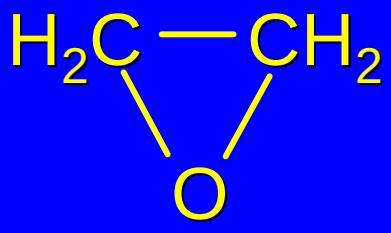
# 6.18
# Epoxidation of Alkenes

# *Epoxides*

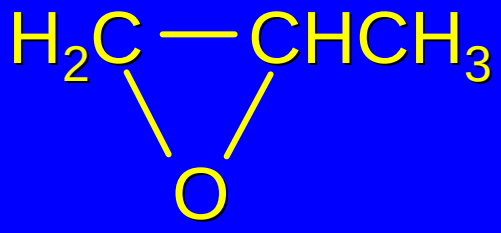
are examples of heterocyclic compounds

three-membered rings that contain oxygen

ethylene oxide




propylene oxide

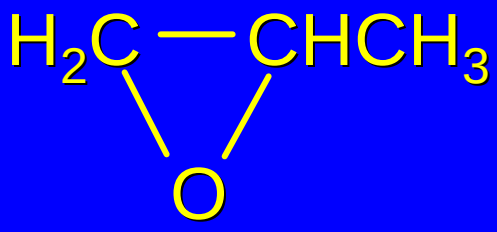


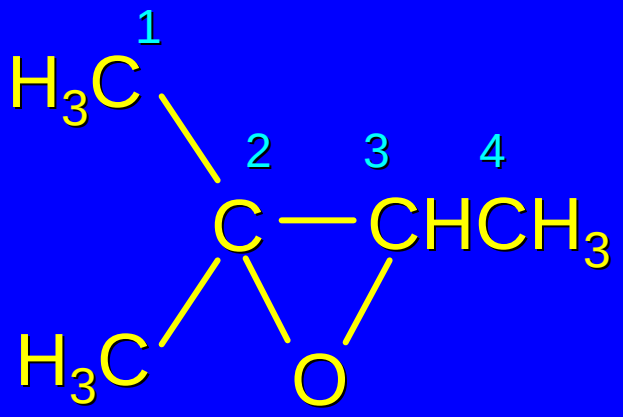
# *Epoxide Nomenclature*

Substitutive nomenclature: named as epoxy-substituted alkanes.

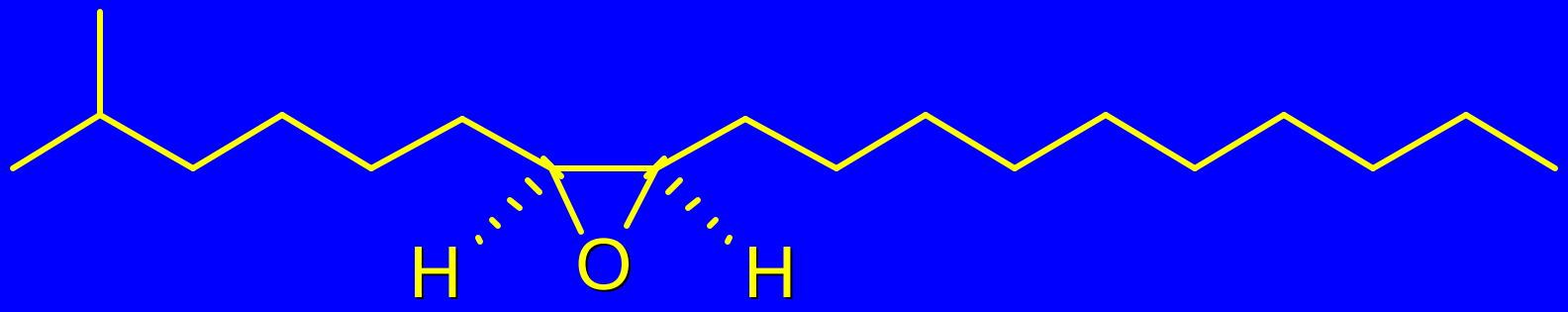
"epoxy" precedes name of alkane

1,2-epoxypropane 2-methyl-2,3-epoxybutane



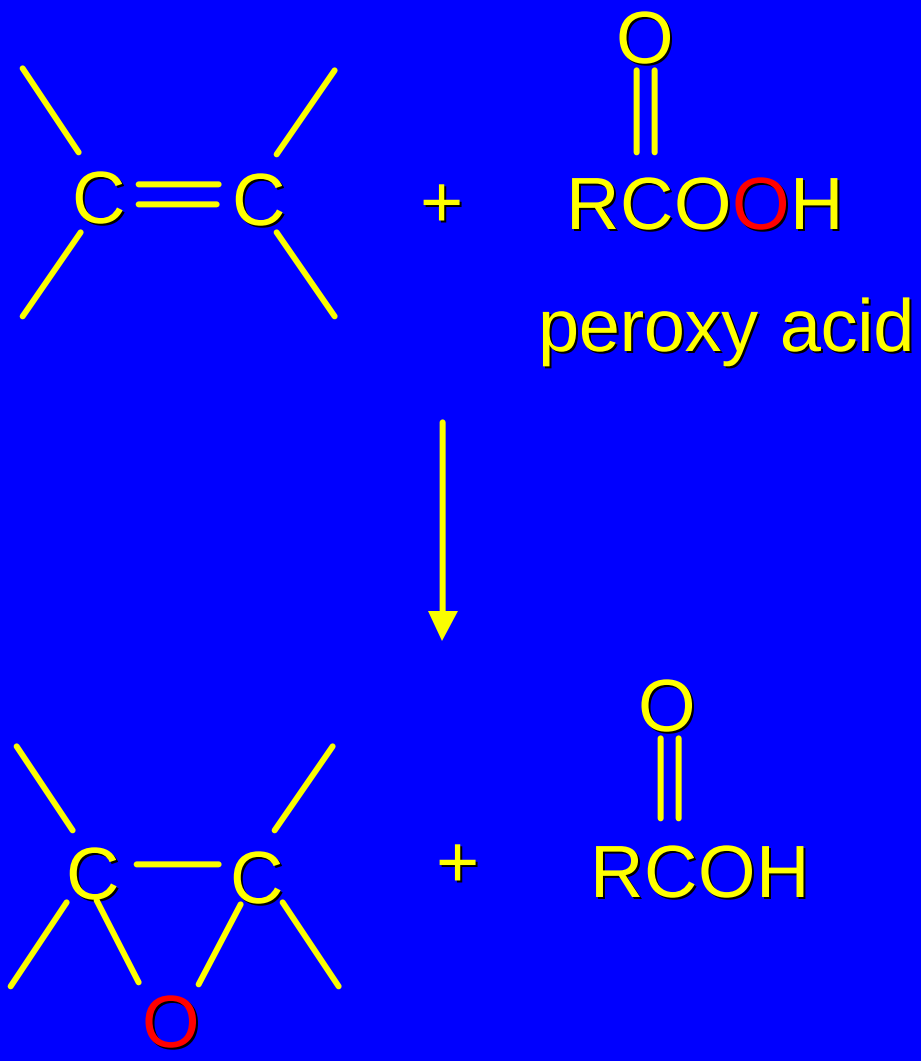



Problem 6.17 Give the IUPAC name, including stereochemistry, for disparlure.

