Dr. Brent Iverson's Organic Chem Class
Gilbert Tuhabonye | Run For The Water
Gilbert will be there at 12:28. He knows your class begins at 12:30
Race date: Sunday Nov 9, 2025
Race website: runforthewater.com

Background details & special pricing:

- 15+ years Dr. Iverson's students have participated
- **SPECIAL PRICING FOR UT:** $30 to register for 5k = clean water for 1 person.
  - Discount code: R4TW25HOOKEM
  - When registering for 5k: join Dr. Iverson's team: OChem Iverson

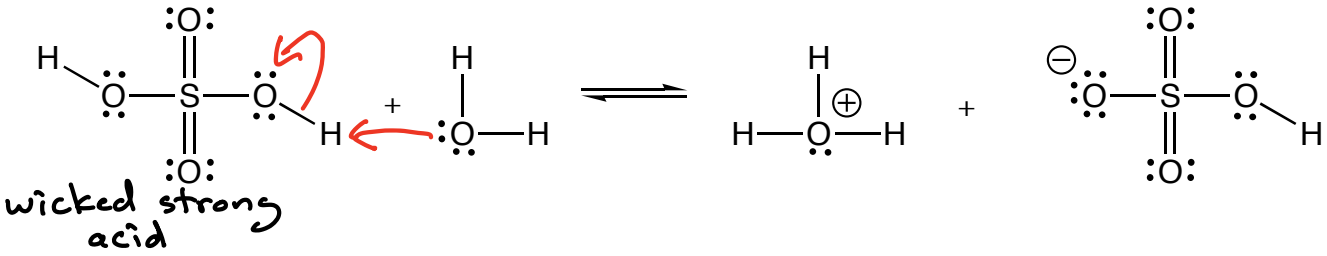
Here is Team Ochem Iverson's unique registration link:
https://raceroster.com/events/2025/102453/run-for-the-water/register?team=871280

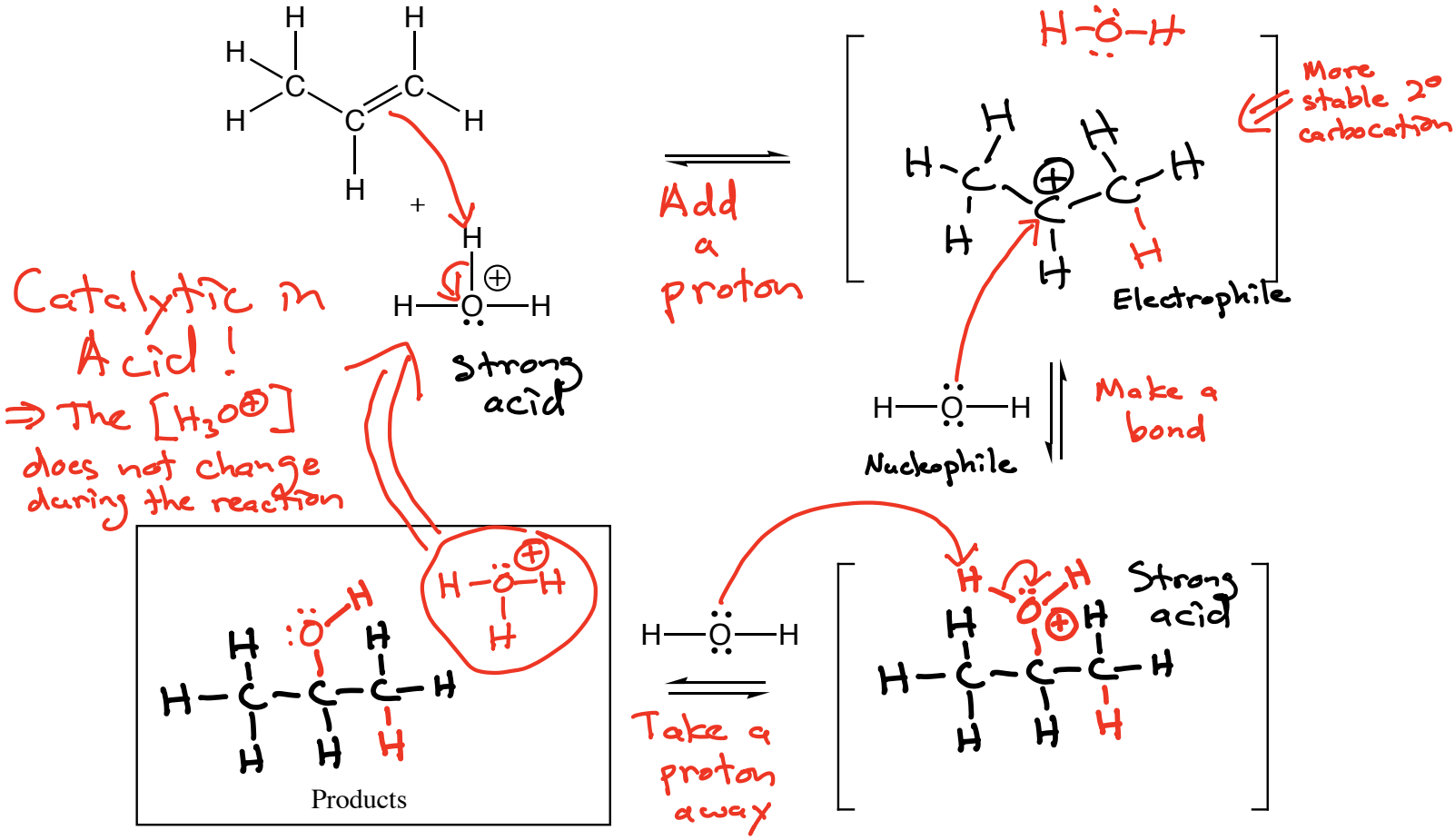
And if you won't be running but would like to support Gibert and the Gazelle Foundation, you can volunteer at the packet pickup before the race, or during the race you can work at a water stop (water stops 3,4,5 and 6 are going to be staffed by UT students like you!) where you provide water for the runners. You can get to the volunteer sign up by clcking here:

https://raceroster.com/events/2025/102453/run-for-the-water/volunteer?_gl=1*vluhd*_gcl_au*MTczMzQ3MDU3Ni4xNzU5NzA3Mzk2*_ga*MTc3NDA1NjI3Ny4xNzU5NzA3Mzk2*_ga_XSJQX37G0F*czE3NTk5Mzk3ODUkbzQkZzEkdDE3NTk5NDAyMjckajQzJGwwJGgw

From the Gazelle Foundation: "Water stops 3, 4, 5 and 6 are labeled "UT only". If students are more interested in packet pickup and we don't get quite enough to fill those spots, no worries. We'll supplement with other interested volunteers. Just wanted to make sure your students get first dibs and the chance to be with each other. 😁"

Acid-catalyzed Hydration of an Alkene



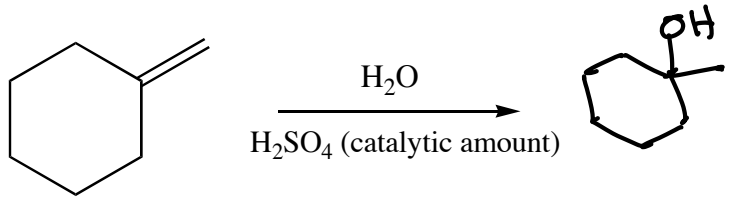


Summary: Proton adds to make a carbocation intermediate, water attacks to make a new bond, take a proton away to make the product alcohol. Catalytic in $H_3O^{\oplus}$

Regiochemistry: Markovnikov's Rule

Stereochemistry: Mixed (time capsule)

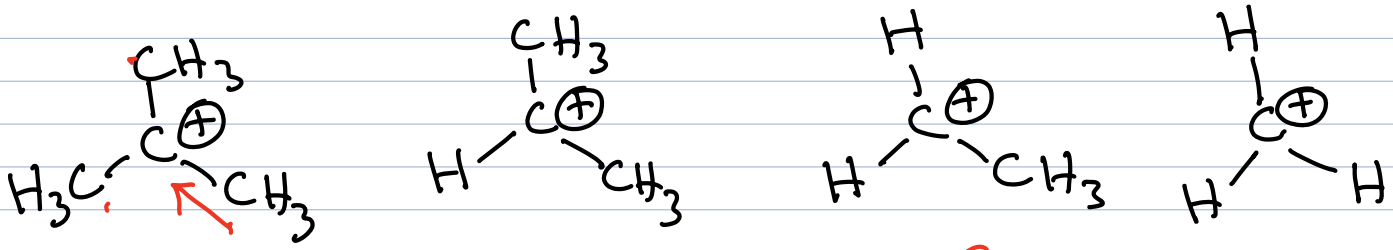
Example:



(Not chiral)

-OH on more substituted C atom ⇒ Markovnikov's Rule

Carbocation stability → the more C atoms bonded to the $C^{\oplus}$ the more stable



3° (tertiary) 2° (secondary) 1° (primary) methyl

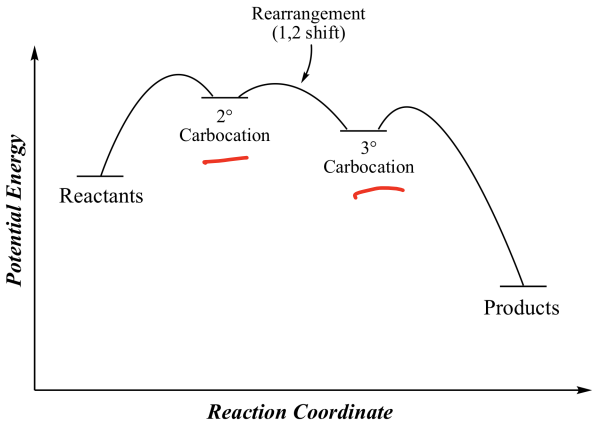
Hyperconjugation stabilization

Inductive effect stabilization

Carbocation Stability

Markovnikov's Rule → For alkene reactions involving a carbocation intermediate the nucleophile (ex. $:\ddot{B}r:^{\ominus}$) will make a bond to the more substituted C atom → derived from the more stable carbocation

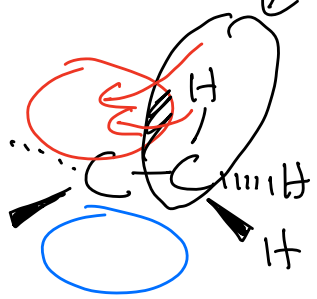
Carbocation intermediates can sometimes rearrange (Called 1,2 Shift) If a carbocation intermediate of equal or greater stability can be produced by shifting an adjacent H atom (or rarely an alkyl group), rearrangement will compete with product formation to give a mixture of products.



Motive → A 3° (tertiary) carbocation is more stable than a 2° (secondary) carbocation

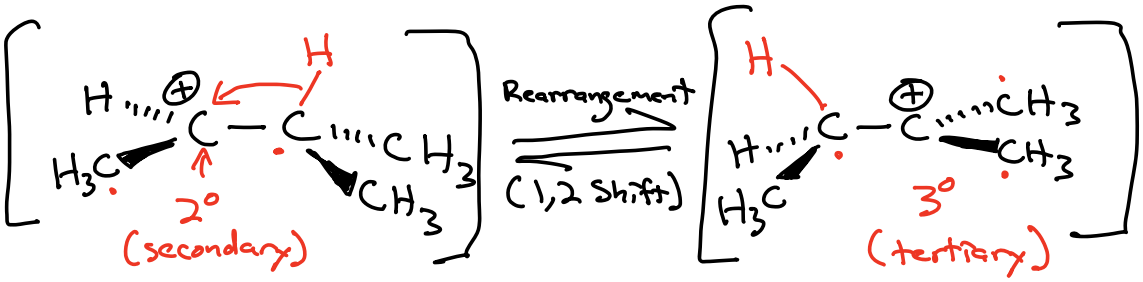
Opportunity → The mechanism is really just hyperconjugation "taken to the extreme"

1) Hyperconjugation → overlap of adjacent σ bonding electron density with the empty 2p orbital of a carbocation



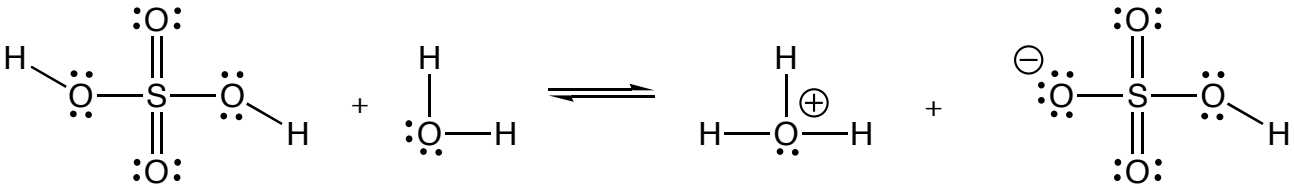
Some electron density of the C–H σ bond is pulled into the empty 2p orbital (red arrows in the figure)

