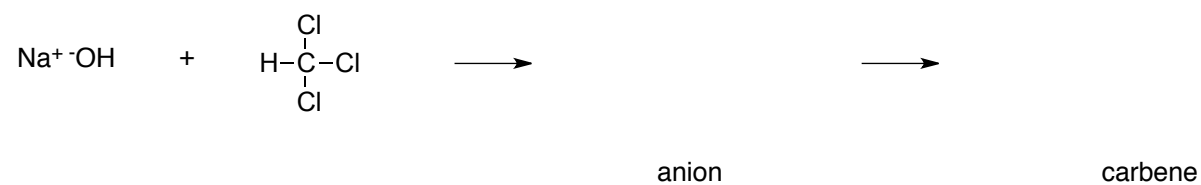


## CHAPTER 8. ALKENES: REACTIONS AND SYNTHESIS

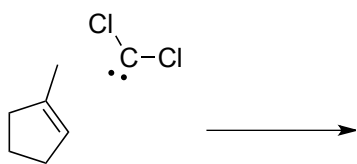
### Dichlorocyclopropanation

- initiated by formation of dichlorocarbene
- syn addition of carbene to pi-bond results in cis stereochemistry

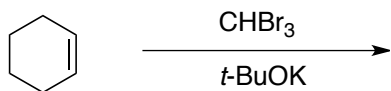


Show how resonance delocalization of electrons can help stabilize this carbene:

Now draw the mechanism - make sure you indicate stereochemistry in the product:

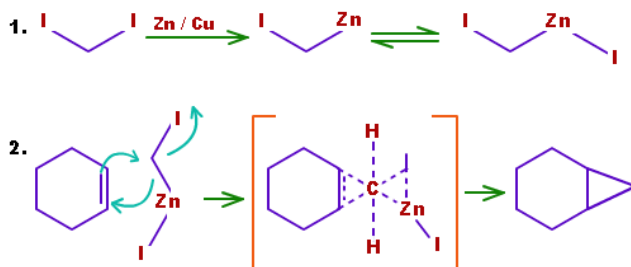
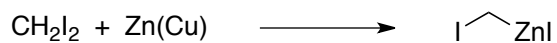


Draw the product of the following reaction:

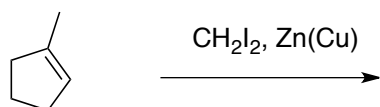


## Cyclopropanation

- initiated by formation of a stabilized carbene
- syn addition of carbene to pi-bond results in cis stereochemistry

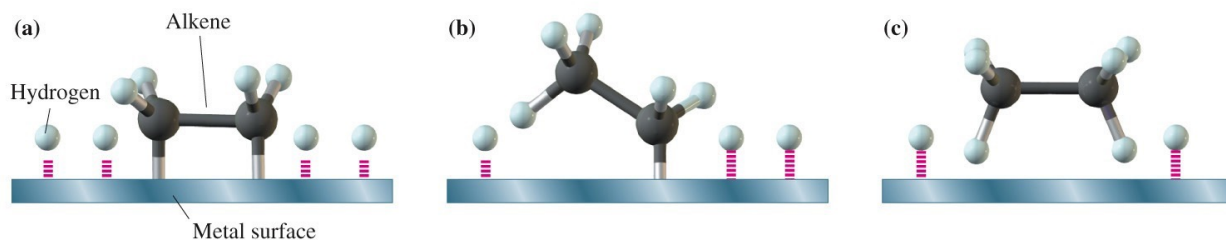


Draw the product of the following reaction:

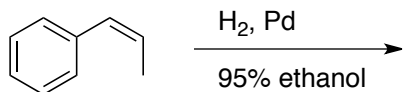
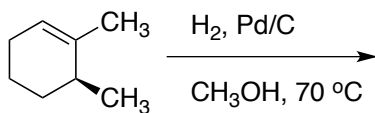
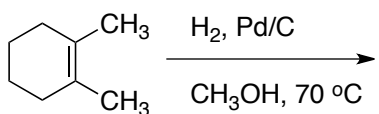
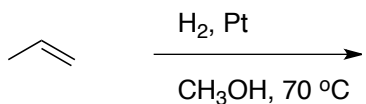
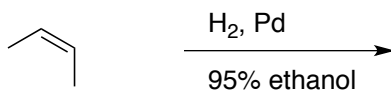
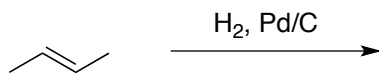