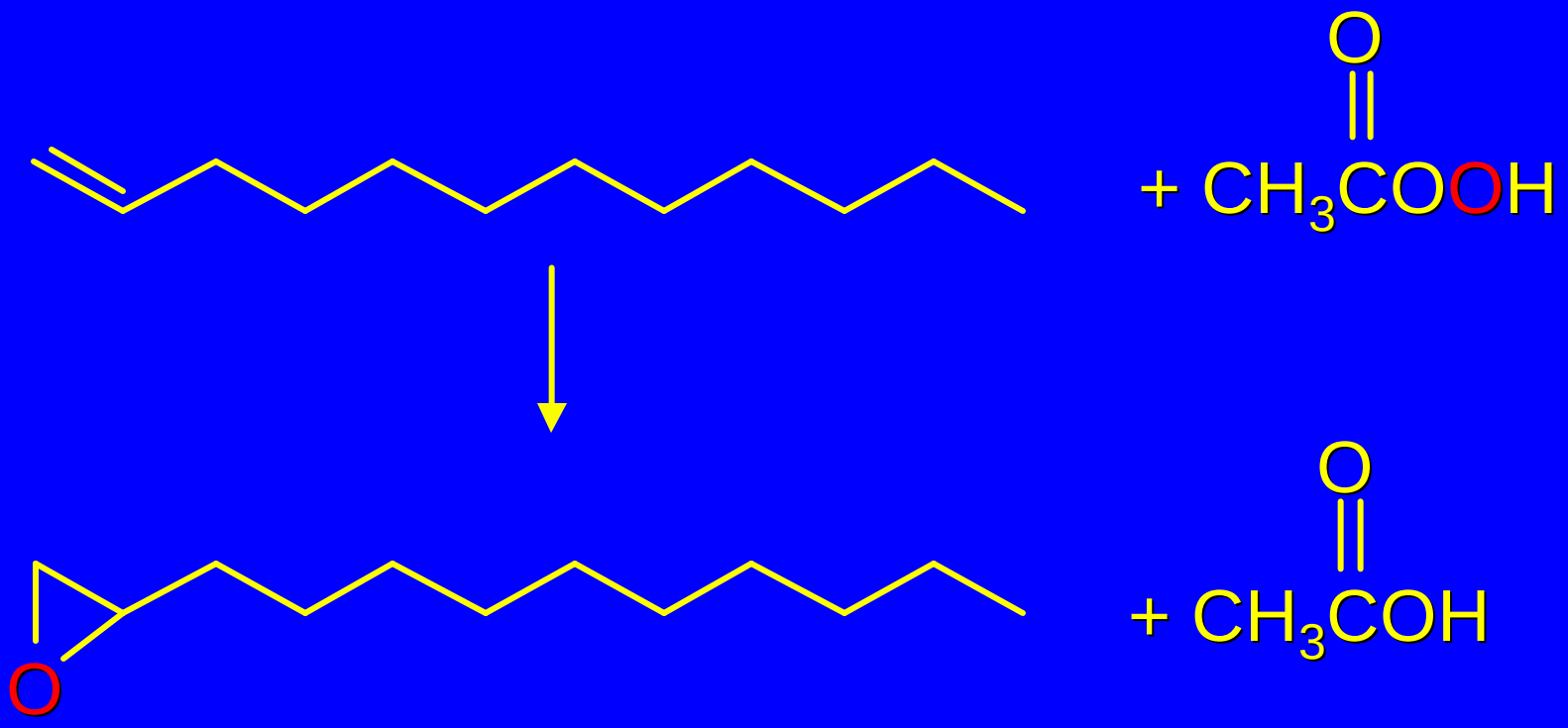



*cis*-2-Methyl-7,8-epoxyoctadecane

# *Epoxidation of Alkenes*

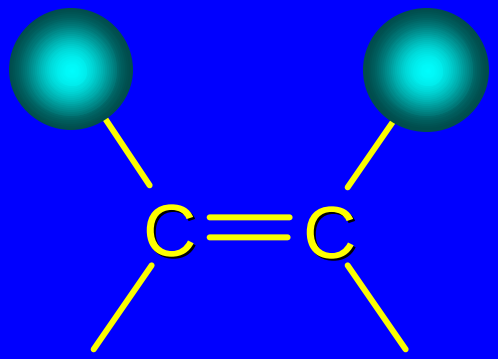


*Example*



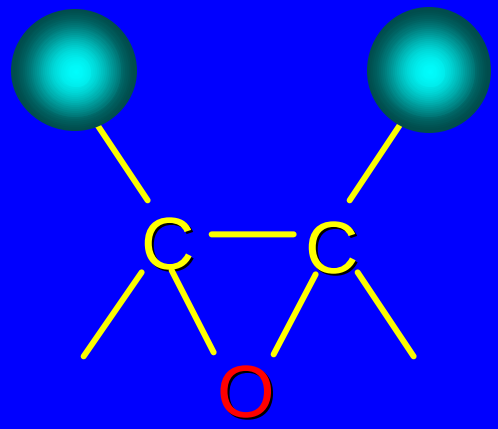

(52%)

# *Stereochemistry of Epoxidation*



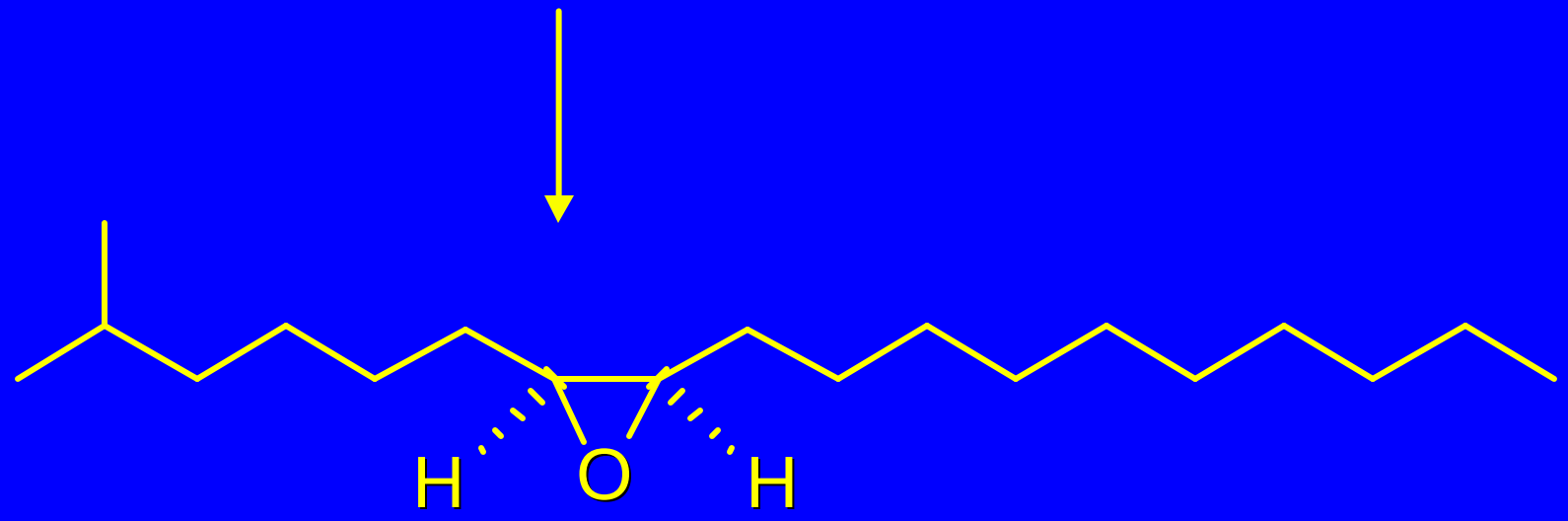

\+ RCO**O**H

syn addition




\+ RCOH

Problem 6.18 Give the structure of the alkene, including stereochemistry, that you would choose as the starting material in a preparation of synthetic disparlure.