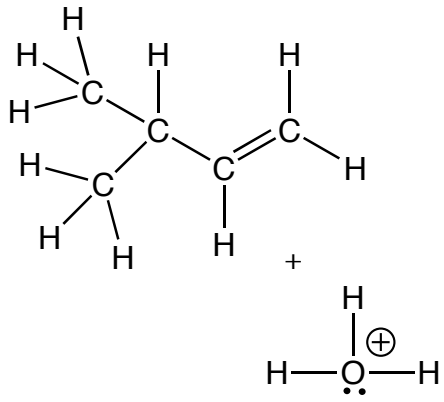
delocalizes the ⊕ charge



More Stable Carbocation

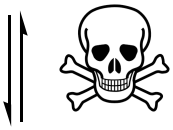
Cation Rearrangement

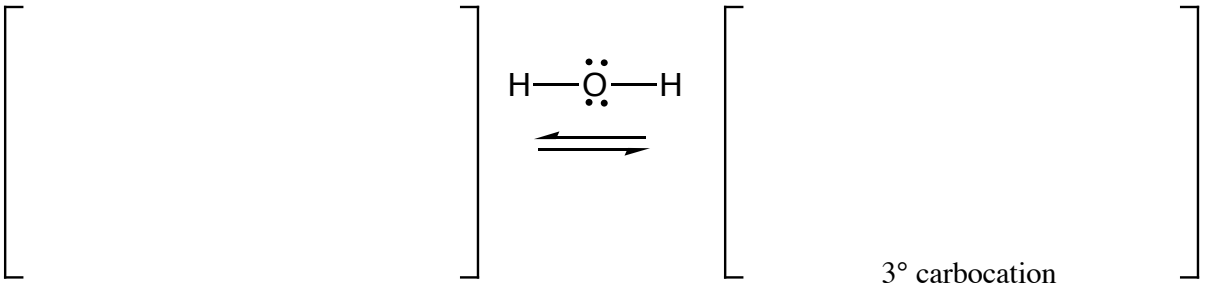




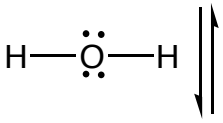
2° carbocation

Rearrangement



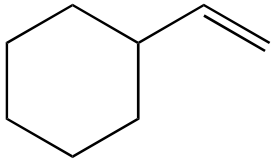


3° carbocation
(more stable)



Products

Example:



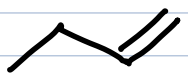
H_2O

H_2SO_4 (catalytic amount)

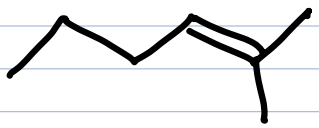
Examples

$\xrightarrow[H_2SO_4]{H_2O}$

(catalytic)

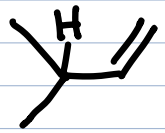


$\xrightarrow{HCl}$



$\xrightarrow[H_2SO_4]{H_2O}$

(catalytic)

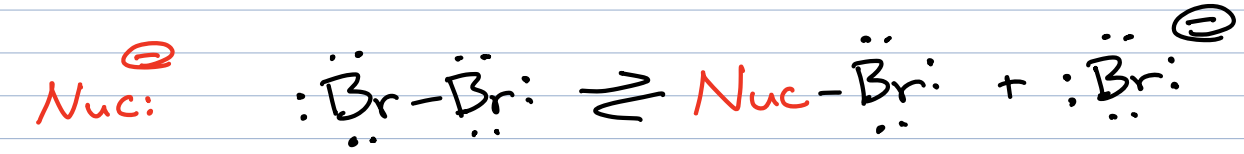


$\xrightarrow{HBr}$

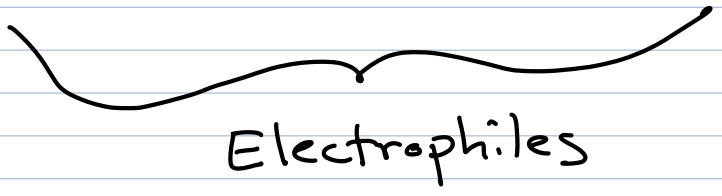
(Only draw the rearranged product)

New definition of an electrophile →

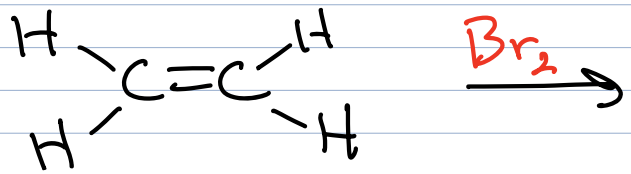
a relatively weak bond that can break to create a stable anion



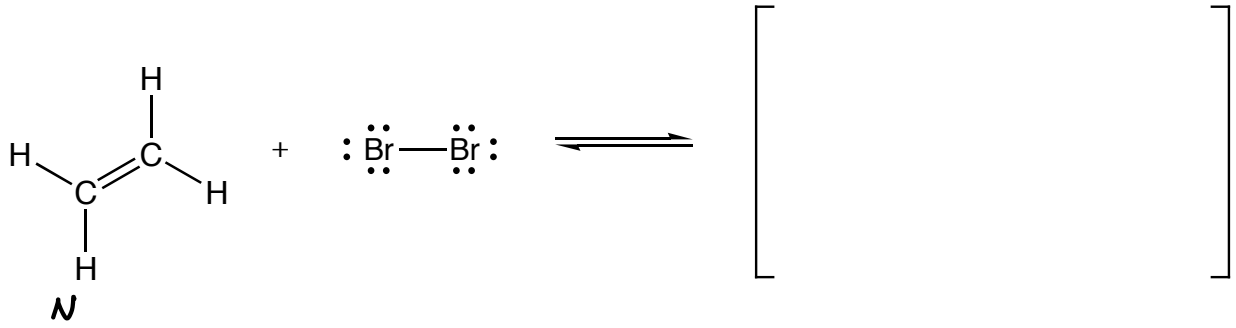
Nucleophile (Note: Not all nucleophiles have a ⊖ charge)

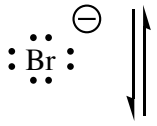


Overall New Reaction



Alkene Halogenation





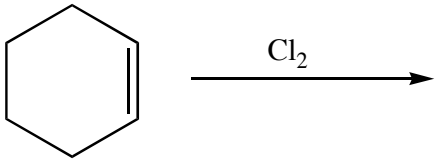
Products

Summary:

Regiochemistry:

Stereochemistry:

Example:



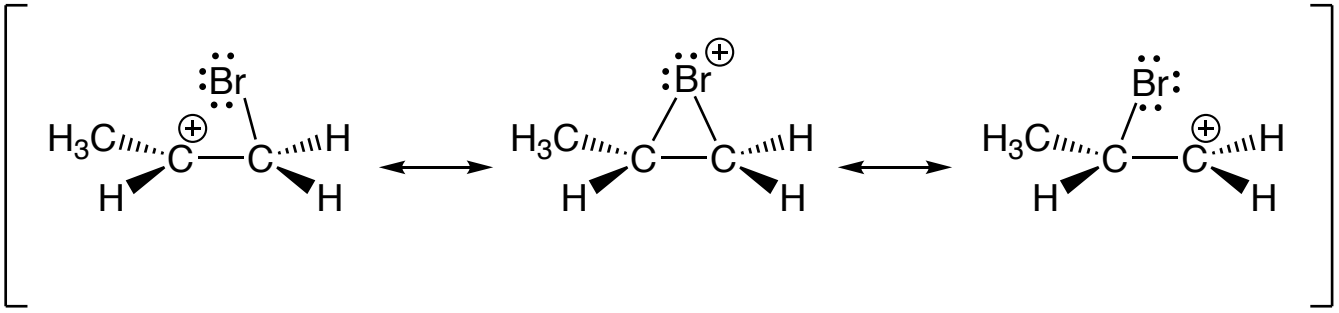
Alkene Reaction Stereochemistry Possibilities

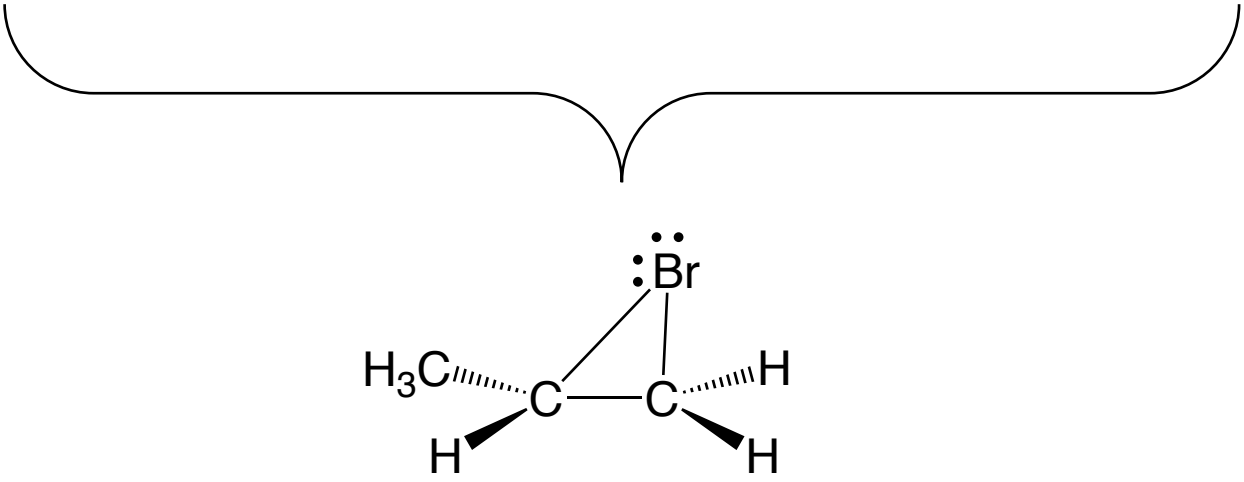
Anti →

Syn →

Mixed →

How to think about unsymmetrical halonium ions

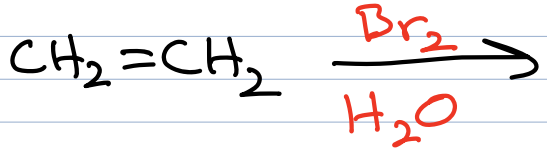




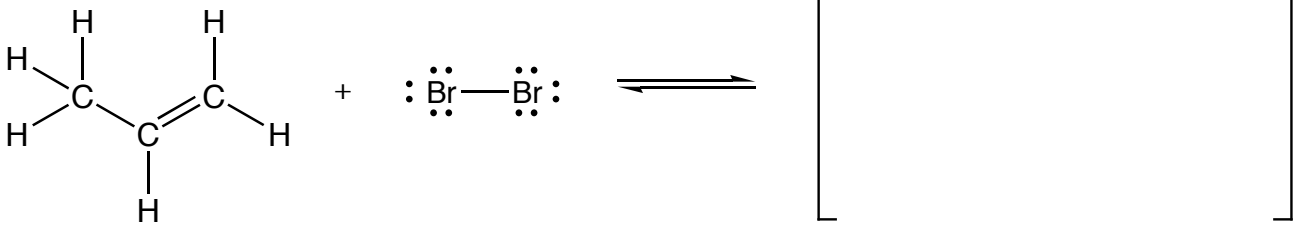
Complication → Some intermediates and products are chiral

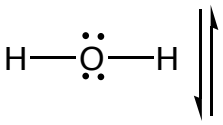
Solution →

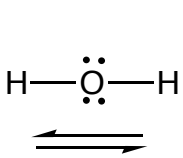
New overall reaction: Halohydrin Formation



Alkene Hydrohalogenation







Products

Summary:

Regiochemistry:

