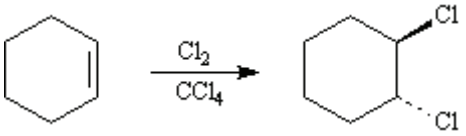
Chapter 8—Alkenes: Reactions and Synthesis

SHORT ANSWER

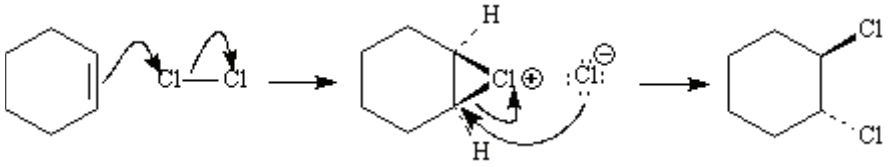
Exhibit 8-1
To answer the question(s) below consider the following reaction:

When cyclohexene reacts with chlorine in carbon tetrachloride the *trans*-dihalide is formed.



1. Refer to Exhibit 8-1. Write the complete stepwise mechanism for this reaction. Be sure to show all intermediate structures and all electron flow using arrows.

ANS:



2. Refer to Exhibit 8-1. Since the two chlorine atoms add to opposite faces of the cyclohexene double bond, we say that the reaction occurs with:

a. syn stereochemistry
b. cis stereochemistry
c. anti stereochemistry
d. retention of stereochemistry

ANS:
c

3. Refer to Exhibit 8-1. The observed stereochemistry of addition of chlorine to cyclohexene is explained by the intermediacy of a:

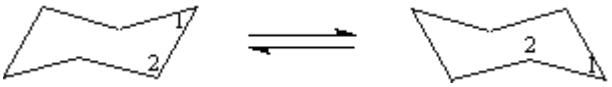
a. cyclonium ion
b. carbocation
c. carbene
d. chloronium ion

ANS:
d

4. Refer to Exhibit 8-1. Provide the IUPAC name for the product of the reaction of cyclohexene with chlorine.

ANS:
trans-1,2-dichlorocyclohexane

5. Draw both chair conformations of *trans*-1,2-dichlorocyclohexane on the templates provided below. Circle the *least* stable conformation.



ANS:

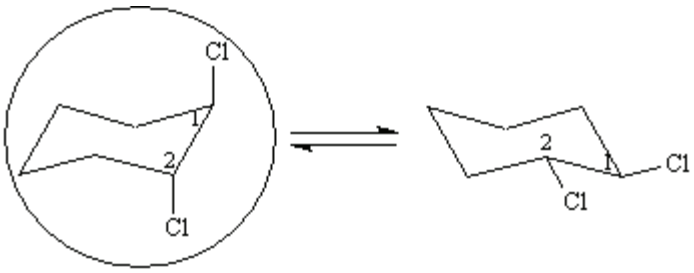
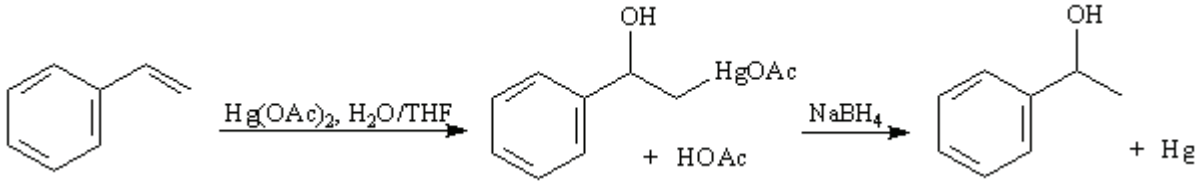
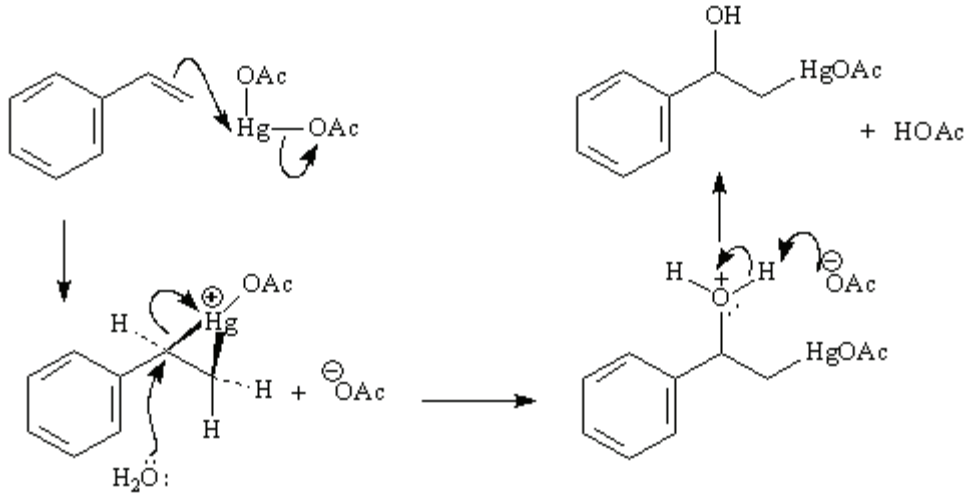