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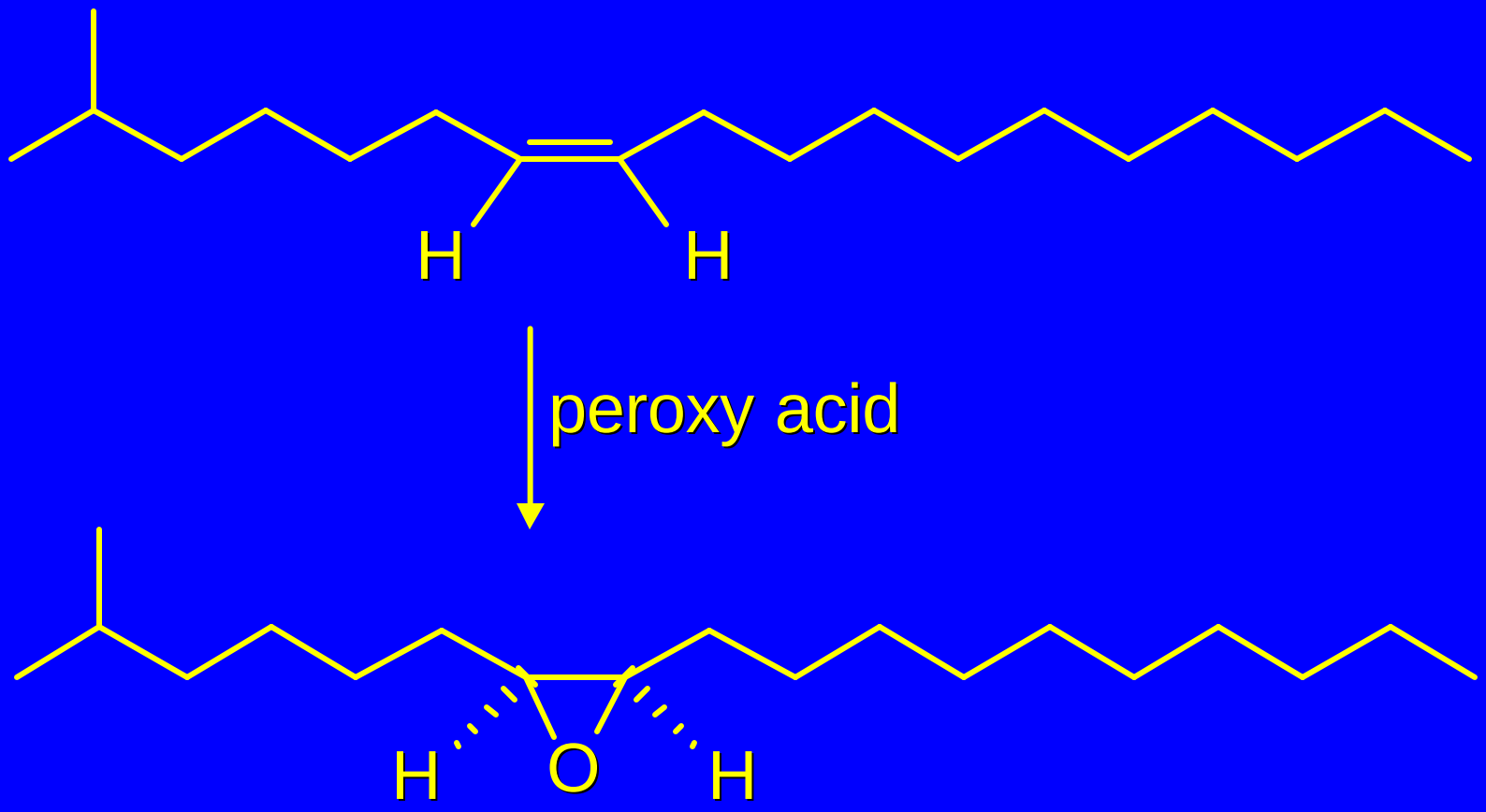
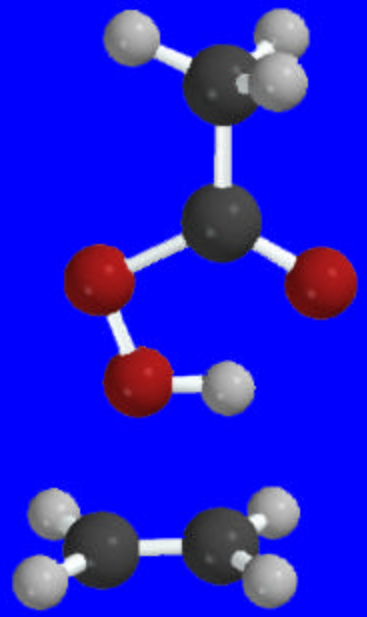


