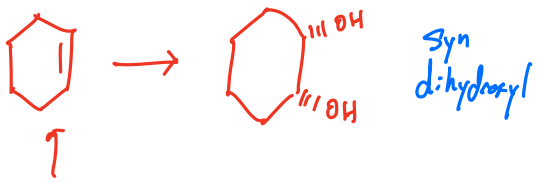


   c. Diluted sulfuric acid is added to the product in #1b. Draw the new product, and provide a mechanism for its production.



   d. Describe the stereochemistry in #1c, and explain.

Anti: the H_2O attacks the epoxide from the back



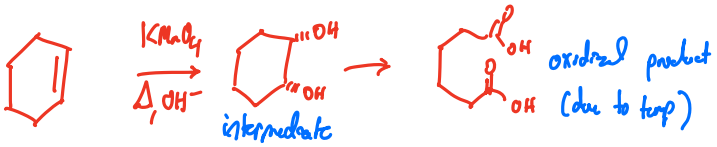
2. A chemist is trying to convert cyclohexene to cis-cyclohexen-1,2-diol. Provide two reagents that can do this.

#1: OsO_4, H_2O_2

#2: cold, dilute $KMnO_4$, OH^-

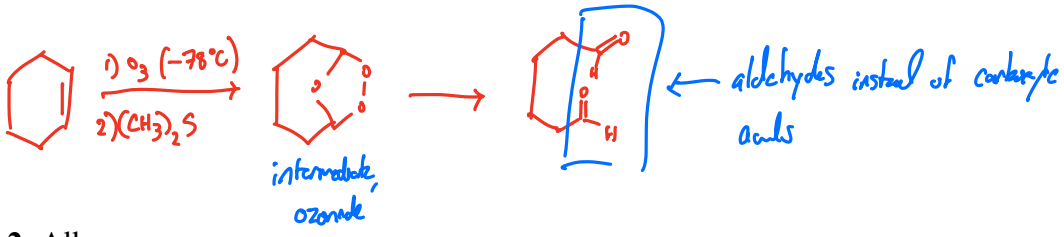
3. One of the reagents in #2 is sensitive to temperature; draw the product of the reaction if the temperature is too high.

The $KMnO_4$ is sensitive to temperature; if it is too warm, it will cleave the syn dihydroxyl.



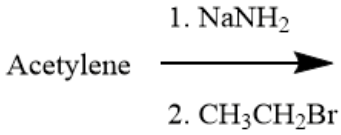
4. Our final reagent in Chapter 8 can perform a similar reaction to #3, but with a key difference. Provide the product of this reagent's reaction with cyclohexene, and point out the major difference.

Ozonolysis oxidizes the double bond, but does not fully oxidize to carboxylic acids

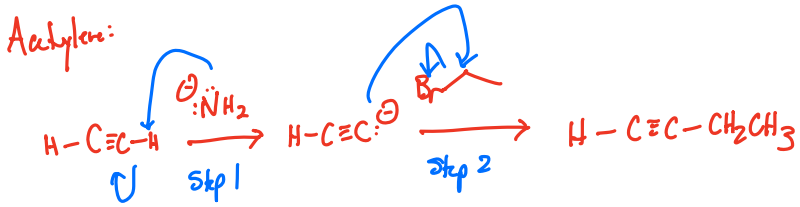


Section 2: Alkynes

5. The following reaction is performed



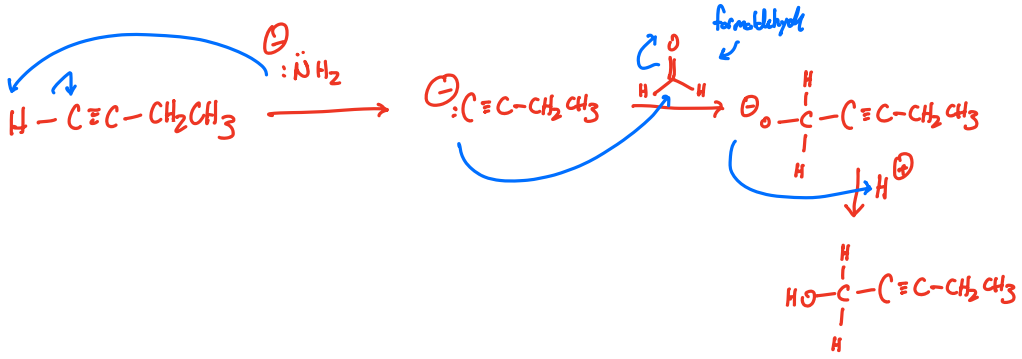
a. Draw the mechanism of each step of the reaction, and draw the final product.



b. Explain why $NaNH_2$ can be used in this reaction, but not NaOH.

$^{\ominus}NH_2$ is more basic than $^{\ominus}OH$.

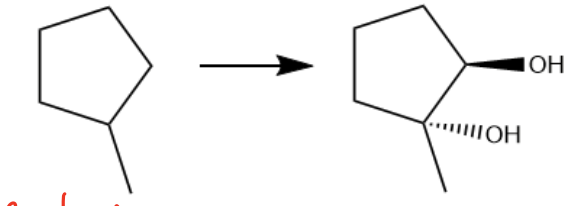
6. The product in #5 first reacts with $NaNH_2$, and then formaldehyde. After this, dilute acid is added.
   a. Draw the mechanism of the reaction that results from these three steps



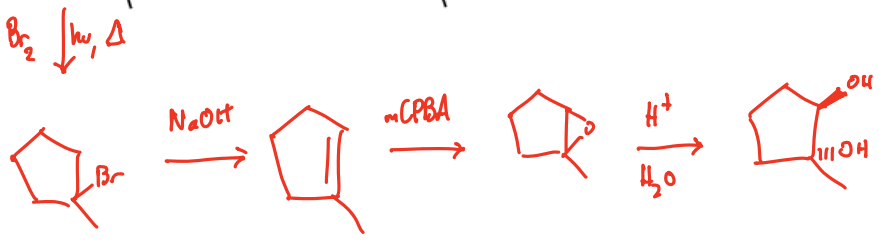
Section 3: Combined Synthesis Practice

7. Provide synthesis routes for each of the following reactions

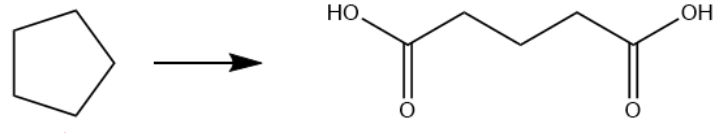
a.

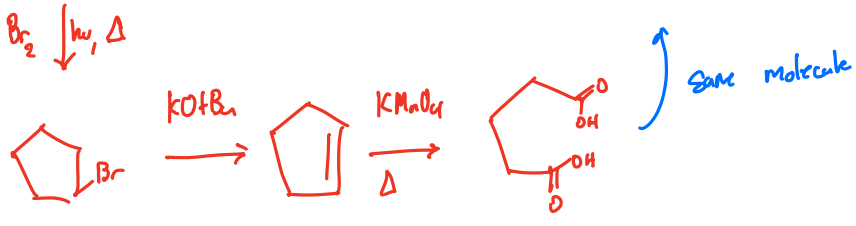


anti - dihydroxylation; need to open an epoxide.



b.





carboxylic acid => need to use $KMnO_4$

c.