## Catalytic Hydrogenation

- pi bond associates with metal surface
- delivery of hydrogens from SAME side of alkene (syn-addition)



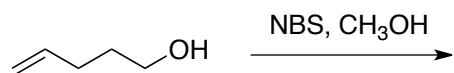
Draw the product(s) of the following hydrogenation reactions:



**THAT'S THE LAST REACTION WE WILL LEARN IN CHAPTER 8.**

Here are some problems for you to work through that will test some of the things you've learned.

Treating 4-penten-1-ol with bromine in water forms a cyclic bromoether. Draw an arrow-pushing mechanism that accounts for this transformation:



How do you convert ethene to these compounds (what are the reagents necessary)?

- a. Ethane
- b. chloroethanol
- c. chloroethane
- d. ethanol
- e. 1,2-dibromoethane
- f. bromoethane
- g. 1,2-ethanediol

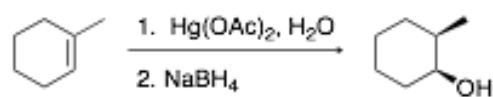
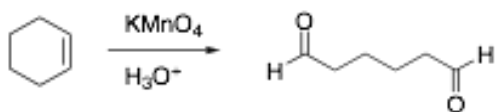
Draw the products of these two reactions - are the products any different?



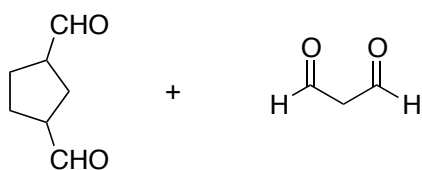
In an abandoned laboratory has been found a flammable liquid, A, in a bottle bearing only the label "Compound A: C<sub>7</sub>H<sub>12</sub>." Government agents have offered you a considerable sum to determine the structure of this compound. After verifying the molecular formula by elemental analysis, you find that Compound A reacts with 1 mol equiv of hydrogen; and, after treatment with acidic KMnO<sub>4</sub>, Compound A gives the dicarboxylic acid C. Another bottle from the same laboratory is labeled "Compound B (isomer of A)." Compound B also reacts with 1 mol equiv of hydrogen, but yields cyclohexanone after treatment with acidic KMnO<sub>4</sub>.