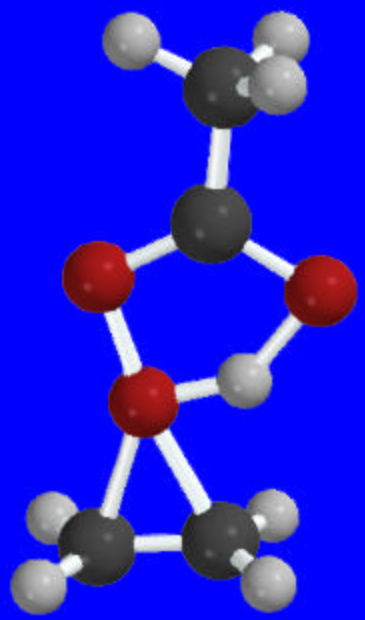
## *Relative Rates of Epoxidation*

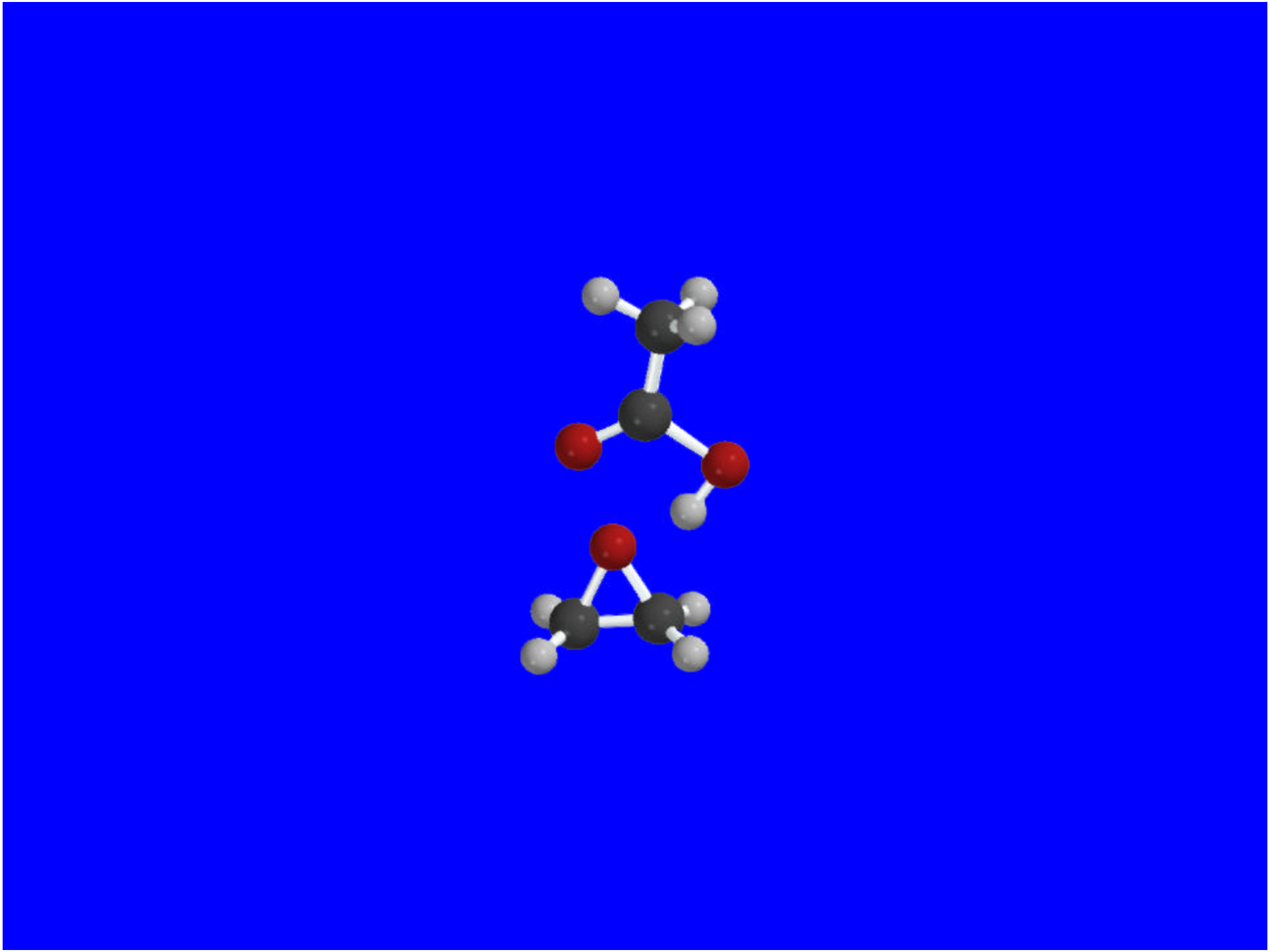
| | | |
|---|---|---|
| ethylene | $H_2C=CH_2$ | 1 |
| propene | $CH_3CH=CH_2$ | 22 |
| 2-methylpropene | $(CH_3)_2C=CH_2$ | 484 |
| 2-methyl-2-butene | $(CH_3)_2C=CHCH_3$ | 6526 |

More highly substituted double bonds react faster. Alkyl groups on the double bond make it more “electron rich.”

# *Mechanism of Epoxidation*







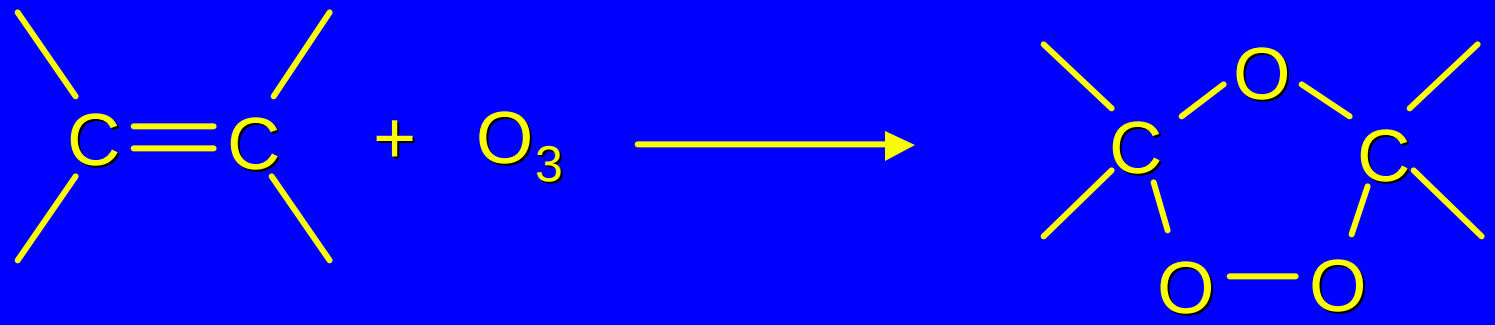
# 6.19
# Ozonolysis of Alkenes

Ozonolysis has both synthetic and analytical applications.

- synthesis of aldehydes and ketones
- identification of substituents on the double bond of an alkene

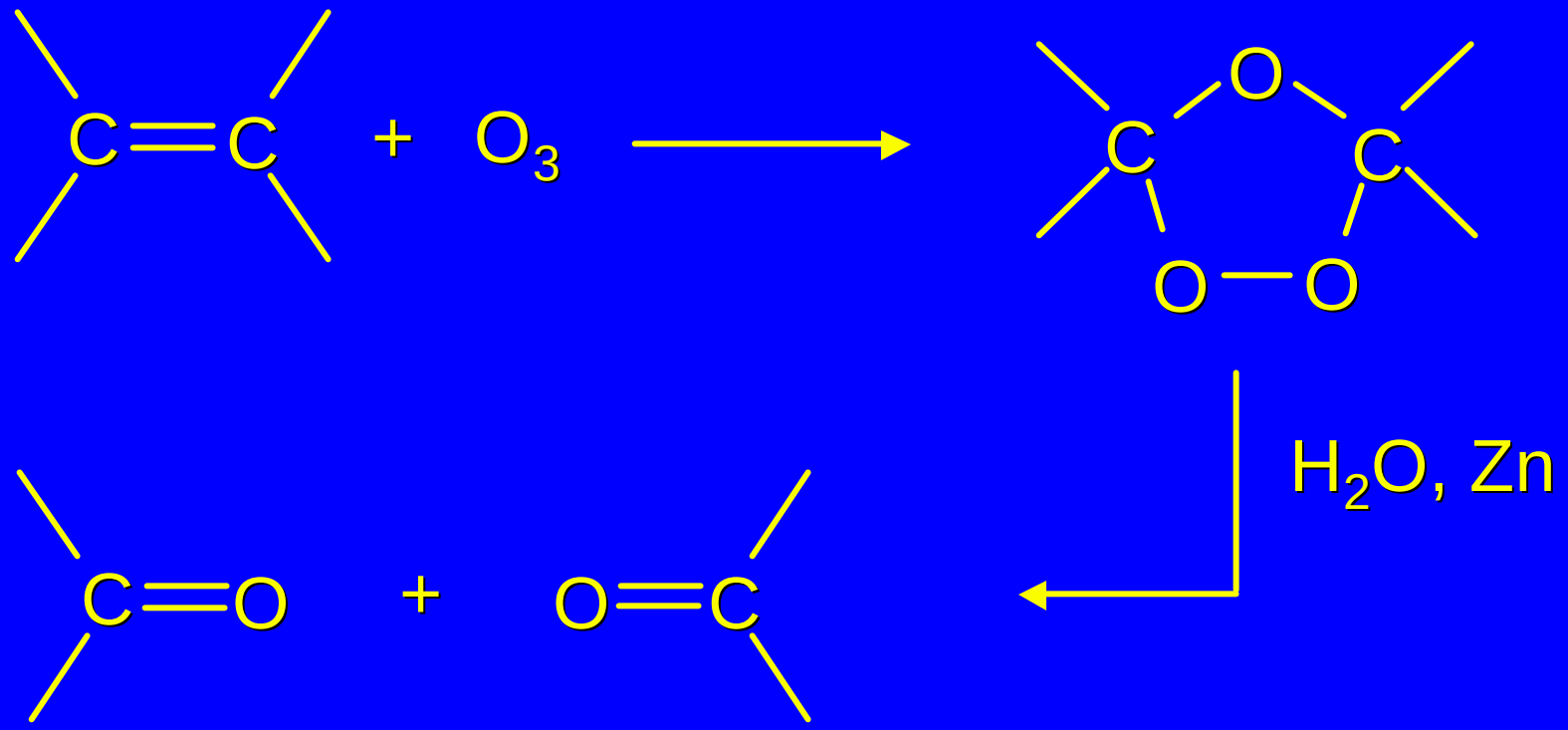
# *Ozonolysis of Alkenes*

First step is the reaction of the alkene with ozone. The product is an *ozonide.*



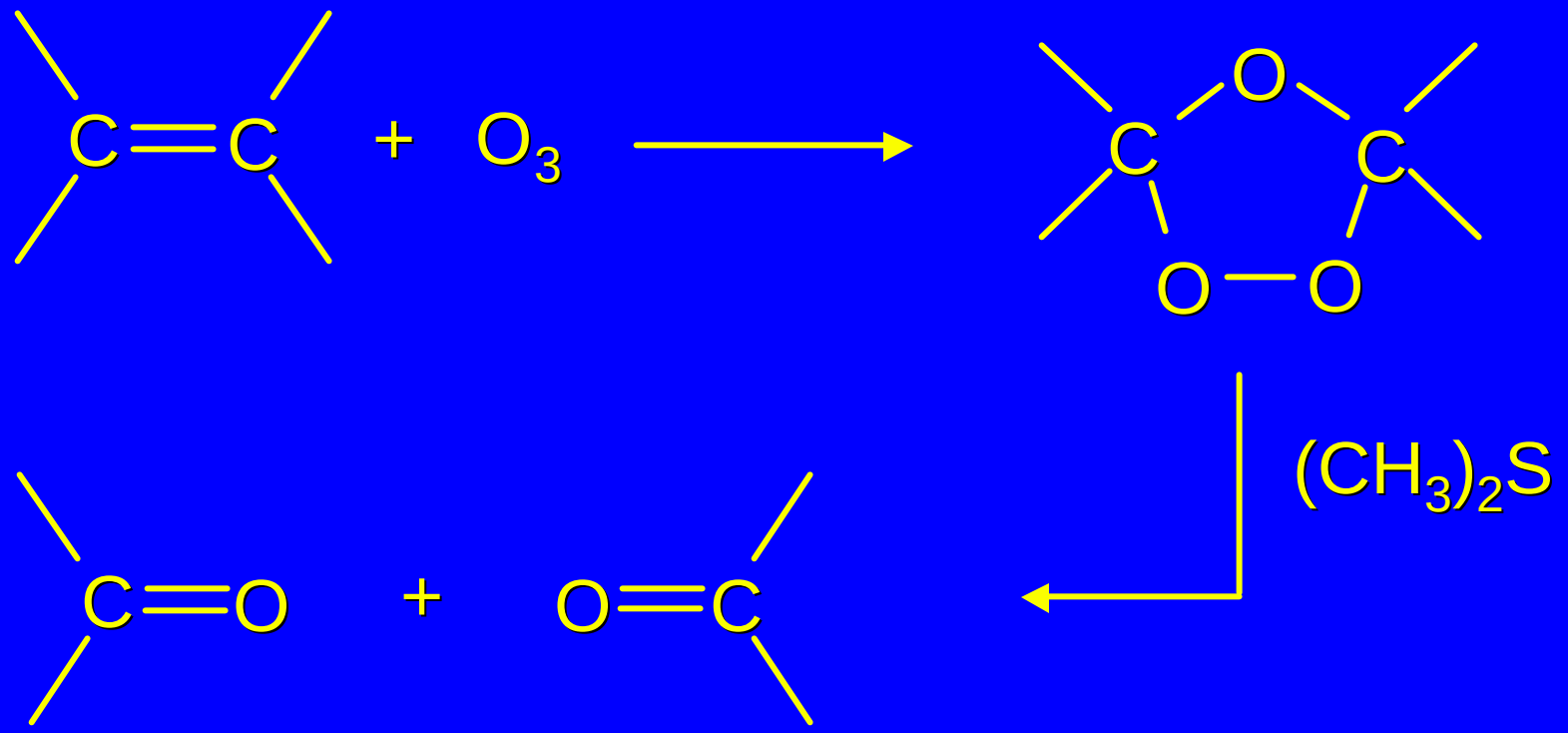
# *Ozonolysis of Alkenes*

Second step is hydrolysis of the ozonide. Two aldehydes, two ketones, or an aldehyde and a ketone are formed.

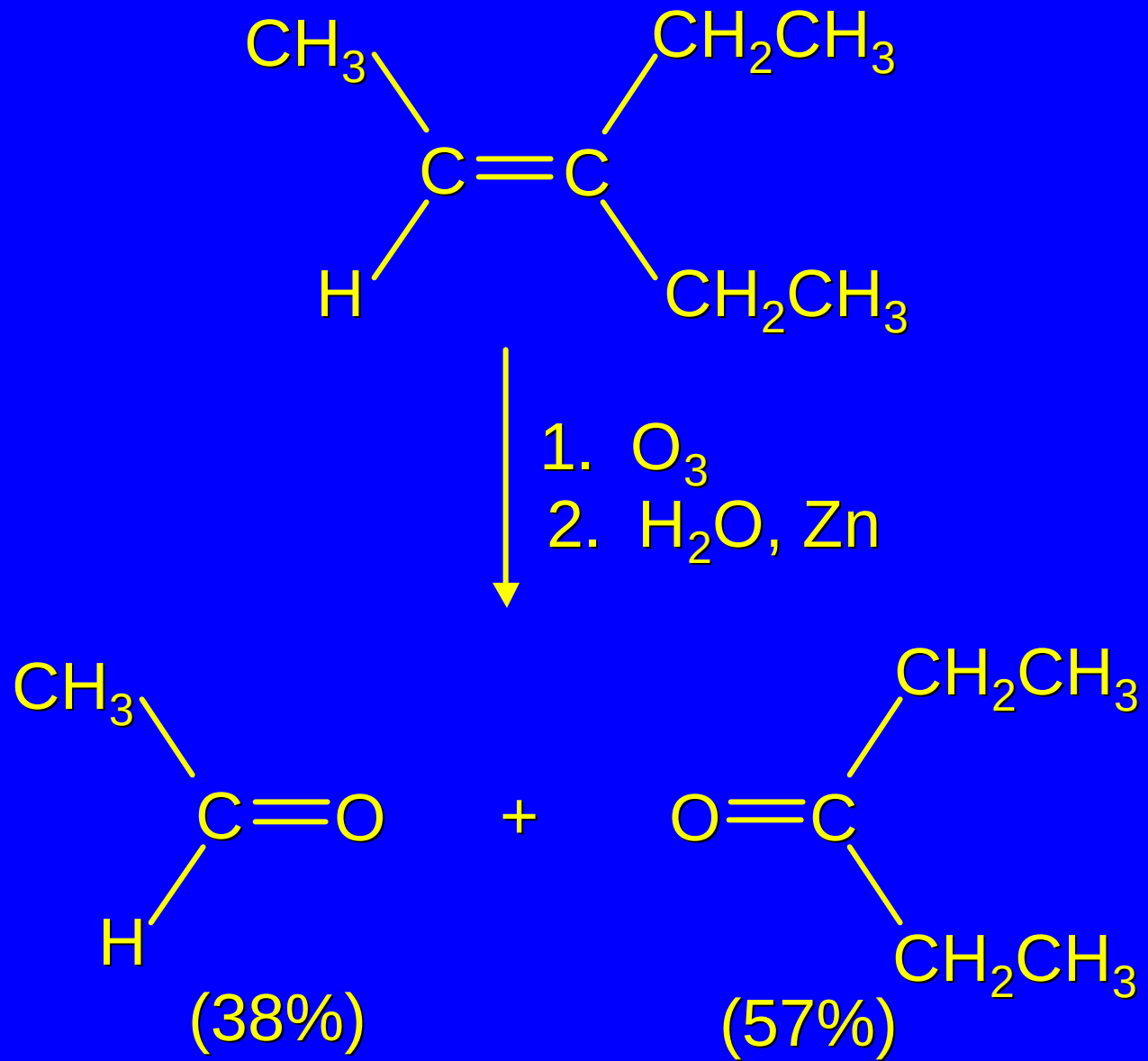


## *Ozonolysis of Alkenes*

As an alternative to hydrolysis, the ozonide can be treated with dimethyl sulfide.



*Example*


CH3
CH2CH3
C
C
H
CH2CH3
1. O3
2. H2O, Zn
CH3
C
O
H
(38%)
+
CH2CH3
O
C
CH2CH3
(57%)