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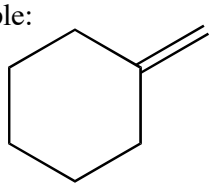
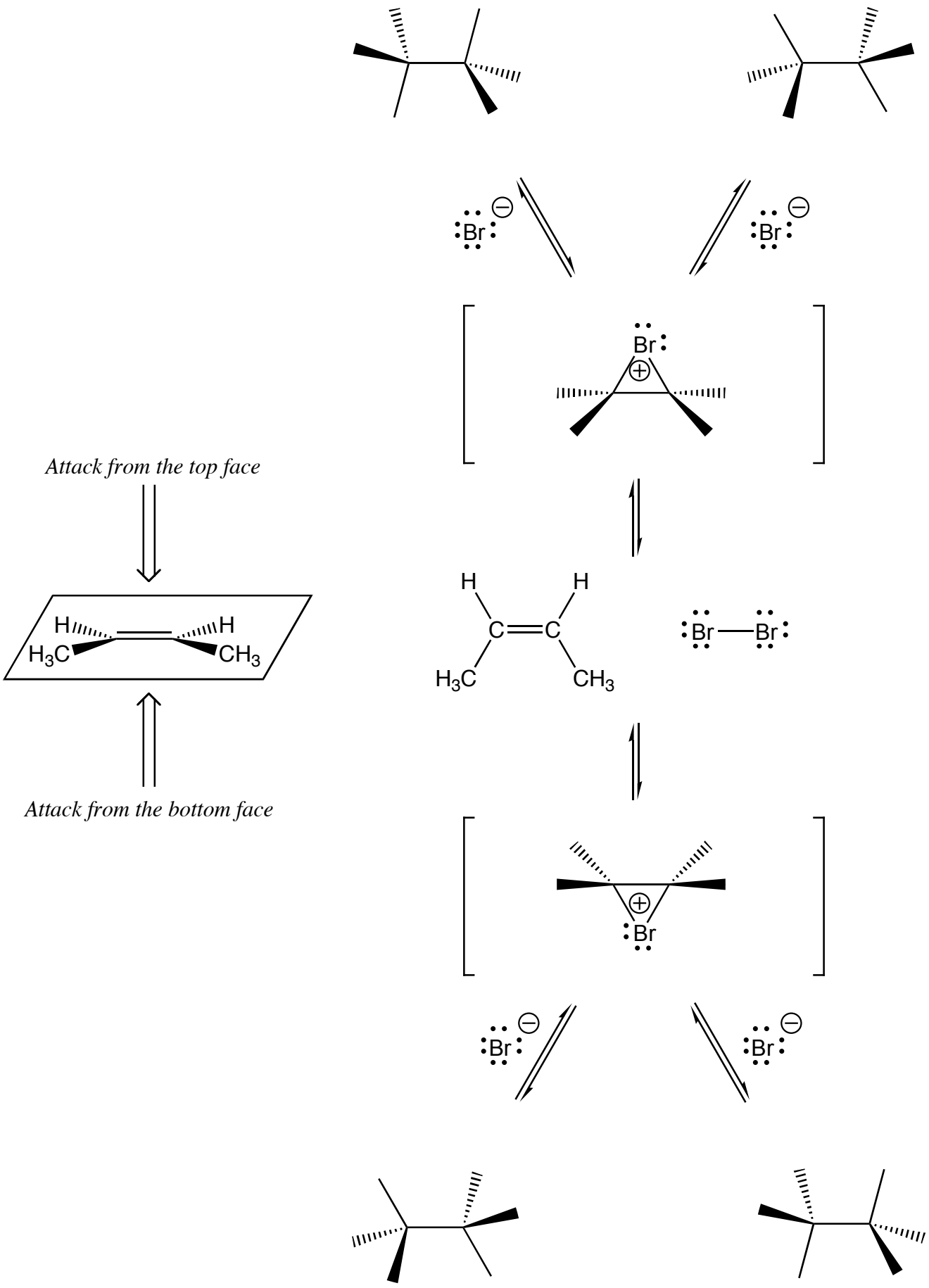
Example:

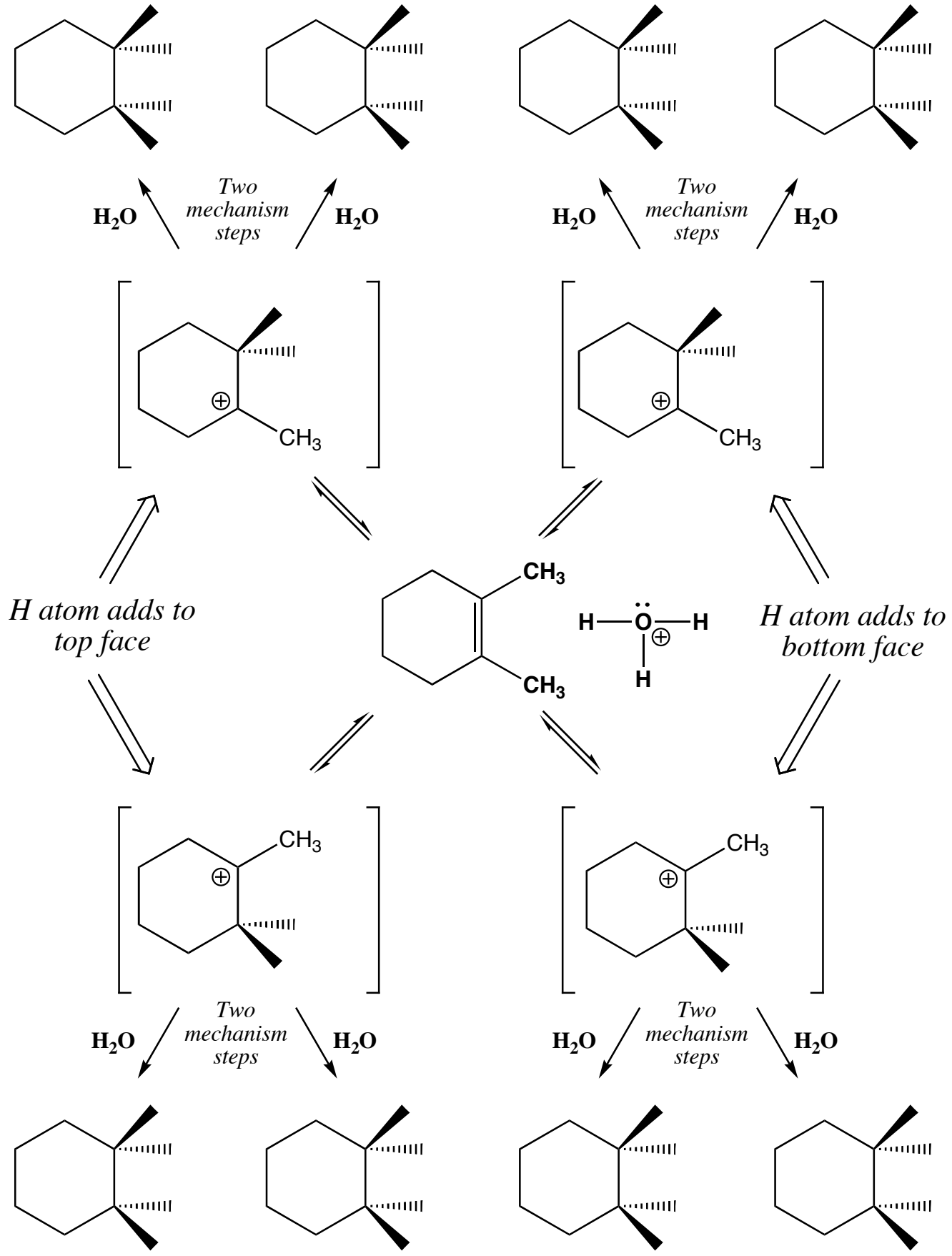


Br_2 / H_2O

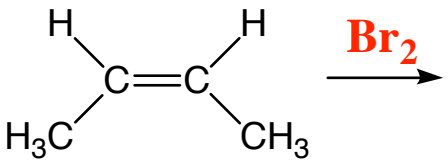
Only carbocations rearrange!

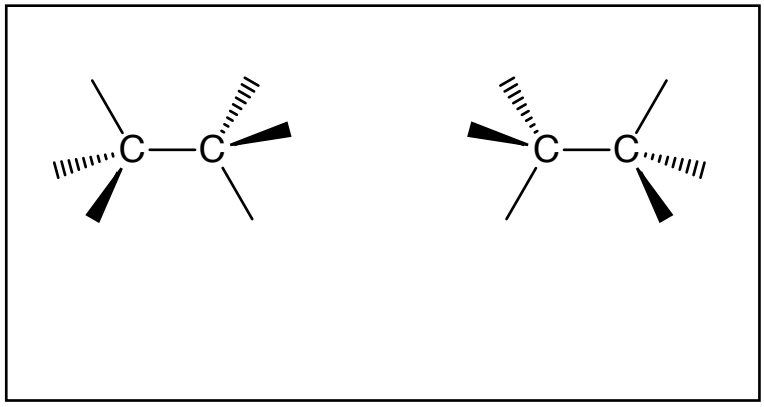
To get stereochemistry correct when predicting reaction products,

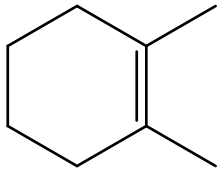

Attack from the top face
H
H
H3C
CH3
Attack from the bottom face
Br
H
H
C
C
H3C
CH3
Br
Br

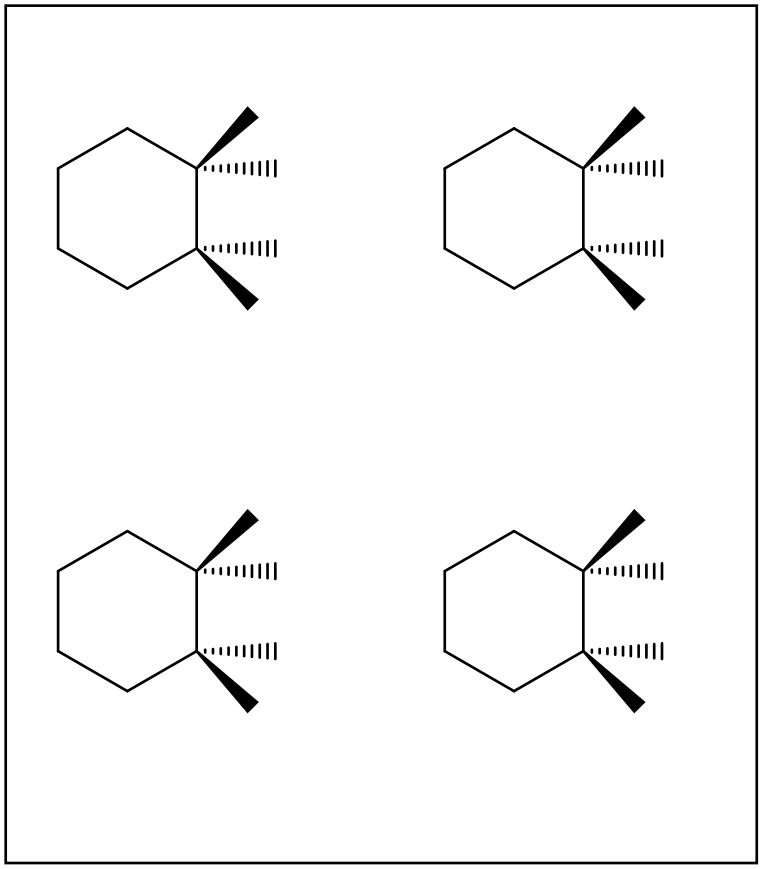

H2O
Two mechanism steps
H2O
H2O
Two mechanism steps
H2O
CH3
CH3
CH3
CH3
H atom adds to top face
H atom adds to bottom face
H
O
H
H
CH3
CH3
CH3
CH3
H2O
Two mechanism steps
H2O
H2O
Two mechanism steps
H2O

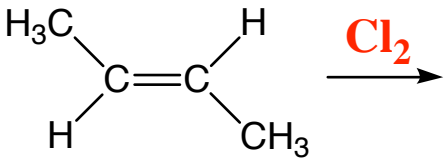
Examples

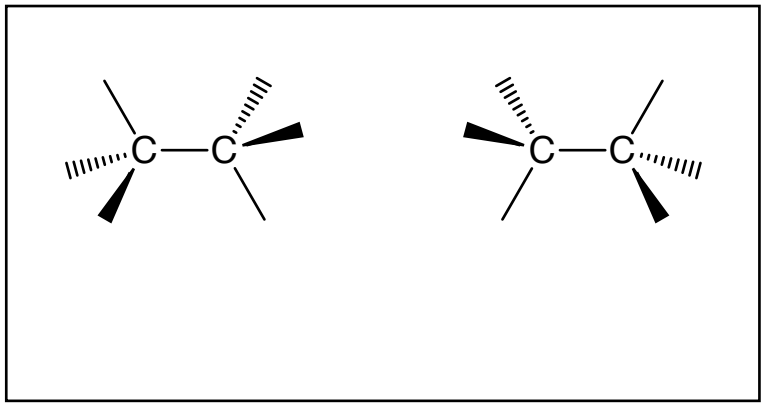
1) 



2) 

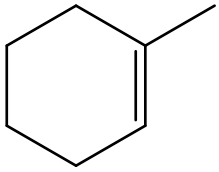


3) 

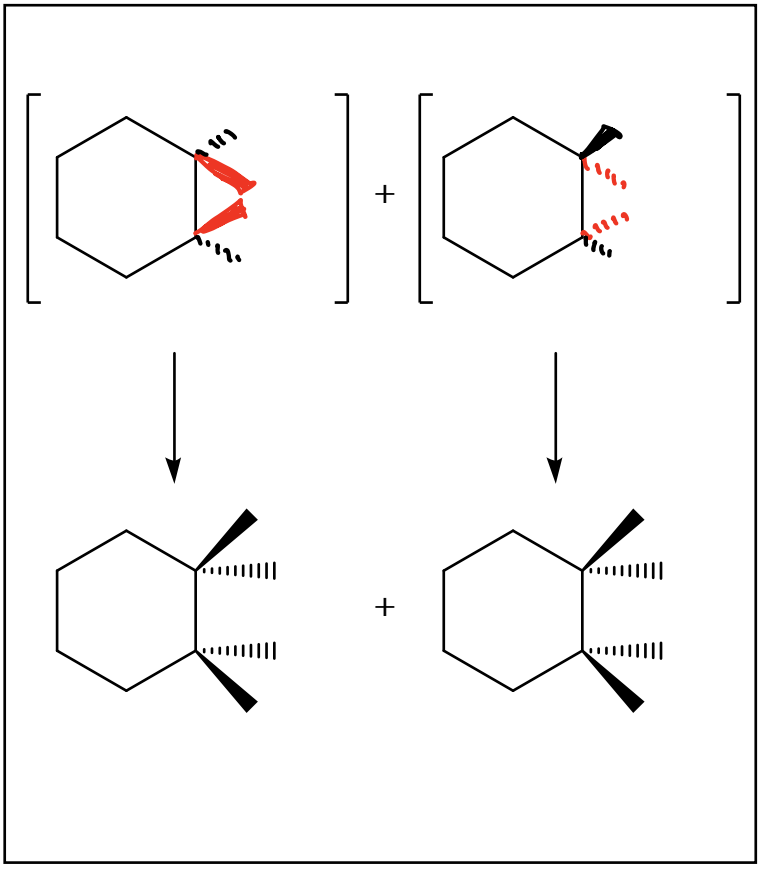


More Examples

4)



Br_2
H_2O



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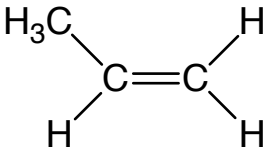
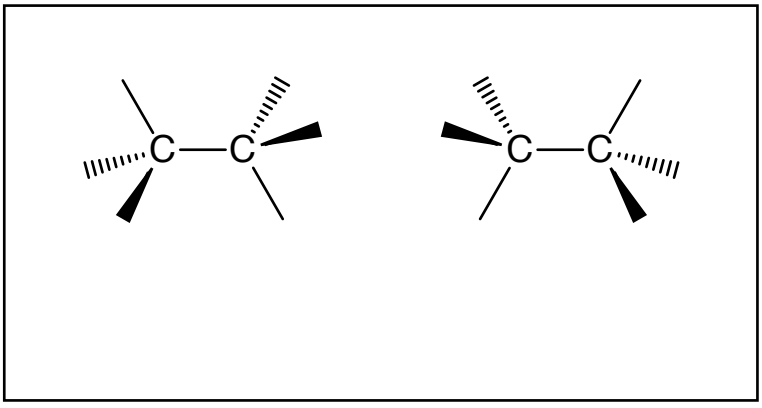
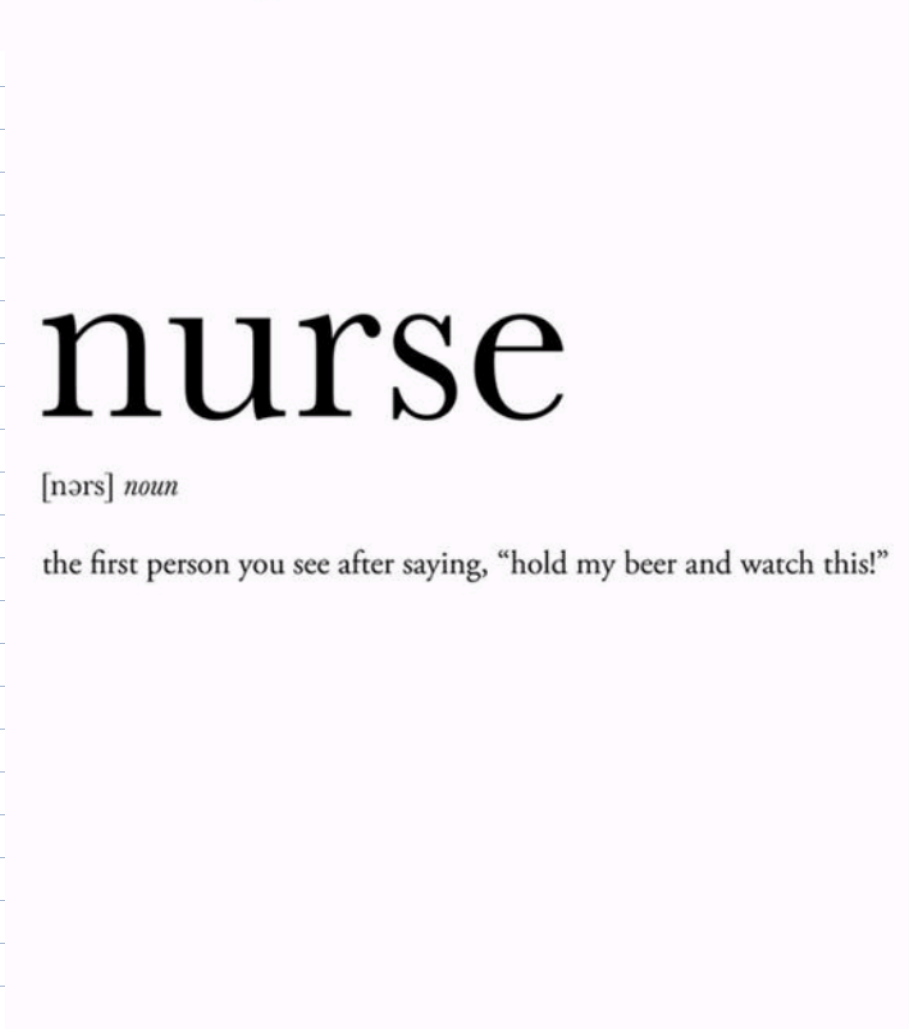


Cl_2
H_2O



Who do you call when you need help?



When studying OChem → Call a NIRRS

Learn each of these things for every reaction → then you will be able to predict mechanisms and therefore products

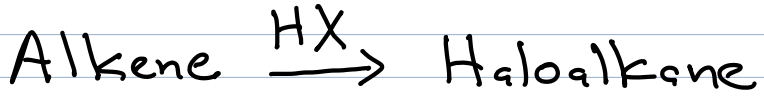
Nature of the reaction; what is the starting material/product? (i.e. alkene converted to an alcohol)

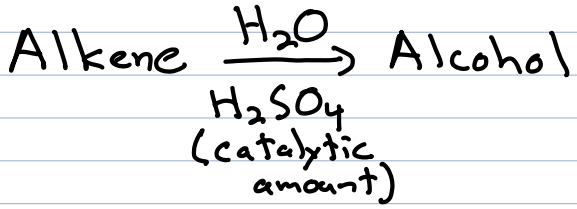
Intermediate (or "**I**mportant transition state" if applicable) of the reaction, the key to the mechanism (carbocation, halonium ion, etc.)

Reagents Learn the exact way to designate the reagents for each reaction

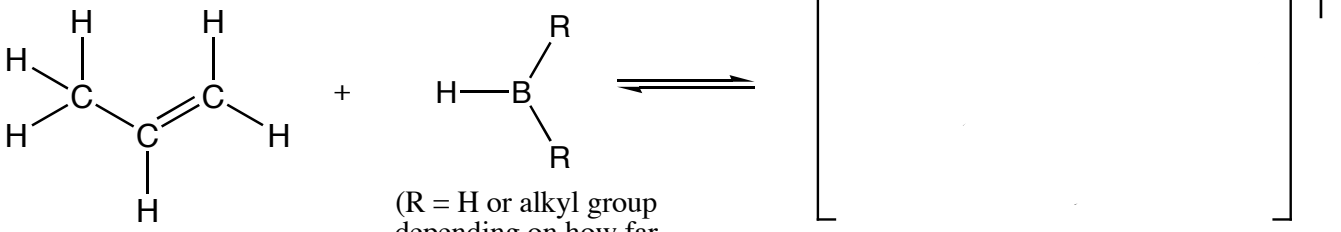
Regiochemistry What is the regiochemistry of addition? (Markovnikov, non-Markovinikov, etc.)