Exhibit 8-2
Consider the reaction sequence below to answer the following question(s):



6. Refer to Exhibit 8-2. Write the complete reaction mechanism for the first step of this reaction sequence. Show all electron flow with arrows and show all intermediate structures.

ANS:



7. Refer to Exhibit 8-2. The intermediate in the first step of this reaction sequence is called a:

a. carbocation
b. cyclonium ion
c. mercurinium ion
d. mercapto species.

ANS:
c

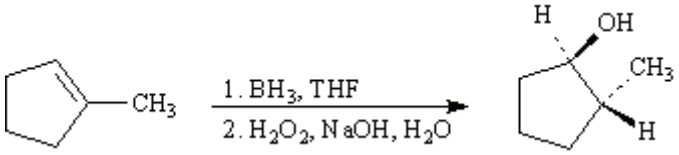
8. Refer to Exhibit 8-2. In the second step of this reaction sequence, the organomercury compound is treated with sodium borohydride, $NaBH_4$, to yield the alcohol product. This replacement of a carbon-mercury bond with a carbon-hydrogen bond is termed:

a. an oxidation
b. a reduction
c. a hydroxylation
d. a cycloaddition

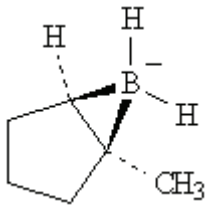
ANS:
b

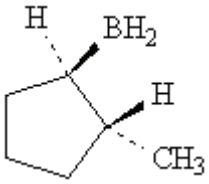
Exhibit 8-3
Consider the reaction below to answer the following question(s).

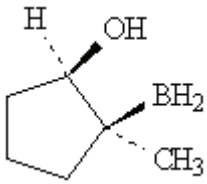
Alkenes may be hydrated by the hydroboration/oxidation procedure shown.

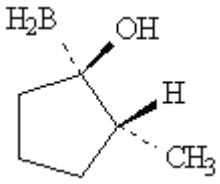


9. Refer to Exhibit 8-3. The intermediate formed in the first step of this reaction is:

a.


b.


c.


d.


ANS:
b

10. Refer to Exhibit 8-3. Hydroboration of alkenes is an example of:

a. a rearrangement reaction.
b. a substitution reaction.
c. an elimination reaction.
d. an addition reaction.

ANS:
d

11. Refer to Exhibit 8-3. Hydroboration/oxidation of alkenes occurs with:

a. *anti* stereochemistry.
b. *trans* stereochemistry.
c. *syn* stereochemistry.
d. unpredictable stereochemistry.

ANS:
c