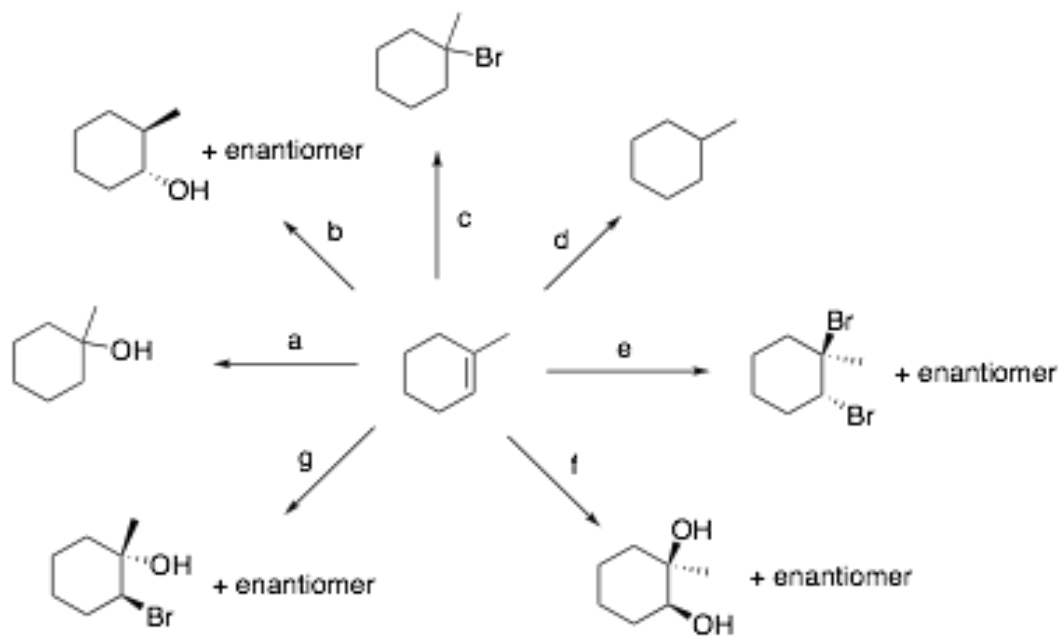
Suggest structures for A and B and C

The products of the following reactions are written incorrectly. What is wrong with each, and suggest the correct product structure.



A hydrocarbon with the formula  $\text{C}_{10}\text{H}_{14}$  is treated with ozone, then with acidic zinc in water. The products of the reaction are shown below. Write the structure of the hydrocarbon starting material.





Enter the synthetic step (a-h) that would apply to each reagent set. More than one reagent (or set of reagents) may cause the same transformation – it is not necessary to chose BOTH, but just one that works. Not all reagents, below, are used.

\_\_\_\_\_  $\text{H}_2\text{O}, \text{H}_2\text{SO}_4$

\_\_\_\_\_ 1.  $\text{BH}_3$   
2.  $\text{NaOH}, \text{H}_2\text{O}_2$   
3.  $\text{H}_3\text{PO}_4, \text{H}_2\text{O}$

\_\_\_\_\_ 1.  $\text{O}_3$   
2.  $(\text{CH}_3)_2\text{S}$

\_\_\_\_\_ 1.  $\text{Hg}(\text{OAc})_2, \text{H}_2\text{O}$   
2.  $\text{NaBH}_4$

\_\_\_\_\_ 1.  $\text{OsO}_4$   
2.  $\text{NaHSO}_3, \text{H}_2\text{O}$

\_\_\_\_\_  $\text{Br}_2$

\_\_\_\_\_  $\text{CH}_3\text{OH}, \text{H}_2\text{SO}_4$

\_\_\_\_\_  $\text{HIO}_4, \text{H}_2\text{O}$

\_\_\_\_\_  $\text{Br}_2, \text{H}_2\text{O}$

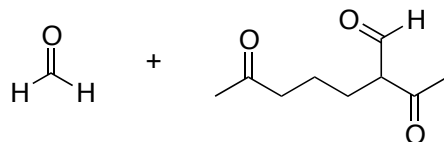
\_\_\_\_\_  $\text{HBr}$

\_\_\_\_\_  $\text{KMnO}_4, \text{H}_2\text{O}, \text{H}_3\text{PO}_4$

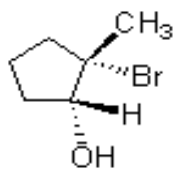
\_\_\_\_\_  $\text{Cl}_2, \text{H}_2\text{O}$

\_\_\_\_\_  $\text{H}_2, \text{Pd-C}$

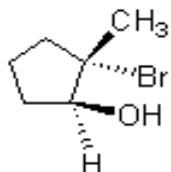
A compound of formula  $C_{10}H_{16}$  is treated with ozone, then with acidic zinc in water. The products of this reaction are shown below. When the original compound is treated with excess  $H_2 / Pt$ , 1-isopropyl-2,3-dimethylcyclohexane is formed. Write the structure of the original compound.



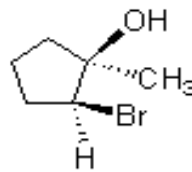
Which of the compounds will result from the reaction of NBS/ $H_2O$ /DMSO with 1-methylcyclopentene?



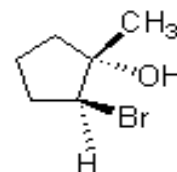
a)



b)



c)



d)

What alkene starting material would reaction with borane ( $BH_3$ ) to give the following trialkylborane?