Stereochemistry of addition (anti, syn or mixed)

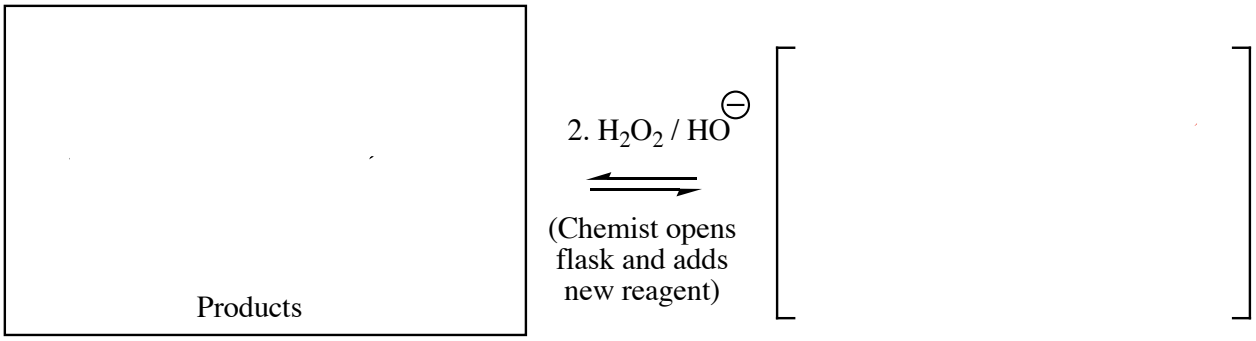




Hydroboration-Oxidation



transition state

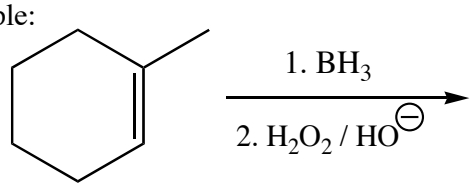


Summary:

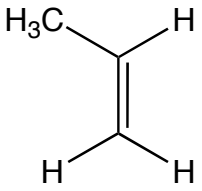
Regiochemistry:

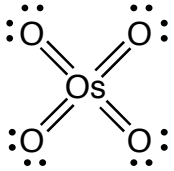
Stereochemistry:

Example:



OsO_4 Partial Mechanism

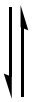


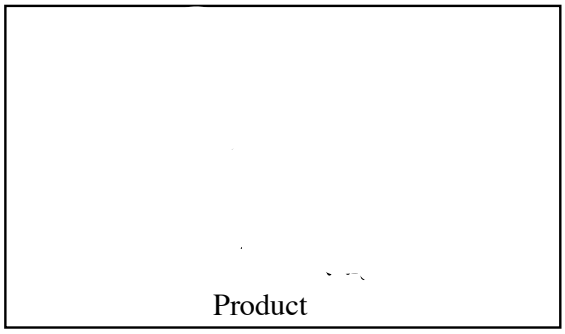


OsO_4

A cyclic osmate ester

2. $NaHSO_3$ / H_2O
(Chemist opens up flask)





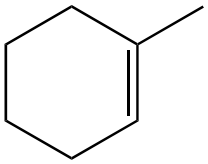
Product

Summary:

Regiochemistry:

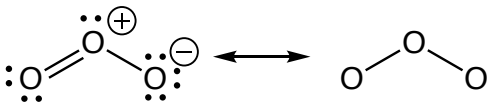
Stereochemistry:

Example:

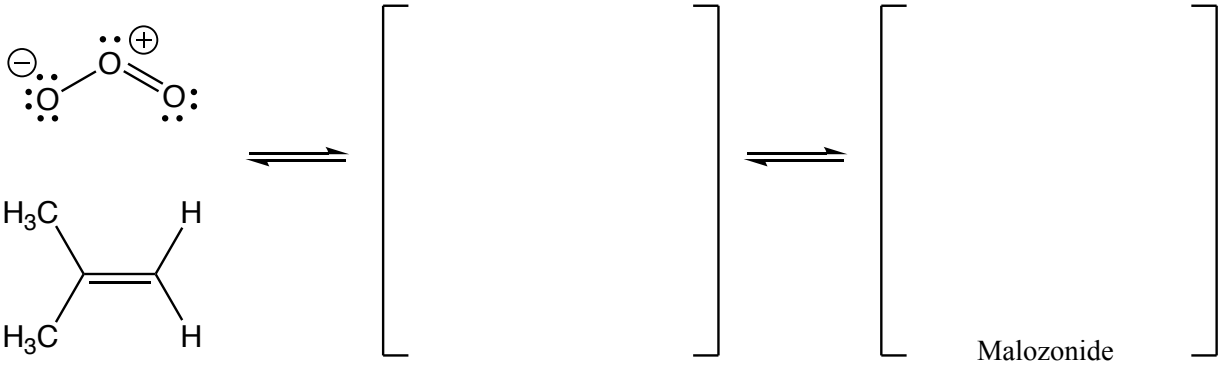


1. OsO_4
2. $NaHSO_3$ / H_2O

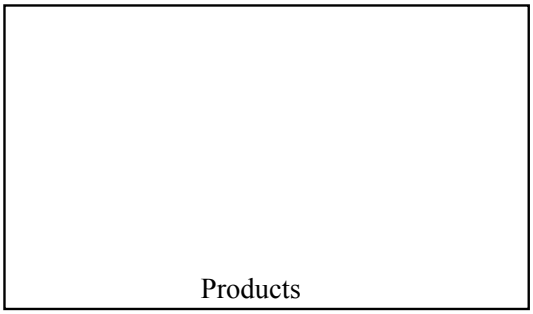
Ozonolysis Partial Mechanism



Ozone contributing structures

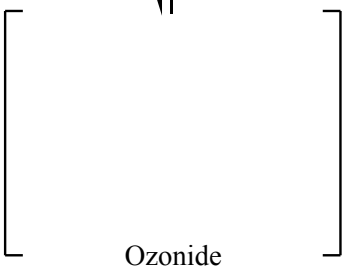


Rearrangement
in two steps



$2.\ (CH_3)_2S$

(Chemist opens
up flask)



Summary:

Regiochemistry:

Stereochemistry:

Example: