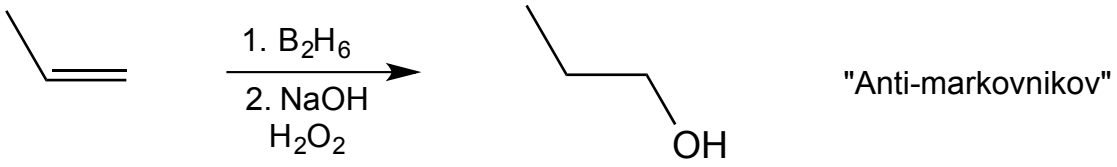
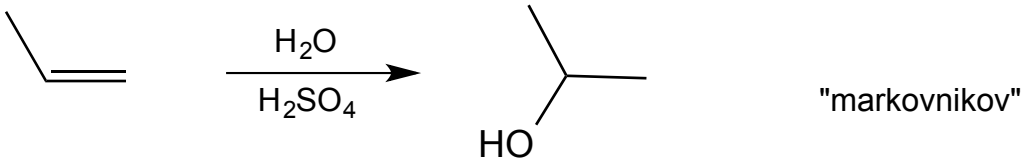
Review

Hydration of Alkenes:

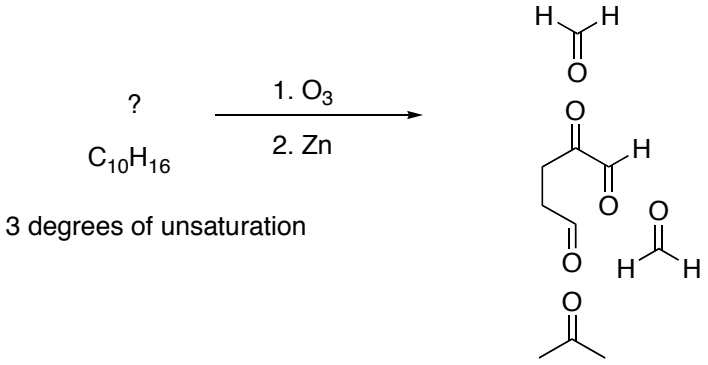
- Two different kinds of reactions, hydroboration/oxidation and hydration under acidic conditions, on the same starting material yield respectively 1-propanol ("anti-Markovnikov") or 2-propanol ("Markovnikov").



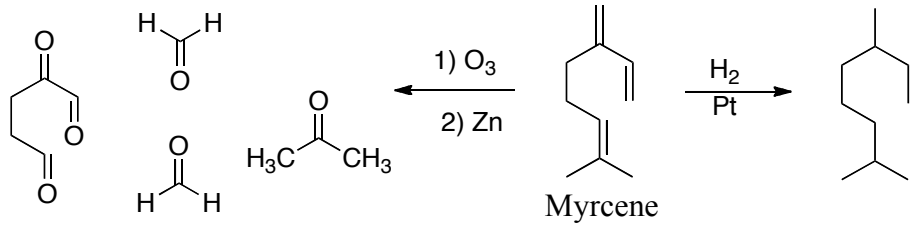


Practice question:

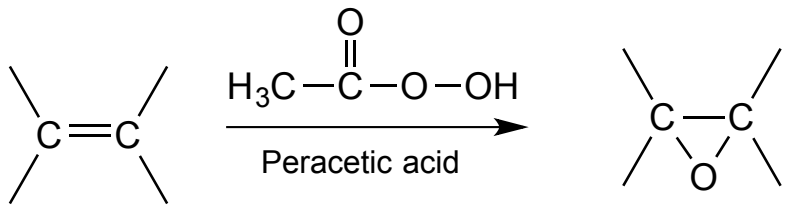
- What is a possible structure for the starting material below ($C_{10}H_{16}$)?
- Are there other isomers that will give the same products for ozonolysis followed by Zn treatment?



Answer:



Epoxidation – Oxirane Formation

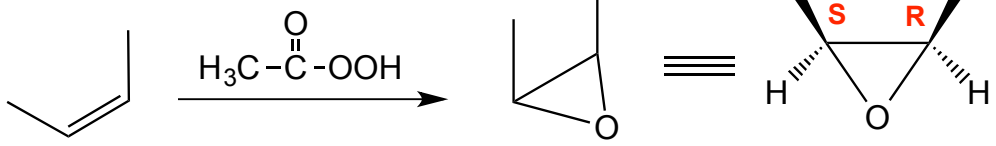


SYN addition

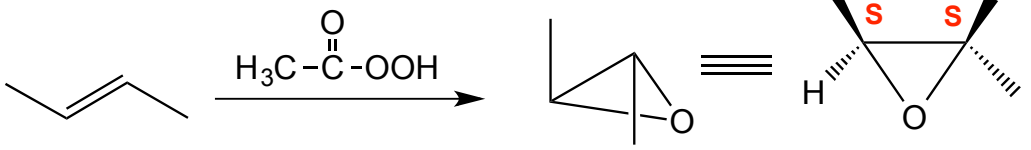
- Concerted reaction: all bonds break and form at the same time

