

# Chapter 6

6.1 Calculate the degree of the unsaturation in the following hydrocarbons:

- (a)  $C_8H_{14}$ ;
- (b)  $C_5H_6$
- (c)  $C_{12}H_{20}$
- (d)  $C_{20}H_{32}$
- (e)  $C_{40}H_{56}$

Solution:

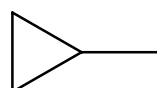
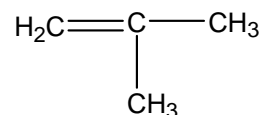
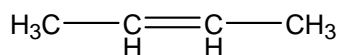
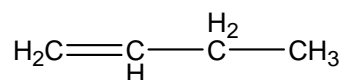
- (a)  $\Delta=2$
- (b)  $\Delta=3$
- (c)  $\Delta=3$
- (d)  $\Delta=5$
- (e)  $\Delta=13$

6.2 Calculate the degree of the unsaturation in the following formula, and then draw as many structures as you can for each:

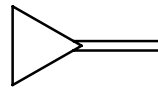
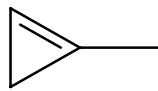
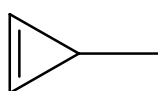
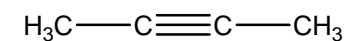
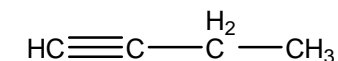
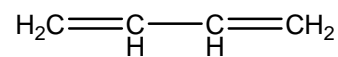
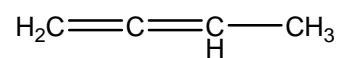
- (a)  $C_4H_6$ ;
- (b)  $C_4H_8$ ;
- (c)  $C_3H_4$ ;

Solution:

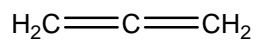
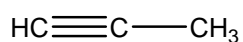
- (a)  $\Delta=1$



- (b)  $\Delta=2$



- (c)  $\Delta=2$

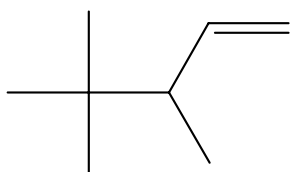


**6.3** Calculate the degree of unsaturation in the following formulas:

- (1)  $\text{C}_6\text{H}_5\text{N}$  5
- (2)  $\text{C}_6\text{H}_5\text{NO}_2$  5
- (3)  $\text{C}_8\text{H}_9\text{Cl}_3$  3
- (4)  $\text{C}_9\text{H}_{10}\text{Br}_2$  1
- (5)  $\text{C}_{10}\text{H}_{12}\text{N}_2\text{O}_3$  6
- (6)  $\text{C}_{20}\text{H}_{32}\text{ClN}$  5

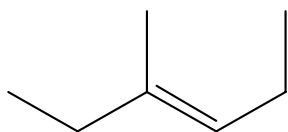
**6.4** Give the IUPAC name for the following compounds:

(1)



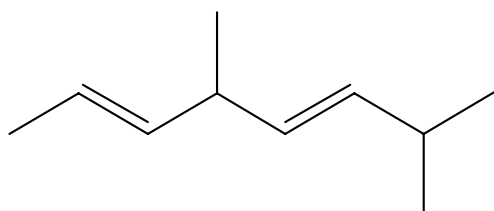
3,4,4-trimethyl-1-pentene

(2)



3-methyl-3-hexene

(3)

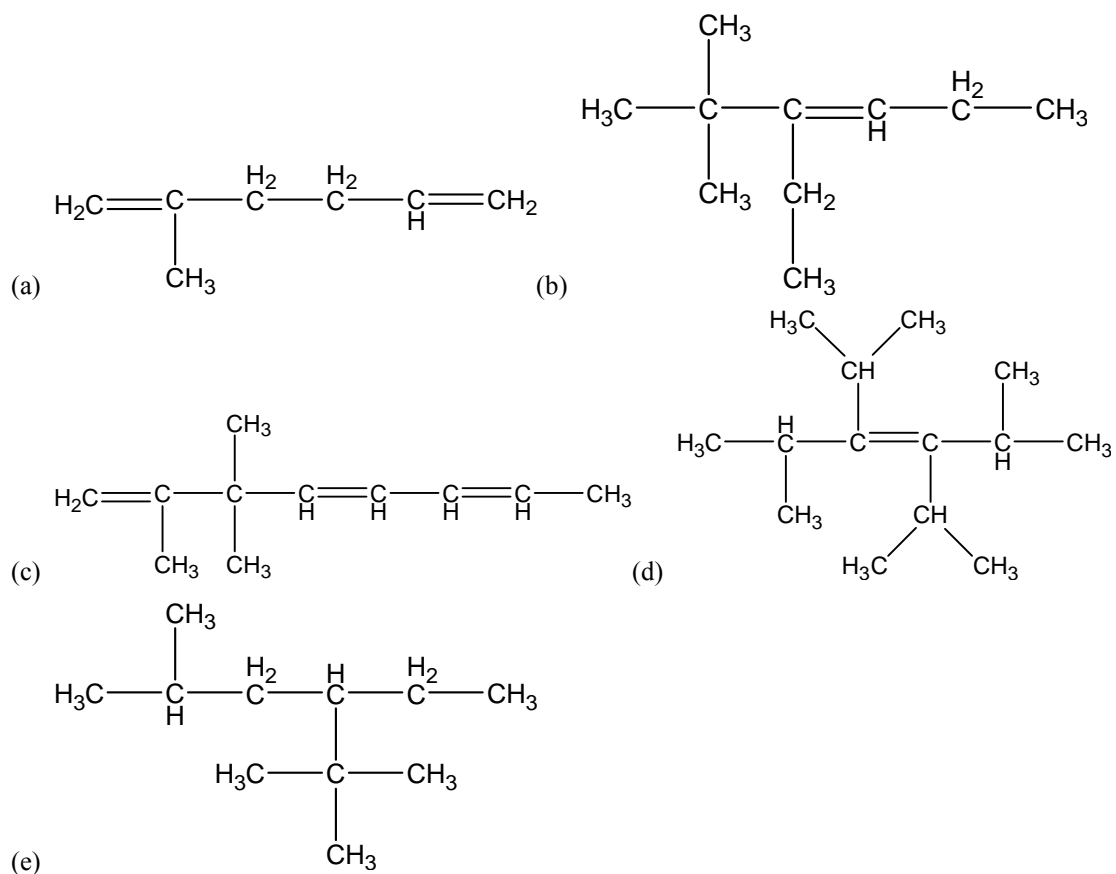


4,7-dimethyl-2,5-octadiene

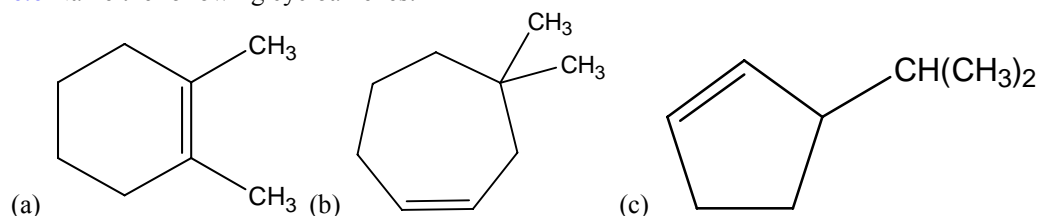
**6.5** Draw structures corresponding to the following IUPAC names:

- (a) 2-Methyl-1,5-hexadiene
- (b) 3-Ethyl-2,2-dimethyl-3-heptene
- (c) 2,3,3-Trimethyl-1,4,6-octatriene
- (d) 3,4-diisopropyl-2,5-dimethyl-3-hexene
- (e) 4-tert-Butyl-2-methylheptane

Solution:



6.6 Name the following cycloalkenes:



Solution:

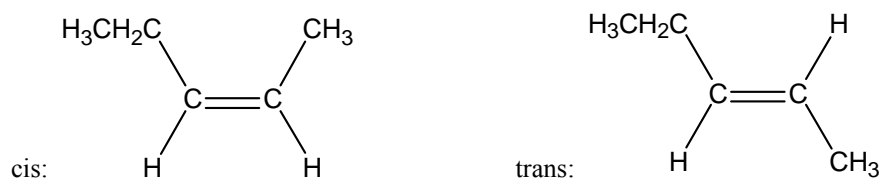
- (a) 1,2-Dimethyl-cyclohexene  
 (b) 4,4-Dimethyl-cycloheptene  
 (c) 3-Isopropyl-cyclopentene

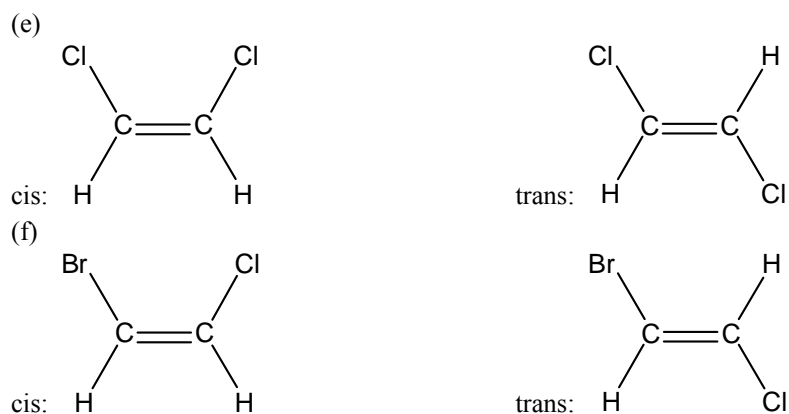
6.7 Which of the following compounds can exist as pairs of cis-trans isomers? Draw each cis-trans pair, and indicate the geometry of each isomer.

- (a)  $\text{H}_3\text{CCH}=\text{CH}_2$  (b)  $(\text{H}_3\text{C})_2\text{C}=\text{CHCH}_3$   
 (c)  $\text{H}_3\text{CH}_2\text{CH}=\text{CHCH}_3$  (d)  $(\text{H}_3\text{C})_2\text{C}=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_3$   
 (e)  $\text{ClHC}=\text{CHCl}$  (f)  $\text{BrHC}=\text{CHCl}$

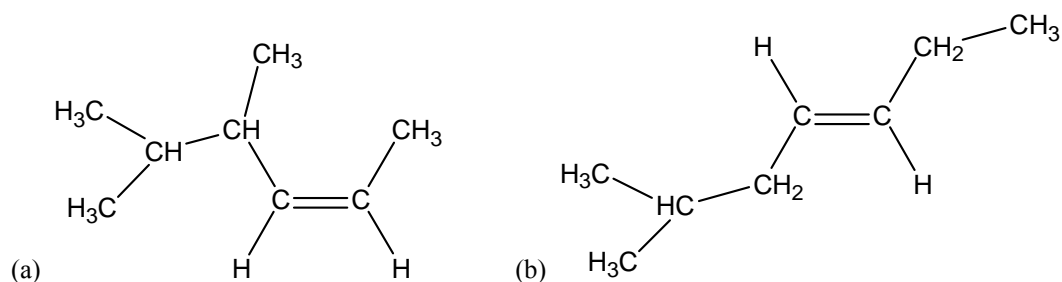
Solution:

(c)





**6.8** Name the following alkenes, including the cis or trans designation:



Solution:

(a) cis-4,5-Dimethyl-2-hexene

(b) trans-6-Methyl-3-heptene

**6.9** Which member in each of the following sets has higher priority?

(a)  $-H$  or  $-Br$

(b)  $-Cl$  or  $-Br$

(c)  $-CH_3$  or  $-CH_2CH_3$

(d)  $-NH_2$  or  $-OH$

(e)  $-CH_2OH$  or  $-CH_3$

(f)  $-CH_2OH$  or  $-CH=O$

Solution:

(a)  $-Br$

(b)  $-Br$

(c)  $-CH_2CH_3$

(d)  $-OH$

(e)  $-CH_2OH$

(f)  $-CH=O$

**6.10** Rank the following sets of substituents in order of Cahn-Ingold-Prelog priorities.

(a)  $-CH_3$ ,  $-OH$ ,  $-H$ ,  $-Cl$

(b)  $-CH_3$ ,  $-CH_2CH_3$ ,  $-CH=CH_2$

(c)  $-CO_2H$ ,  $-CH_2OH$ ,  $-C\equiv N$ ,  $-CH_2NH_2$

(d)  $-CH_2CH_3$ ,  $-C\equiv CH$ ,  $-C\equiv N$ ,  $-CH_2OCH_3$

Solution: (From High to low)

(a)  $-Cl$ ,  $-OH$ ,  $-CH_3$ ,  $-H$

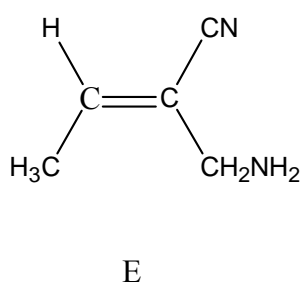
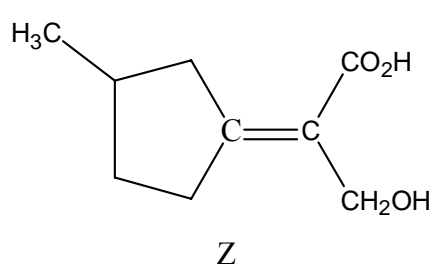
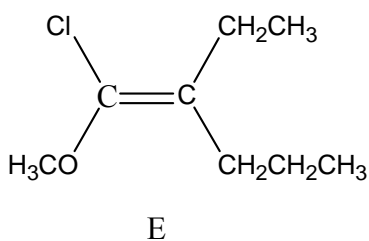
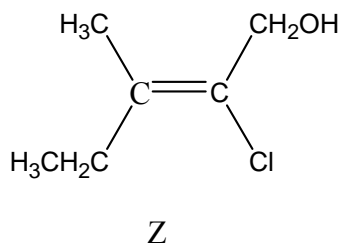
(b)  $-CH=CH_2$ ,  $-CH_2CH_3$ ,  $-CH_3$

(c)  $-CO_2H$ ,  $-CH_2OH$ ,  $-C\equiv N$ ,  $-CH_2NH_2$

(d)  $-CH_2OCH_3$ ,  $-C\equiv N$ ,  $-C\equiv CH$ ,  $-CH_2CH_3$

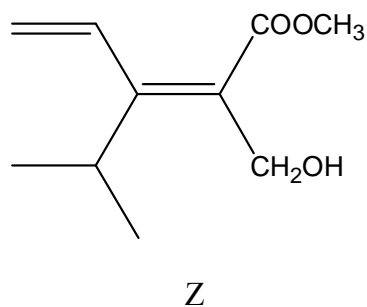
6.11 Assign E or Z configuration to the following alkenes:

Solution:



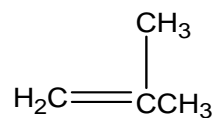
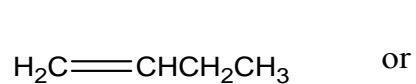
6.12 Assign stereochemistry to the following alkene, and convert the drawing into a skeletal structure:

Solution:



6.13 Name the following alkenes, and tell which compounds in each of the following pairs are more stable:

(a)

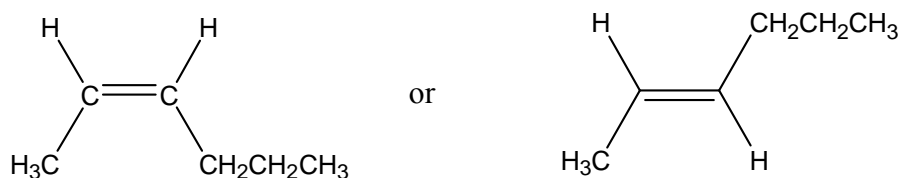


1-butene

2-methyl-1-propene

2-methyl-1-propene is more stable because it is more substituted.

(b)

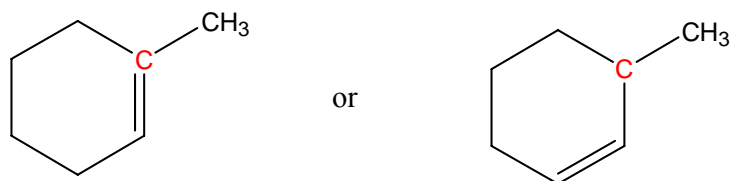


*cis*-2-hexene

*trans*-2-hexene

*trans*-2-hexene is more stable because it is trans isomer.

(c)

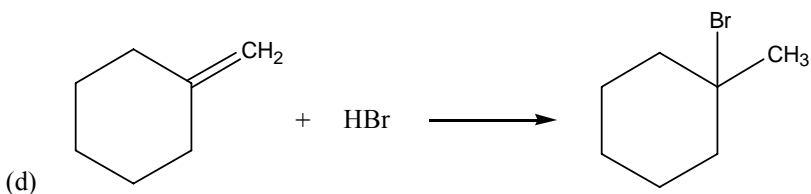
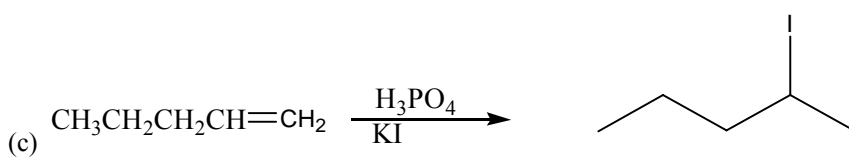
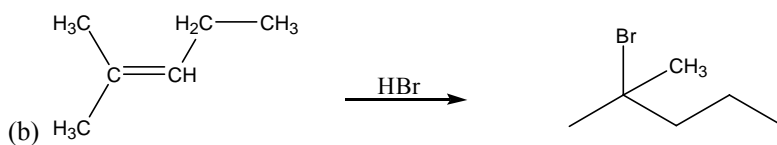
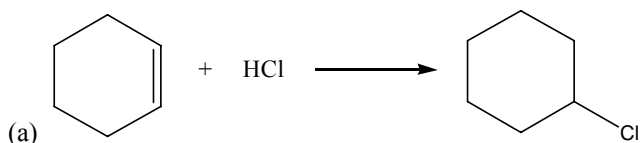


1-methyl-1-cyclohexene

3-methyl-1-cyclohexene

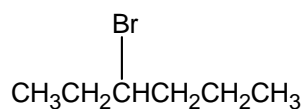
1-methyl-1-cyclohexene is more stable because the carbon has only  $sp^2$ - $sp^2$  bonds while the other has  $sp^2$ - $sp^3$  bonds.

**6.14** Predict the products of the following reactions:



**6.15** What alkenes would you start with to prepare the following alkyl halides?

- (a) Bromocyclopentane  
 (b) 1-Ethyl-1-iodocyclohexane  
 (c)



Solution:

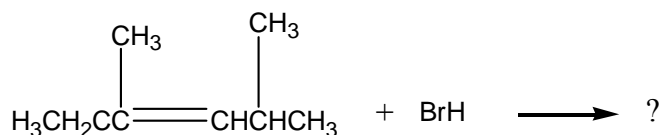
(a) Cyclopentene

(b) 1-Ethylcyclohexene

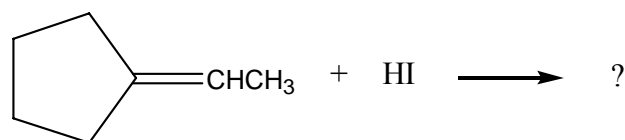
(c)  $\text{H}_3\text{CH}_2\text{CHC}=\text{CHCH}_2\text{CH}_3$

**6.16** Show the structures of carboanions you would expect in the following reactions:

(a)

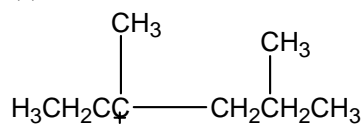


(b)

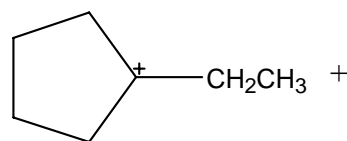


Solution:

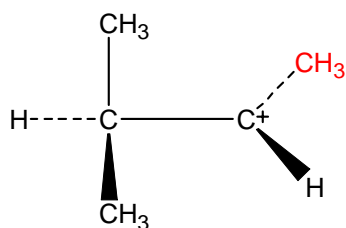
(a)



(b)



**6.17** Draw a skeletal structure of the following carbocation. Identify it as primary, secondary, or tertiary, and identify the hydrogen atoms that are involved in hyperconjugation in the conformation shown.



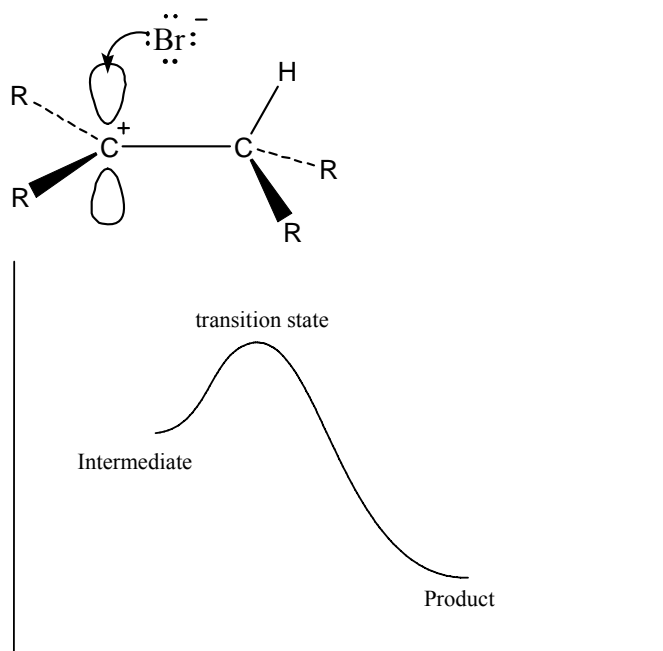
Solution:

It is secondary carbocation.

Only the methyl-group C—H that is parallel to the carbocation p orbital can show hyperconjugation.

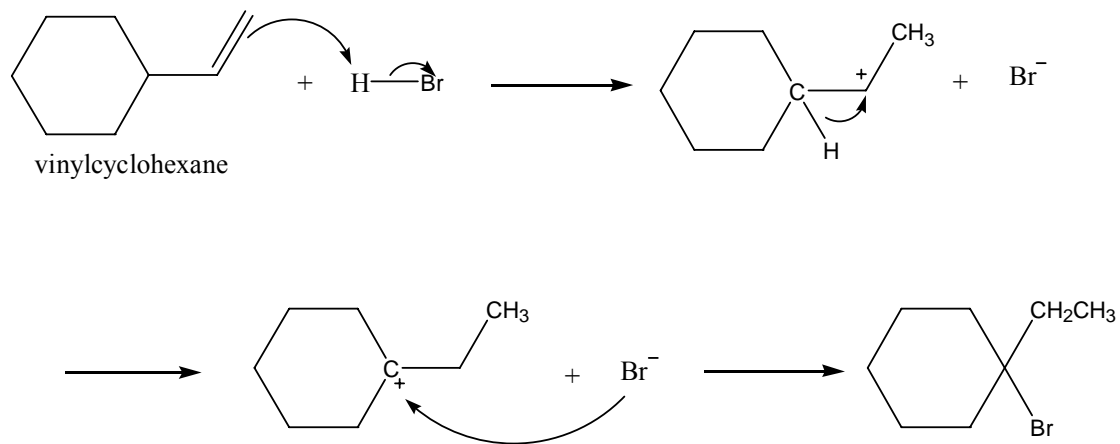
**6.18** What about the second step in the electrophilic addition of HCl to an alkene—the reaction of chloride ion with the carbocation intermediate? Is this step exergonic or endergonic? Does the transition state for this second step resemble the reactant (carbocation) or product (alkyl chloride)?  
Make a rough drawing of what the transition-state structure might look like.

Solution: This step is exergonic. The transition state for this second step resemble carbocation.

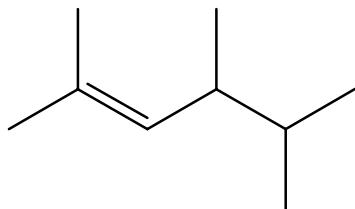


**6.19** On treatment with HBr, vinylcyclohexane undergoes addition and rearrangement to yield 1-bromo-1-ethylcyclohexane. Using curved arrows, propose a mechanism to account for this result.

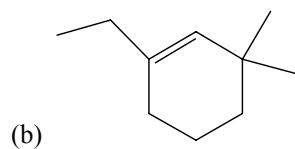
Solution:



**6.20** Name the following alkenes, and convert each drawing into a skeletal structure.



(a) 2,4,5-trimethyl-2-hexene



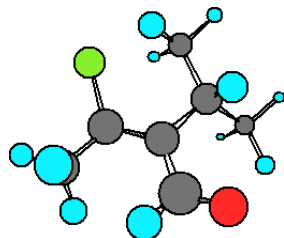
(b)



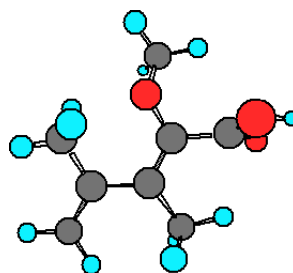
1-ethyl-3,3-dimethyl-1-cyclohexene

6.21. Assign stereochemistry (E or Z) to each of the following alkenes, and convert each drawing into a skeletal structure:

(a)

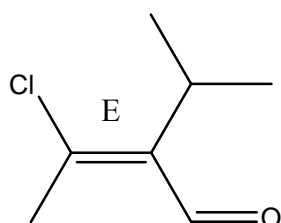


(b)

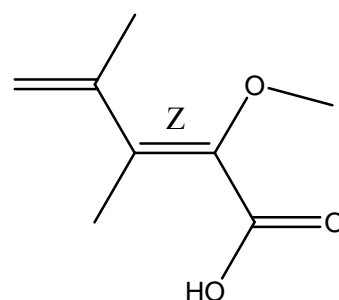


SOLUTION:

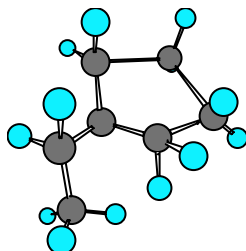
(a)



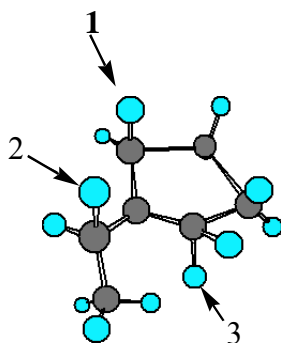
(b)



6.22. The following carbocation is an intermediate in the electrophilic addition reaction of HCl with two different alkenes. Identify both, and tell which C—H bonds in the carbocation are aligned for maximum hyperconjugation with the vacant p orbital on the positively charged carbon.



SOLUTION:



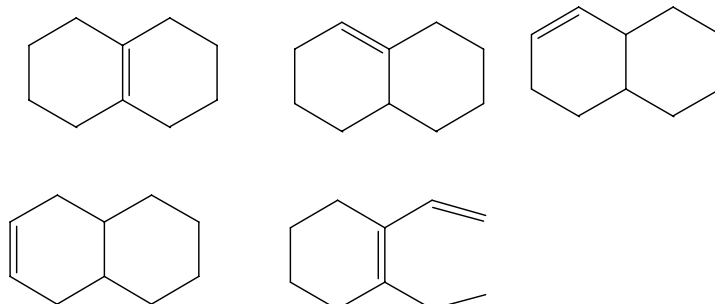
6.23 Calculate the degree of unsaturation in the following formulas, and draw five possible for each:

(a) C<sub>10</sub>H<sub>16</sub> (b) C<sub>8</sub>H<sub>8</sub>O (c) C<sub>7</sub>H<sub>10</sub>Cl<sub>2</sub>

(d) C<sub>10</sub>H<sub>16</sub>O<sub>2</sub> (e) C<sub>5</sub>H<sub>9</sub>NO<sub>2</sub> (f) C<sub>8</sub>H<sub>10</sub>ClNO

Solution”

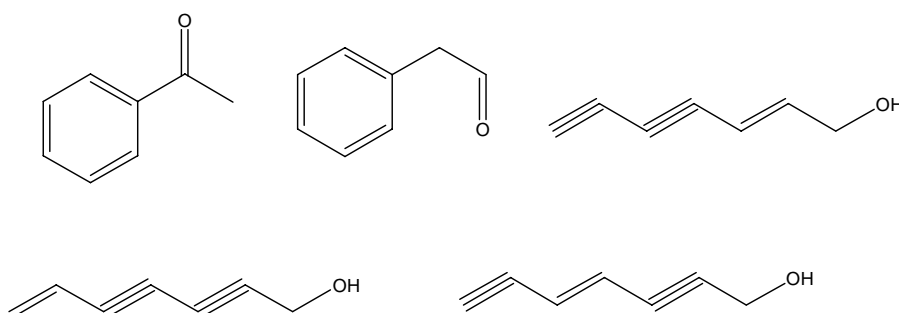
a) It has 3 unsaturation degrees.



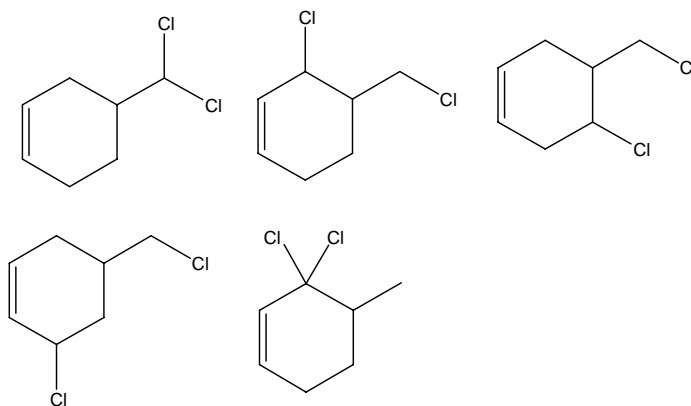
Possible structures:

b) It has 5 unsaturation degrees.

Possible structures:

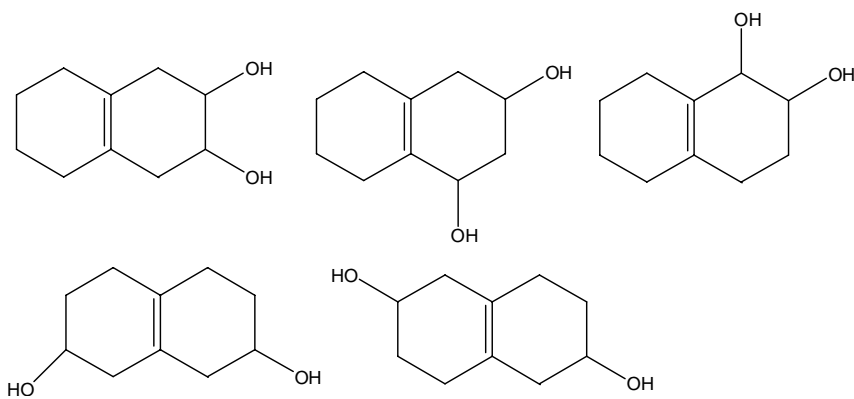


c) It has 2 unsaturation degrees.



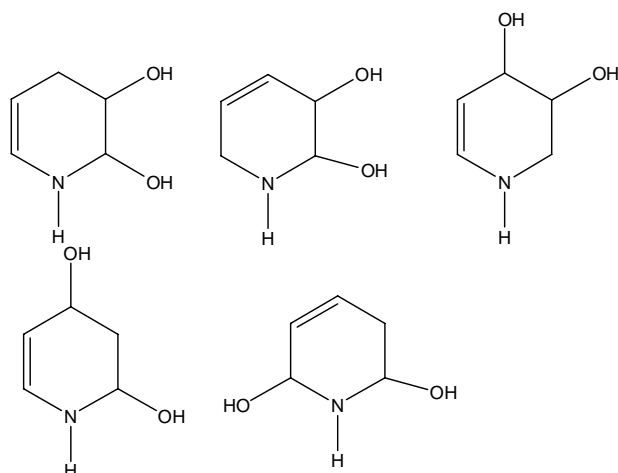
Possible structures:

d) It has 3 unsaturation degrees.



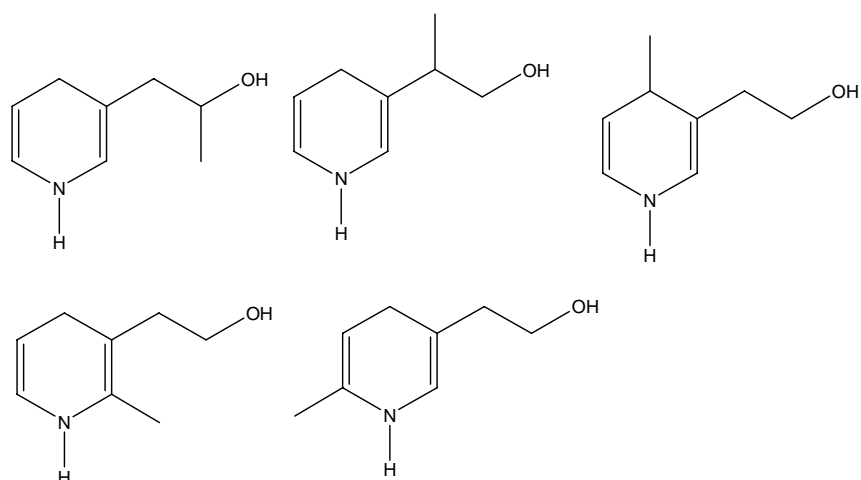
Possible structures:

e) it has 2 unsaturation degrees.



Possible structures:

f) it has 4 unsaturation degrees.



Possible structures:

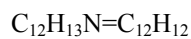
**6.24** A compound of formula  $C_{10}H_{14}$  undergoes catalytic hydrogenation but absorbs only 2 molar equivalents of hydrogen. How many rings does the compound have?

Solution:

It has 4 unsaturation degrees. Two of them are rings.

**6.25** A compound of formula  $C_{12}H_{13}N$  contains two rings. How many molar equivalents of hydrogen does it absorb if all the remaining unsaturations are double bonds?

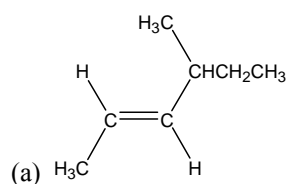
Solution:

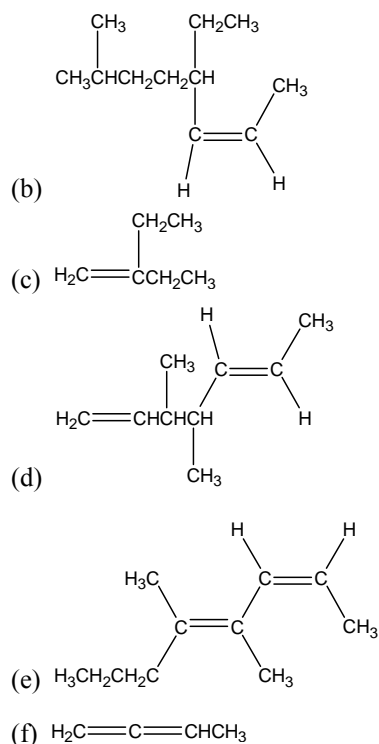


$$\text{Degree of Unsaturation: } \frac{(12 \times 2 + 2 - 12)}{2} = 7$$

It can absorb  $7 - 2 = 5$  molar equivalents of hydrogen.

**6.26** Name the following alkenes:



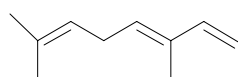


Solution:

- (a). trans-4-Methyl-2-hexene or (E)-4-Methyl-2-hexene  
 (b). cis-4-Ethyl-7-methyl-2-octene or (Z)-4-Ethyl-7-methyl-2-octene  
 (c). 2-Ethyl-1-butene  
 (d). trans-3,4-Dimethyl-1,5-heptadiene or (E)-3,4-Dimethyl-1,5-heptadiene  
 (e). (2-cis,4-trans)-4,5-Dimethyl-2,4-octadiene or (2Z,4E)-4,5-Dimethyl-2,4-octadiene  
 (f). 1,2-Butadiene

**6.27** Ocimene is a triene found in the essential oils of many plants. What is its IUPAC name, including stereochemistry?

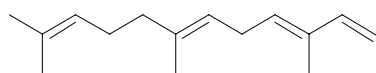
Solution:



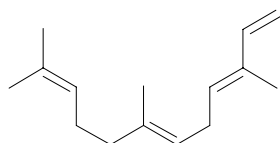
(3E)3,7-dimethyl-octa-1,3,6-triene

**6.28**  $\alpha$ -Farnesene is a constituent of the natural wax found on apples. What is its IUPAC name, including stereochemistry?

Solution:



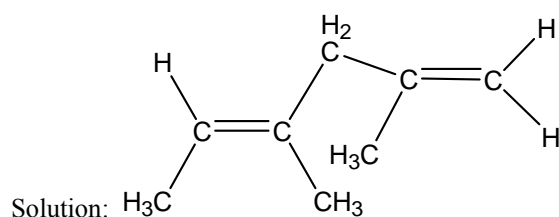
$\alpha$ -Farnesene



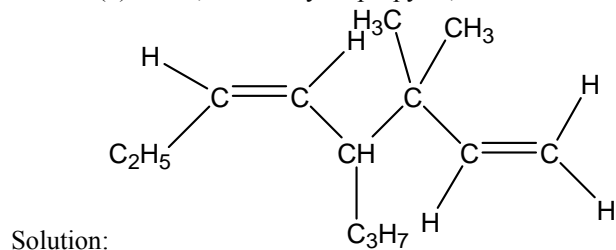
(3E,6E)3,7,11-trimethyl-dodeca-1,3,6,10-tetraene

**6.29** Draw structures corresponding to the following systematic names:

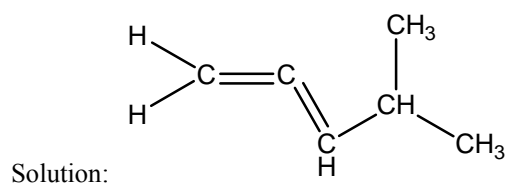
(a) (4E)-2,4-Dimethyl-1,4-hexadiene



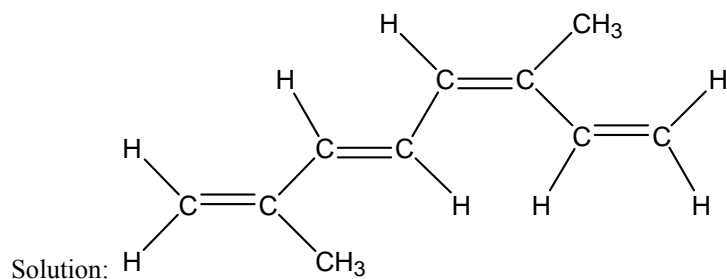
(b) cis-3,3-Dimethyl-4-propyl-1,5-octadiene



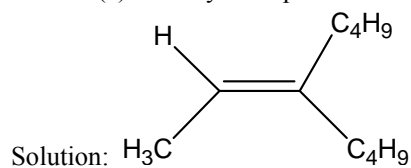
(c) 4-Methyl-1,2-pentadiene



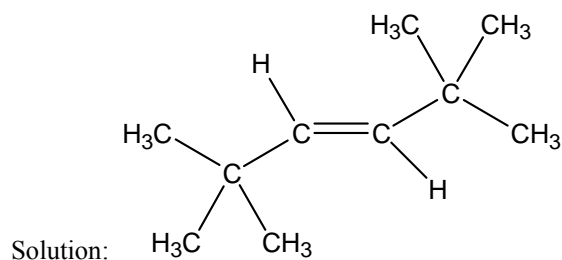
(d) (3E,5Z)-2,6-Dimethyl-1,3,5,7-octatetraene.



(e) 3-Butyl-2-heptene

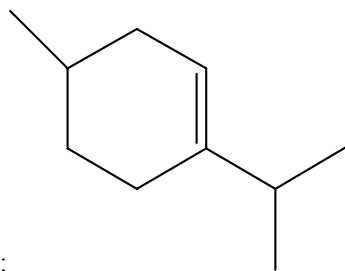


(f) trans-2,2,5,5-Tetramethyl-3-hexene



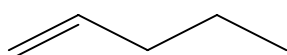
**6.30** Menthene, a hydrocarbon found in mint plants, has the systematic name

1-isopropyl-4-methylcyclohexene. Draw its structure.

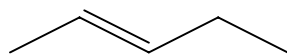


Solution:

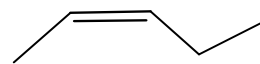
**6.31** Draw and name the 6 pentene isomers,  $C_5H_{10}$ , including E, Z isomers.



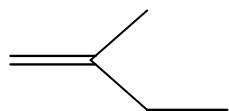
1-Pentene



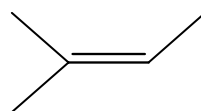
(Z)-2-Pentene



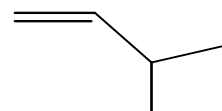
(E)-2-Pentene



2-Methyl-1-butene

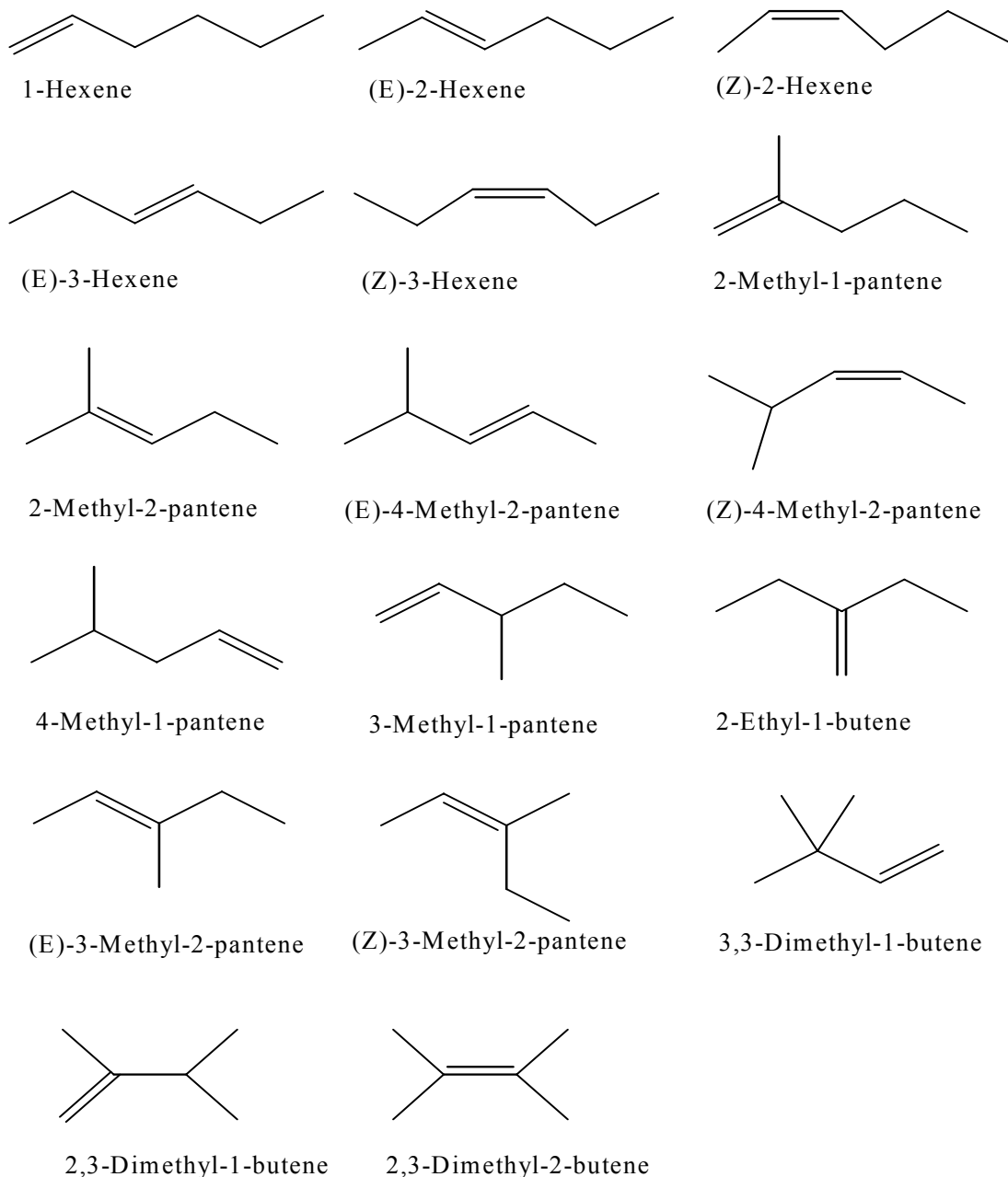


2-Methyl-2-butene



3-Methyl-1-butene

**6.32** Draw and name the 17 hexene isomers,  $C_6H_{12}$ , including E, Z isomers.



**6.33** trans-2-Butene is more stable than cis-2-butene by only 4 KJ/mol, but trans-2, 2, 5, 5-tetramethyl-3-hexene is more stable than cis-2, 2, 5, 5-tetramethyl-3-hexene by 39 KJ/mol. Explain.

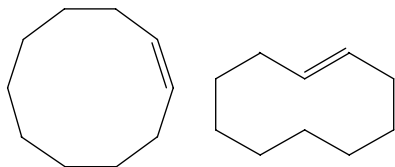
Alkene	$\Delta H^{\circ}_{\text{hydrog}}$	
	(KJ/mol)	(kcal/mol)
cis-2-butene	-119.7	-28.6
trans-2-Butene	-115.5	-27.6
cis-2, 2, 5, 5-tetramethyl-3-hexene	-151.5	-36.2
trans-2,2,5,5-tetramethyl-3-hexene	-112.6	-26.9

Solution: Between cis-2-butene and trans-2-Butene, the cis-2-butene has steric strain, so the trans-2-Butene is more stable. But the steric strain is not large, the difference between them is not very large. And the cis-2, 2, 5, 5-tetramethyl-3-hexene has large steric strain, so the

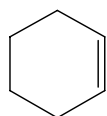
difference between cis-2, 2, 5, 5-tetramethyl-3-hexene and trans-2, 2, 5, 5-tetramethyl-3-hexene is larger.

**6.34** Cyclodecene can exist in both cis and trans forms, but cyclohexene cannot. Explain. (Making molecular models is helpful.)

Solution: the cyclodecene can be



But the cyclohexene can only be:



**6.35** Normally, a trans alkene is more stable than its cis isomer. trans-Cyclooctene, however, is less stable than cis-cyclooctene by 38.5 kJ/mol. Explain.

Build models of the two cyclooctenes and notice that the large amount of torsional strain in trans-cyclooctene relative to cis-cyclooctene. This strain causes the trans isomer to be of higher energy.

**6.36** Trans-Cyclooctene is less stable than cis-cyclooctene by 38.5 kJ/mol, but trans-cyclononene is less stable than cis-cyclononene by only 12.2 kJ/mol. Explain.

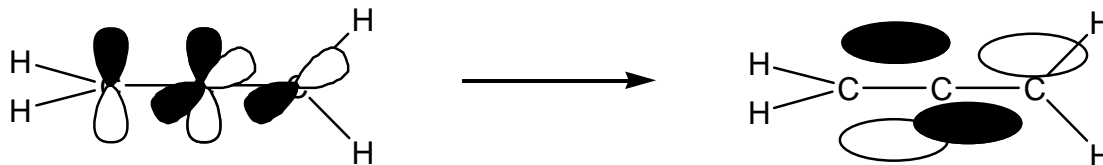
trans-Cyclononene has more carbon than trans-Cyclooctene, and the ring is bigger, so the steric strain is smaller.

**6.37** Allene (1,2-propadiene),  $\text{H}_2\text{C}=\text{C}=\text{CH}_2$ , has two adjacent double bonds. What kind of hybridization must the central carbon have? Sketch the bonding  $\pi$  orbitals in allene. What shape do you predict for allene.

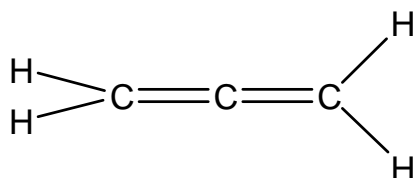
Solution:

The central carbon is  $sp$  hybridized.

The bonding  $\pi$  orbitals in allene is shown as follows:



The structure of allene is shown as follows:



**6.38** The heat of hydrogenation for allene (Problem 6.37) to yield propane is  $-298$  kJ/mol, and the heat



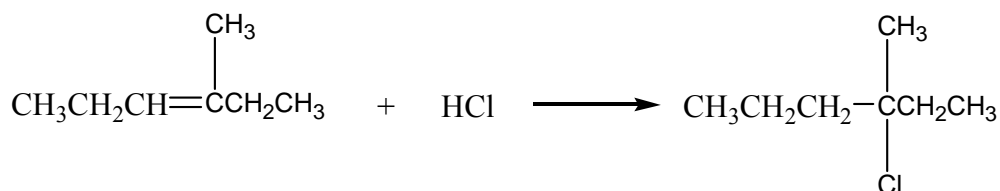
of hydrogenation for a typical monosubstituted alkene such as propene is  $-126\text{kJ/mol}$ . Is allene more or less stable than you might expect for diene? Explain.

Solution:

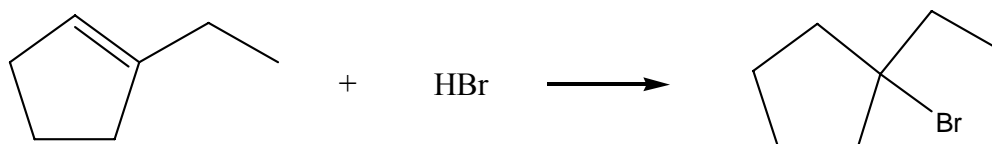
Less stable. Because allene give out more heat than diene in hydrogenation which means that it contains more energy.

**6.39** Predict the major product in each of the following reactions:

(a)

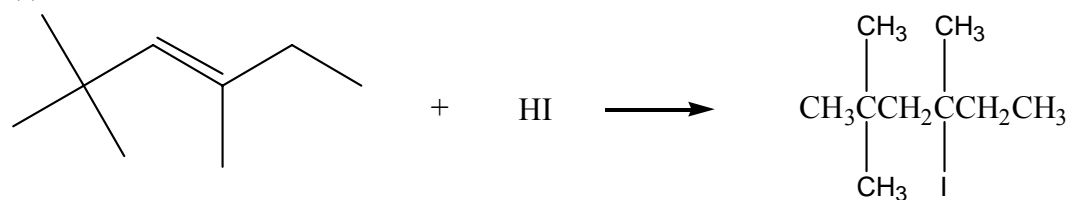


(b)



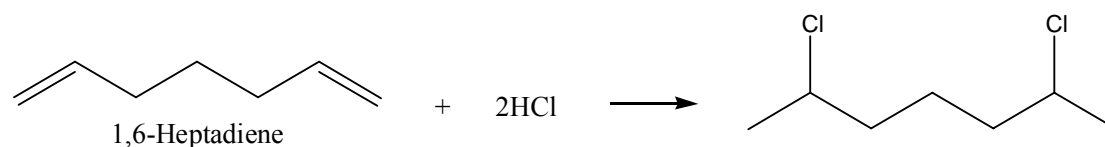
1-Ethylcyclopentene

(c)



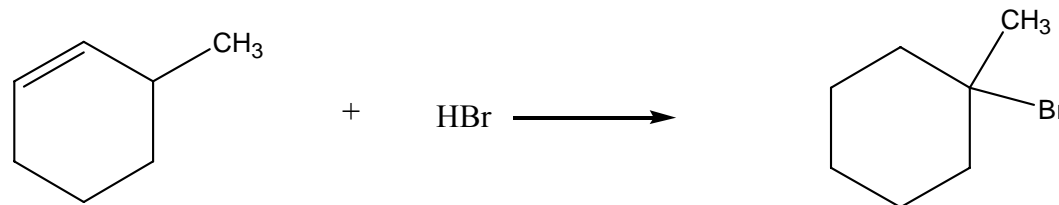
2,2,4-Trimethyl-3-hexene

(d)



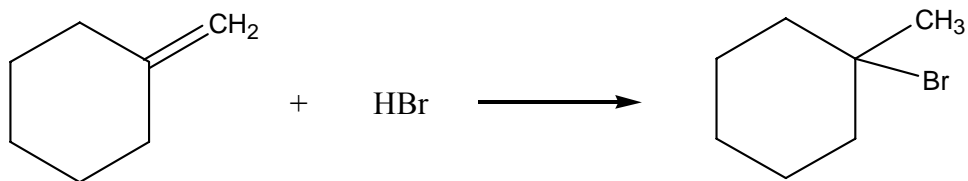
1,6-Heptadiene

(e)

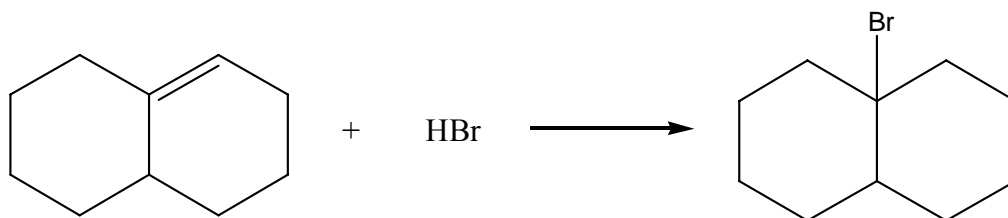


**6.40** Predict the major product from addition of HBr to each of following alkenes:

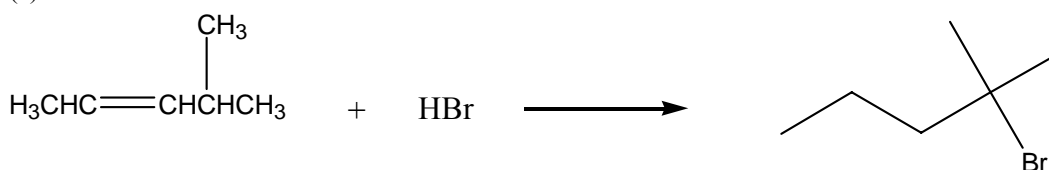
(a)



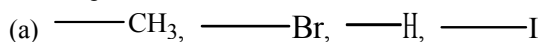
(b)



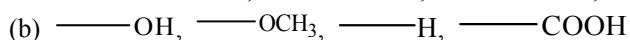
(c)



**6.41** Rank the following sets of substituents in order of priority according to the Cahn-Ingold-Prelog sequence rules:



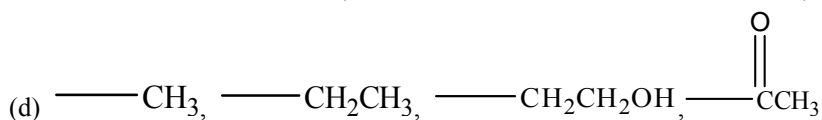
Solution: 1.  $\text{---I}$ , 2.  $\text{---Br}$ , 3.  $\text{---CH}_3$ , 4.  $\text{---H}$ .



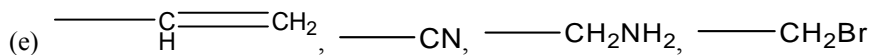
Solution: 1.  $\text{---OCH}_3$ , 2.  $\text{---OH}$ , 3.  $\text{---COOH}$ , 4.  $\text{---H}$ .



Solution: 1.  $\text{---CO}_2\text{CH}_3$ , 2.  $\text{---CO}_2\text{H}$ , 3.  $\text{---CH}_2\text{OH}$ , 4.  $\text{---CH}_3$ .



Solution: 1.  $\text{---C}(=\text{O})\text{CH}_3$ , 2.  $\text{---CH}_2\text{CH}_2\text{OH}$ , 3.  $\text{---CH}_2\text{CH}_3$ , 4.  $\text{---CH}_3$ .

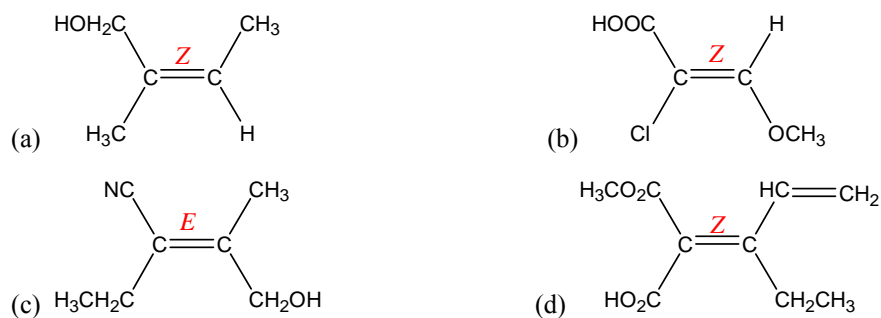


Solution: 1.  $\text{---CH}_2\text{Br}$ , 2.  $\text{---CN}$ , 3.  $\text{---CH}_2\text{NH}_2$ , 4.  $\text{---C}(=\text{CH}_2)\text{H}$ .

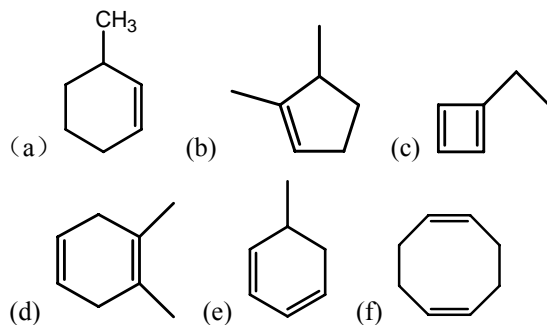


Solution: 1.  $\text{---CH}_2\text{OCH}_3$ , 2.  $\text{---CH}_2\text{OH}$ , 3.  $\text{---C}(=\text{CH}_2)\text{H}$ , 4.  $\text{---CH}_2\text{CH}_3$ .

**6.42** Assign *E* or *Z* configuration to each of the following alkenes:



**6.43** Name the following cycloalkenes:



Solution: (a) 3-Methyl-1-cyclohexene

(b) 2,3-Dimethyl-1-cyclopentene

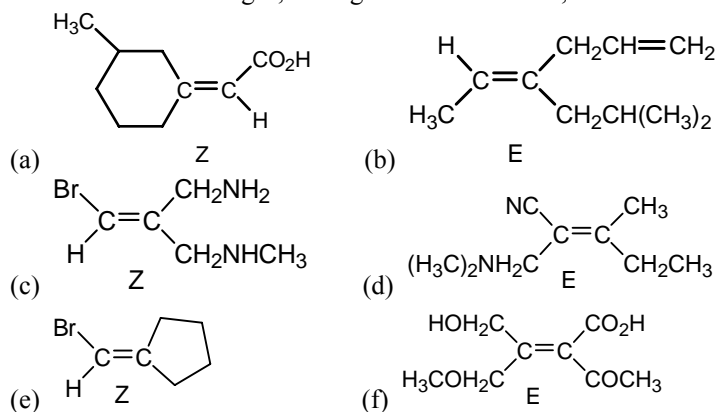
(c) 1-Ethyl-1,3-cyclobutadiene

(d) 1,2-Dimethyl-1,4-cyclohexadiene

(e) 5-Methyl-1,3-cyclohexadiene

(g) 1,5- cyclooctadiene

**6.44** Which of the following E,Z designations are correct, and which are incorrect?



Solution: (a) correct

(b) Correct

(c) incorrect, it should be E

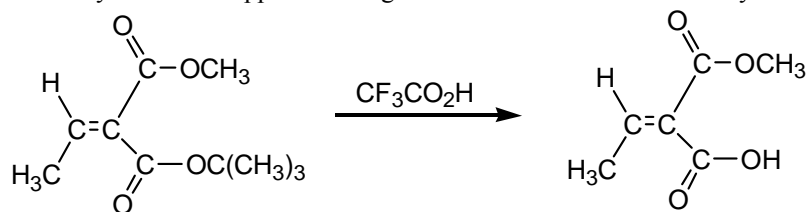
(d) correct

(e) Doesn't show E / Z isomerism.

(f) correct

**6.45** tert-Butyl esters  $[\text{RCO}_2\text{C}(\text{CH}_3)_3]$  are converted into carboxylic acids ( $\text{RCO}_2\text{H}$ ) by reaction with

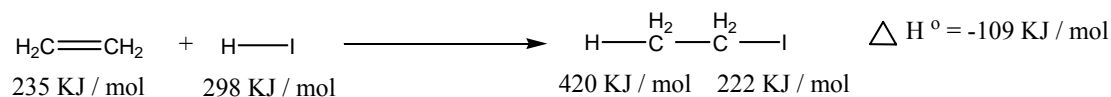
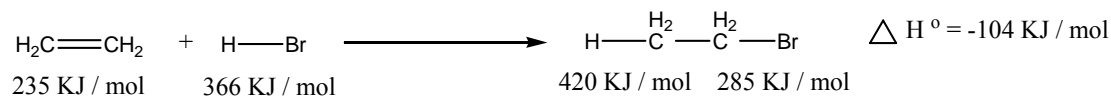
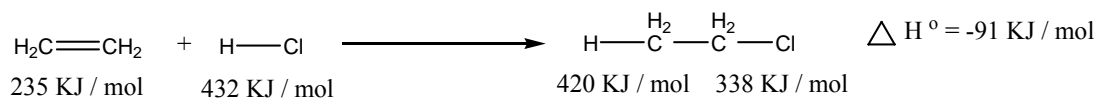
trifluoroacetic acid, a reaction useful in protein synthesis (see Section 26.10). Assign E,Z designation to the double bonds of both reactant and product in the following scheme, and explain why there is an apparent change of double-bond stereochemistry:



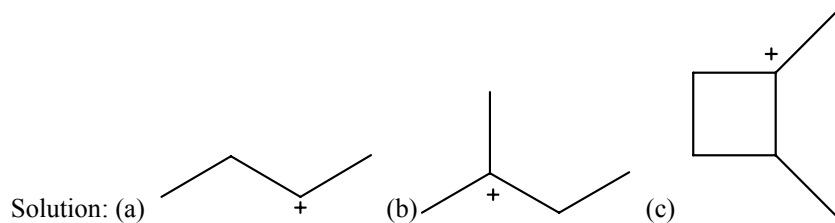
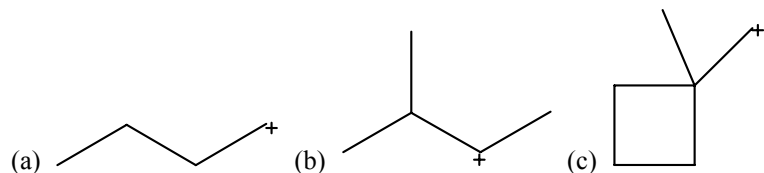
Solution: The reactant is Z designation, while the product is E designation. Because  $\text{—C(=O)OC(CH}_3\text{)}_3$

receives higher priority than  $\text{—C(=O)OCH}_3$ , while  $\text{—C(=O)OCH}_3$  receives higher priority than  $\text{—C(=O)OH}$ , and in the reaction  $\text{—C(=O)OH}$  substitute for  $\text{—C(=O)OC(CH}_3\text{)}_3$ .

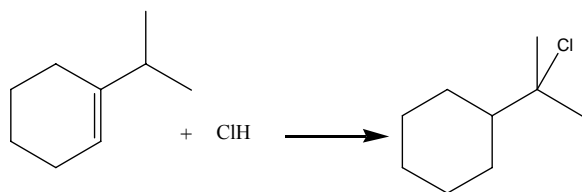
**6.46** Use the bond dissociation energies in Table 5.4 to calculate  $\Delta H^\circ$  for the reaction of ethylene with HCl, HBr, and HI. Which reaction is most favorable?



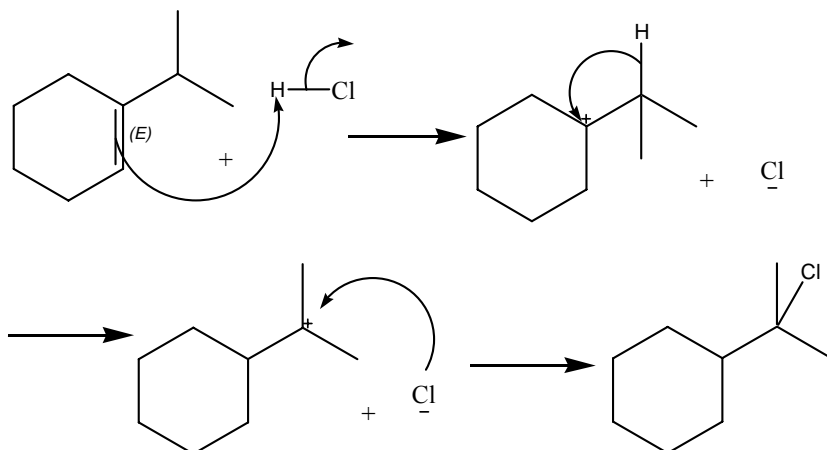
**6.47:** Each of the following carbonocations can rearrange to a more stable ion. Propose structure for the likely rearranges for the likely rearrangement product.



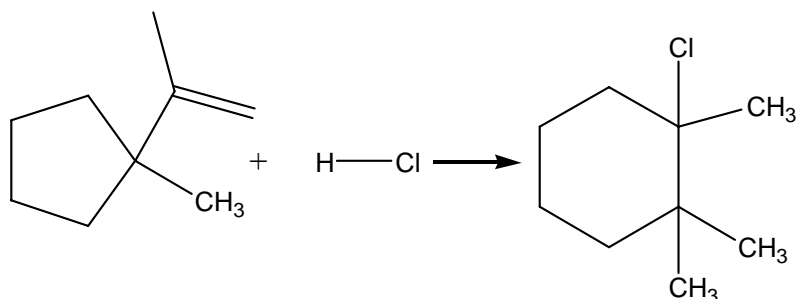
**6.48** Addition of HCl to 1-isopropyl-cyclohexene yields a rearranged product. Propose a mechanism, showing the structures of the intermediates and using curved arrows to indicate electron flow in each step.



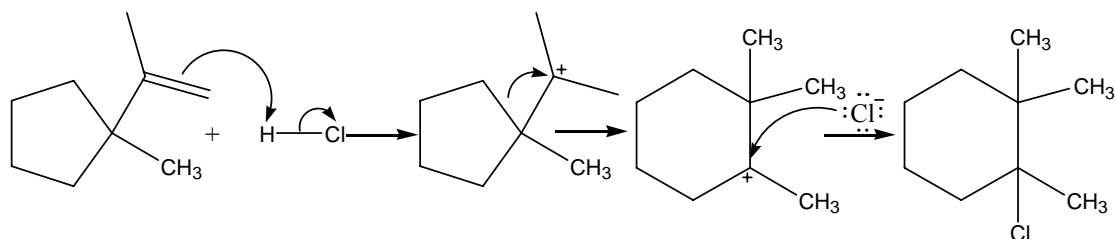
Solution:



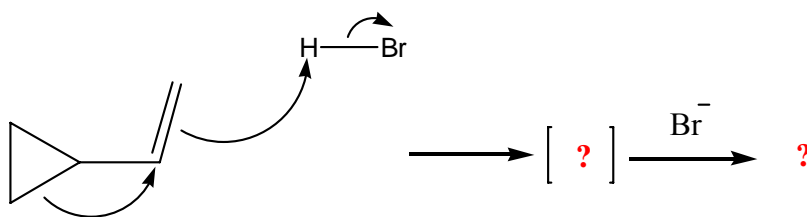
**6.49** Addition of HCl to 1-isopropenyl-1-methylcyclopentane yields 1-chloro-1, 2, 2-trimethylcyclohexane. Propose a mechanism, showing the structures of the intermediates and using curved arrows to indicate electron flow in each step.



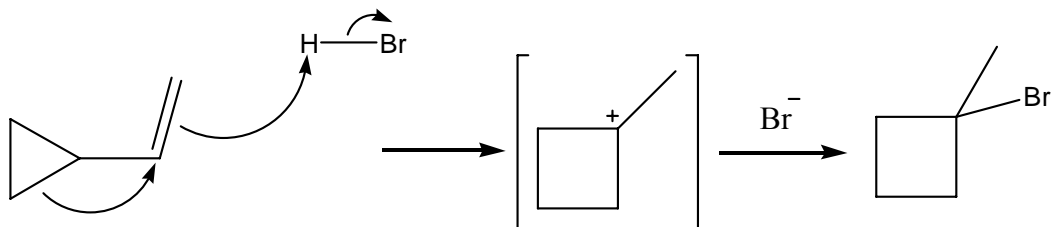
Solution:



**6.50** Vinylcyclopropane reacts with HBr to yield a rearranged alkyl bromide. Follow the flow of electrons as represented by the curved arrows, show the structure of the carbocation intermediate in brackets, and show the structure of the final product.



Solution:



**6.51:** Calculate the degree of unsaturation in each of the following formulas.

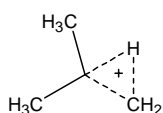
Solution:

- (a)  $C_{27}H_{46}O$      $D=5$
- (b)  $C_{14}H_9Cl_5$      $D=8$
- (c)  $C_{20}H_{34}O_5$      $D=4$
- (d)  $C_8H_{10}N_4O_2$      $D=6$
- (e)  $C_{21}H_{28}O_5$      $D=8$
- (f)  $C_{17}H_{23}NO_3$      $D=7$

**6.52:** Is the rearrangement exergonic or endergonic? Draw the transition state.

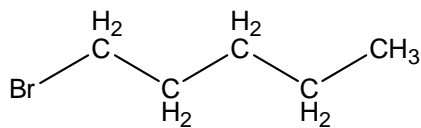
Solution: It is a exergonic.

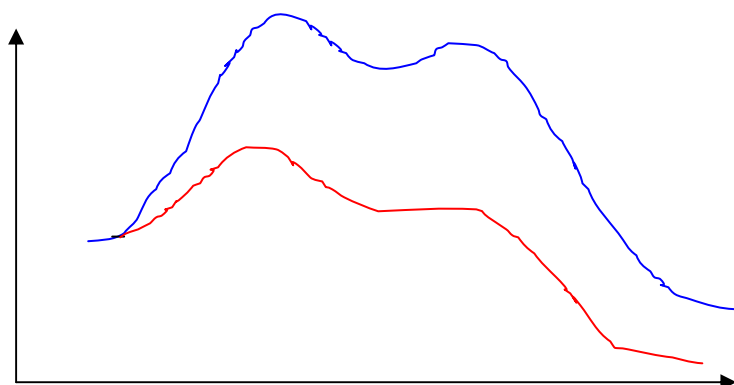
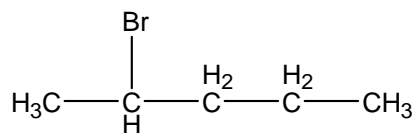
State



**6.53** Draw a reaction energy diagram for the addition of HBr to 1-pentene. Let one curve on your diagram show the formation of 1-bromopentane product and another curve on the same diagram show the formation of 2-bromopentane product. Label the positions for all reactants, intermediates, and products. Which curve has higher-energy carbocation intermediate? Which curve has the higher-energy first transition state?

Solution:





The vertical axis presents energy, and the horizontal one shows the progress of the reaction.

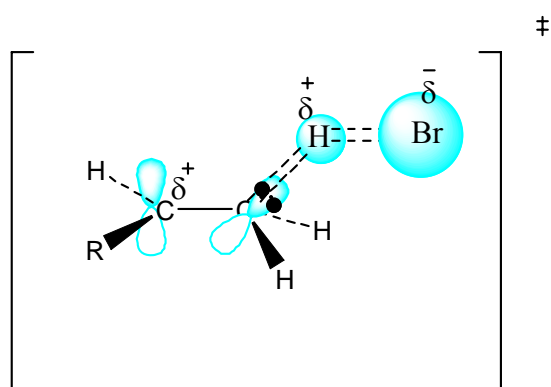
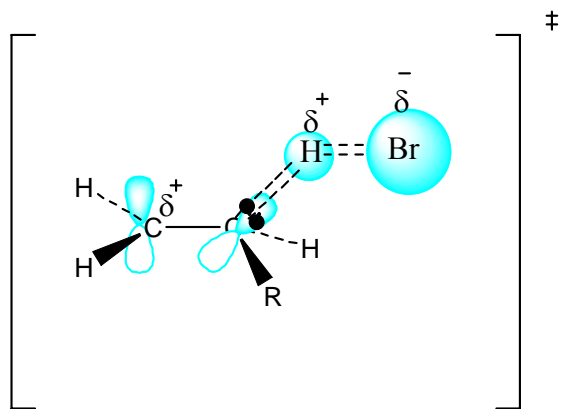
The red one stands for 2-bromopentane, and the blue one stands for 1-bromopentane.

The blue one has higher-energy carbocation intermediate and the higher-energy first transition state.

**6.54** Make sketches of the transition state structures involved in the reaction of HBr with 1-pentene (Problem 6.53). Tell whether each structure resembles reactant or product.

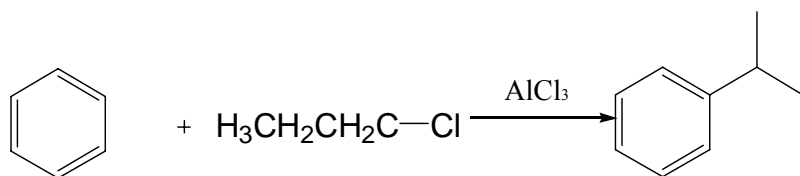
Solution:

The first one is for forming 1-bromopentane, and the second one is for forming 2-bromopentane.



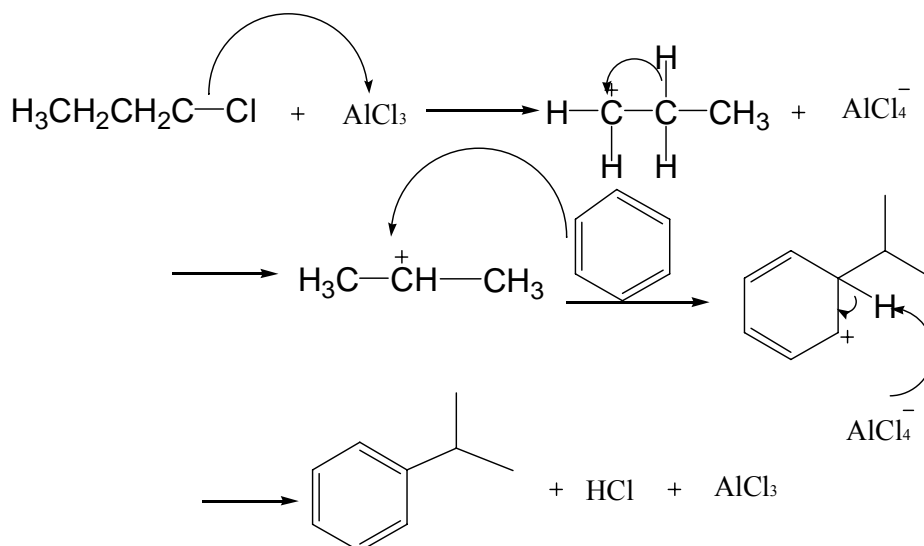
Each structure resembles carbocation.

**6.55** Aromatic compounds such as benzene react with alkyl chlorides in the presence of  $\text{AlCl}_3$  catalyst to yield alkylbenzenes. The reaction occurs through a carbocation intermediate, formed by reaction of the alkyl chloride with  $\text{AlCl}_3$  ( $\text{R}-\text{Cl} + \text{AlCl}_3 \longrightarrow \text{R}^+ + \text{AlCl}_4^-$ ). How can you explain the observation that reaction of benzene with 1-chloropropane yields isopropylbenzene as the major product?

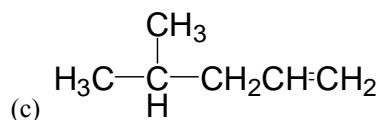
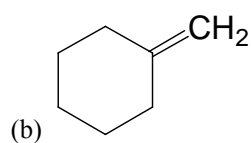
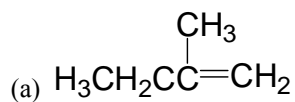


Solution:

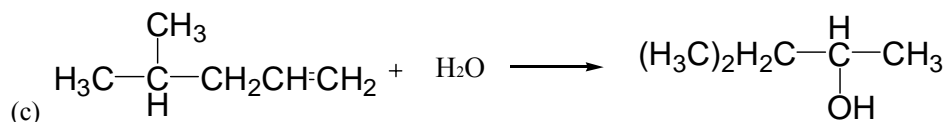
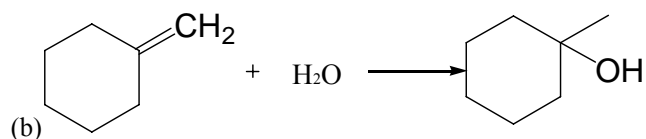
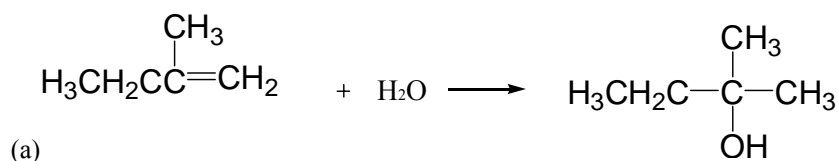




**6.56** Alkenes can be converted into alcohols by acid-catalyzed addition of water. Assuming that Markonikov's rule is valid, predict the major product from each of the following alkenes.



Solution:



**6.57** Reaction of 2,3-dimethyl-1-butene with HBr leads to an alkyl bromide  $\text{C}_6\text{H}_{13}\text{Br}$ . On treatment of this alkyl bromide with KOH in methanol, elimination of HBr occurs and a hydrocarbon that is isomeric with the starting alkene is formed. What is the structure of this hydrocarbon, and how do

you think is formed from the alkyl bromide?

