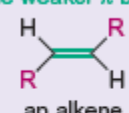


Alkenes and alkynes: electrophilic addition and pericyclic reactions

21.1 Structure and reactivity of alkenes and alkynes

One strong σ bond and one weaker π bond

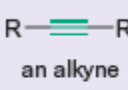
The most stable isomer has the largest groups on the opposite sides of the C=C bond



an alkene


The greater the number of R groups, the more stable the C=C bond

One strong σ bond and two weaker π bonds



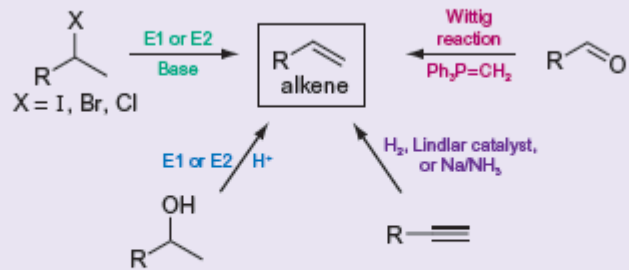
an alkyne

- C=C and C≡C bonds react with electrophiles in electrophilic addition reactions.



21.2 Preparation of alkenes and alkynes

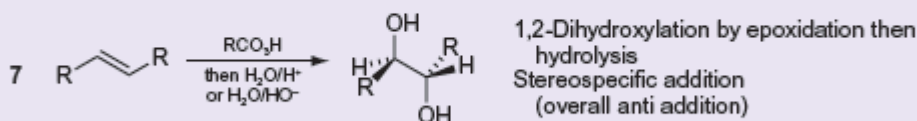
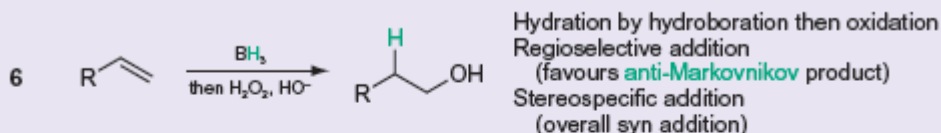
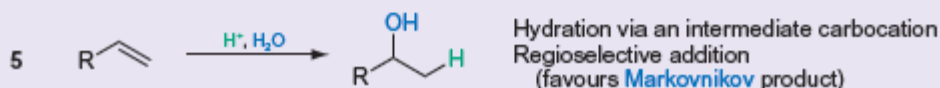
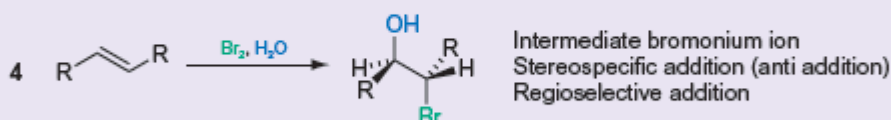
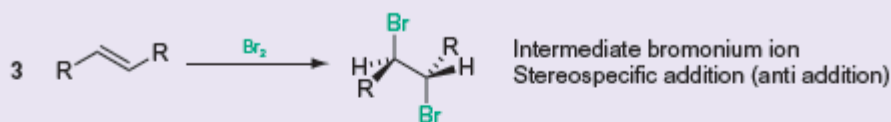
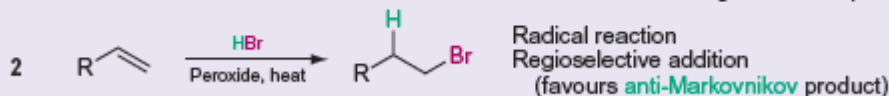
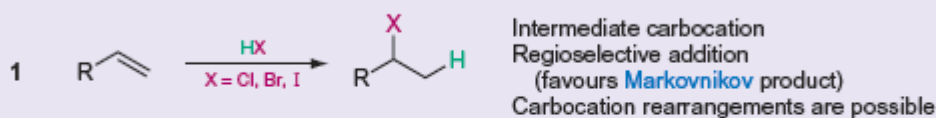
- Alkenes are prepared from halogenoalkanes, alcohols, alkynes, and aldehydes/ketones.



- Alkynes are prepared from 1,2-dibromoalkanes.
- Substituted alkynes are prepared by alkylation of alkynyl anions with halogenoalkanes.

21.3 Electrophilic addition reactions of alkenes

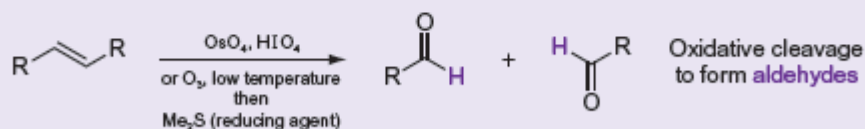
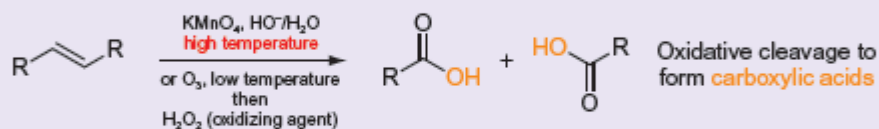
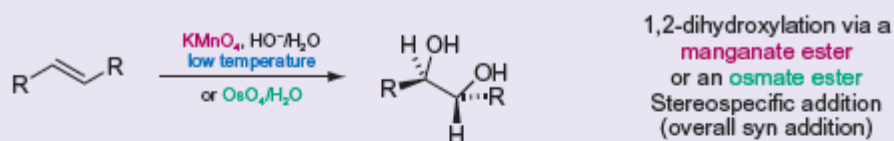
Seven important addition reactions involving alkenes.



For practice questions on these topics, see questions 1, 2, and 6 at the end of this chapter (pp.1000-1001).

21.4 Pericyclic reactions of alkenes

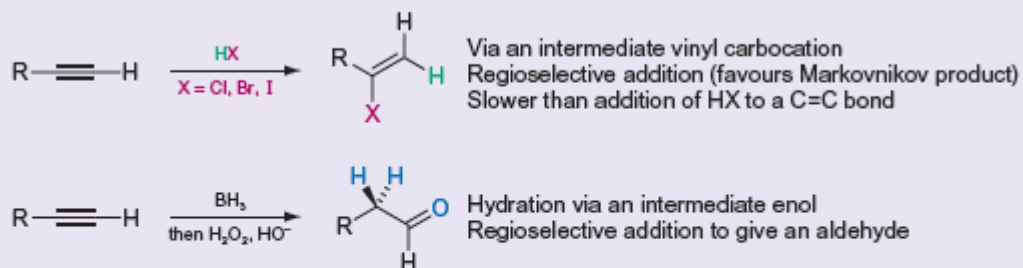
Important pericyclic reactions involving alkenes:



For practice questions on these topics, see questions 2 and 3 at the end of this chapter (pp.999-1000).

21.5 Electrophilic addition reactions of alkynes

Two important electrophilic addition reactions of alkynes:



- $\text{HC}\equiv\text{CH}$ and $\text{RC}\equiv\text{CH}$ react with strong bases to form alkynylmetal reagents (e.g. $\text{HC}\equiv\text{C}^- \text{Na}^+$), which can act as nucleophiles.

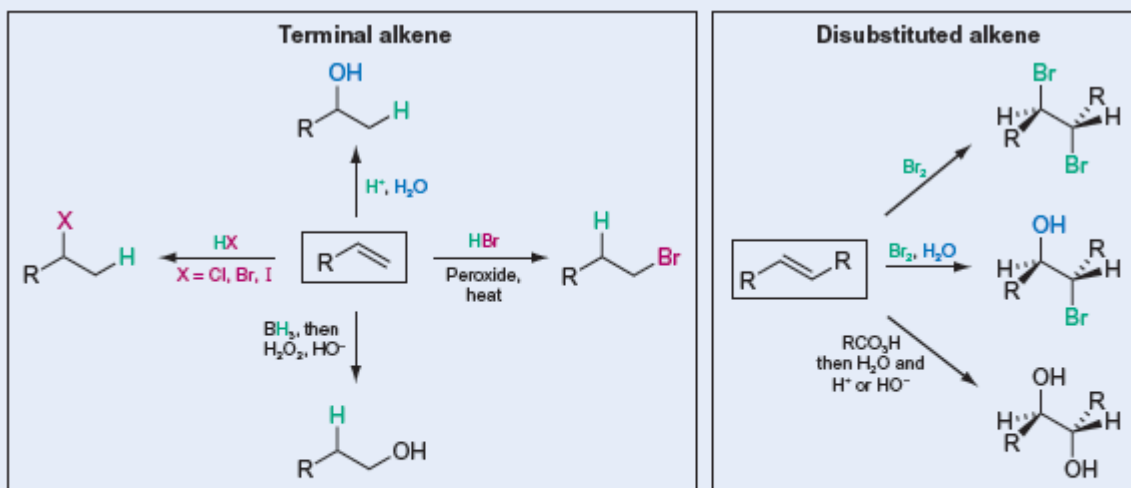


For a practice question on this topic, see question 4 at the end of this chapter (p.1000).

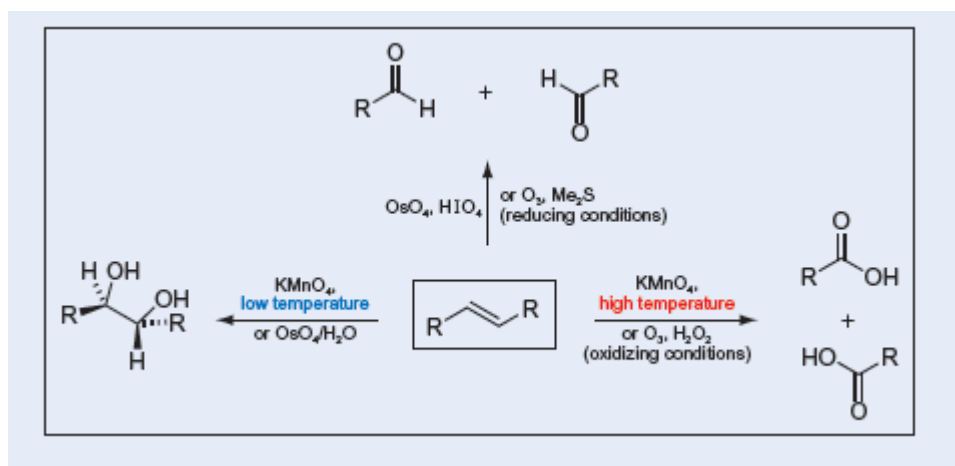
» Concept review

By the end of this chapter, you should be able to do the following.

- Describe how alkenes are prepared from halogenoalkanes, alcohols, alkynes, and aldehydes/ketones.
- Describe how alkynes are prepared from 1,2-dibromoalkanes and how substituted alkynes are prepared by alkylation of alkynyl anions ($\text{RC}\equiv\text{C}^-$) with halogenoalkanes.
- Understand how C=C and C≡C bonds react in electrophilic addition reactions.
- Write reaction mechanisms to explain how C=C bonds undergo the addition reactions shown below.



- Write reaction mechanisms to explain how C=C bonds undergo the pericyclic reactions shown below.



- Write reaction mechanisms to explain how C=C bonds undergo the addition reactions shown below.