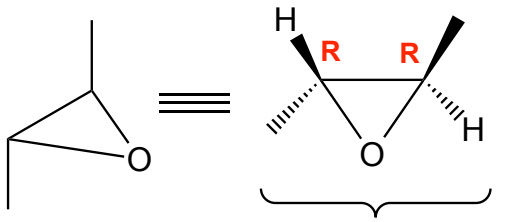
Example 1:

Cis-2-butene



Trans-2-butene



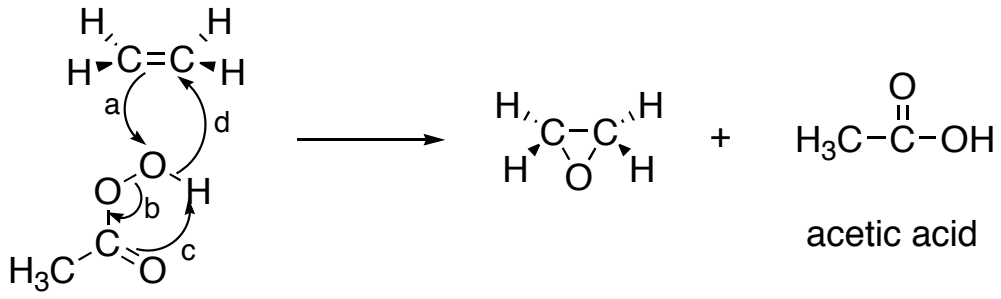


Enantiomers
(1:1) Racemic mixture

Cis-2-butene product: a meso compound
Trans-2-butene product: a racemate

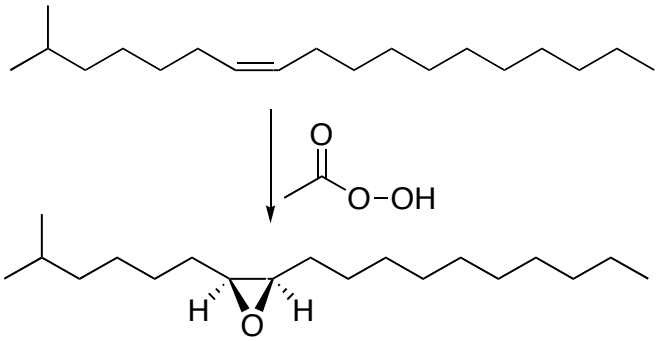
Achiral substrates often yield racemic mixtures of chiral products. There is an equal chance of adding to the top face or the bottom face of the trans-2-butene.

Mechanism:



Peracetic acid (epoxidizing reagent) is NOT the same as acetic acid (product of this reaction; also a component of vinegar).

Example 2:

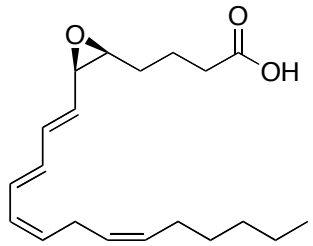


- Done by Adolf Butenandt

Gypsy moth sex pheromone

- Pheromones (pherein horman – to carry excitement)
- Chemical messengers

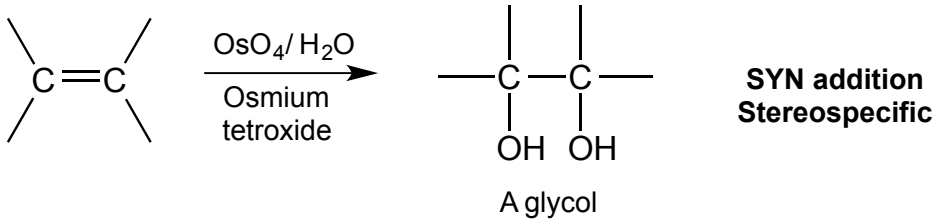
Example 3:

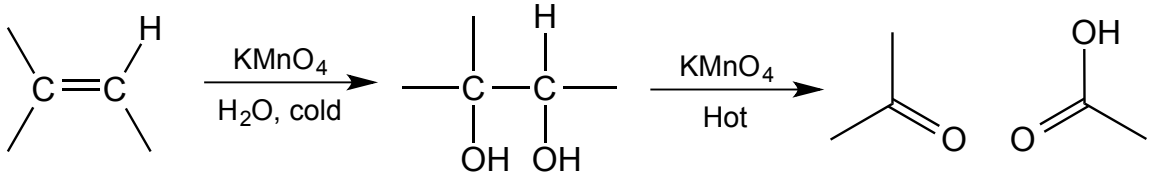


Leukotriene A4 -
- substance (chemical messenger) that mediates anaphylaxis (allergic reaction, asthma)

Dihydroxylation of Alkenes:

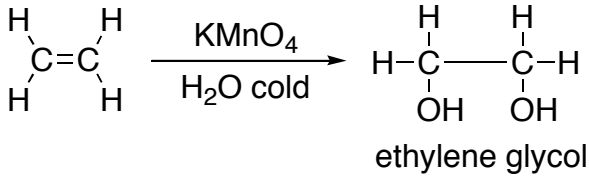
This is a stereospecific reaction (syn addition).



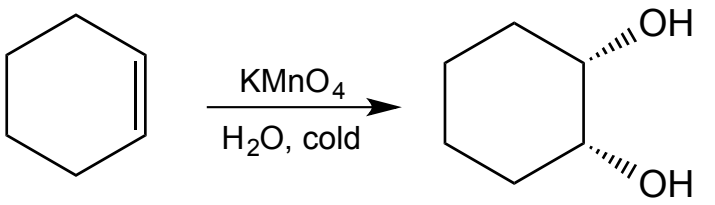


$KMnO_4$ = Potassium permanganate, strong purple solution in water

Example 1:

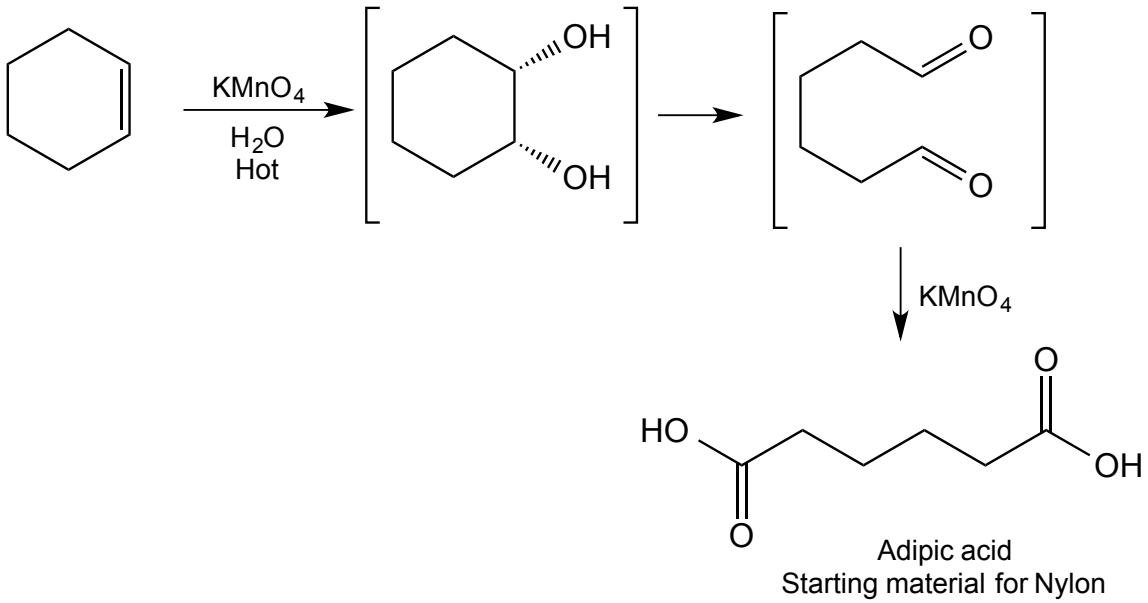


Example 2:



Cyclohexane-1,2-diol

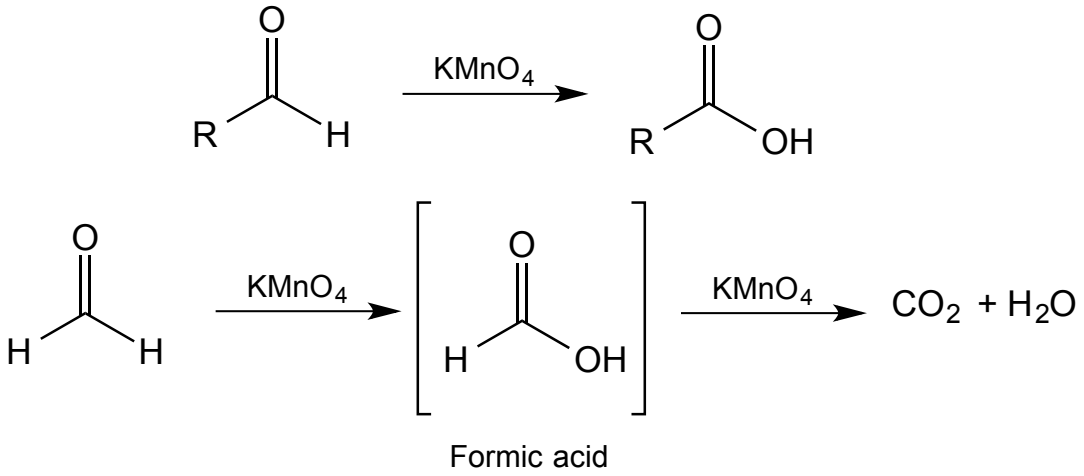
Example 3:



Adipic acid
Starting material for Nylon

Hot potassium permanganate will not stop oxidation at the diol. It can break C-C bonds to form the corresponding carboxylic acids from the original alkene.

In $KMnO_4$ aldehydes get oxidized to carboxylic acids, and formaldehyde to H_2O/CO_2



Example 4: