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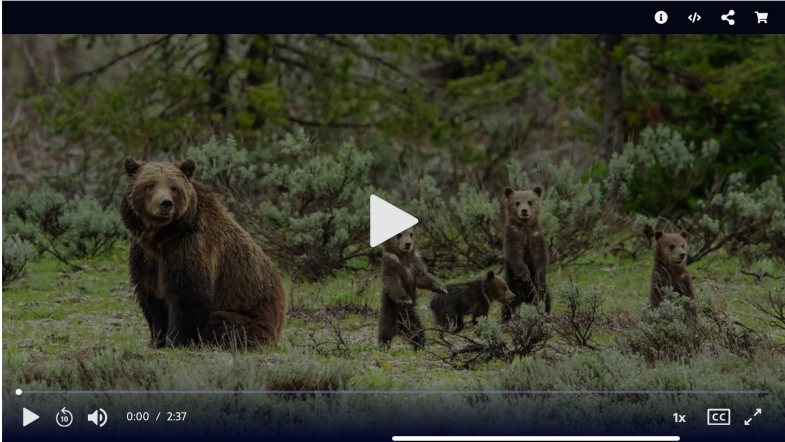
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Alkene Reaction Stereochemistry Possibilities

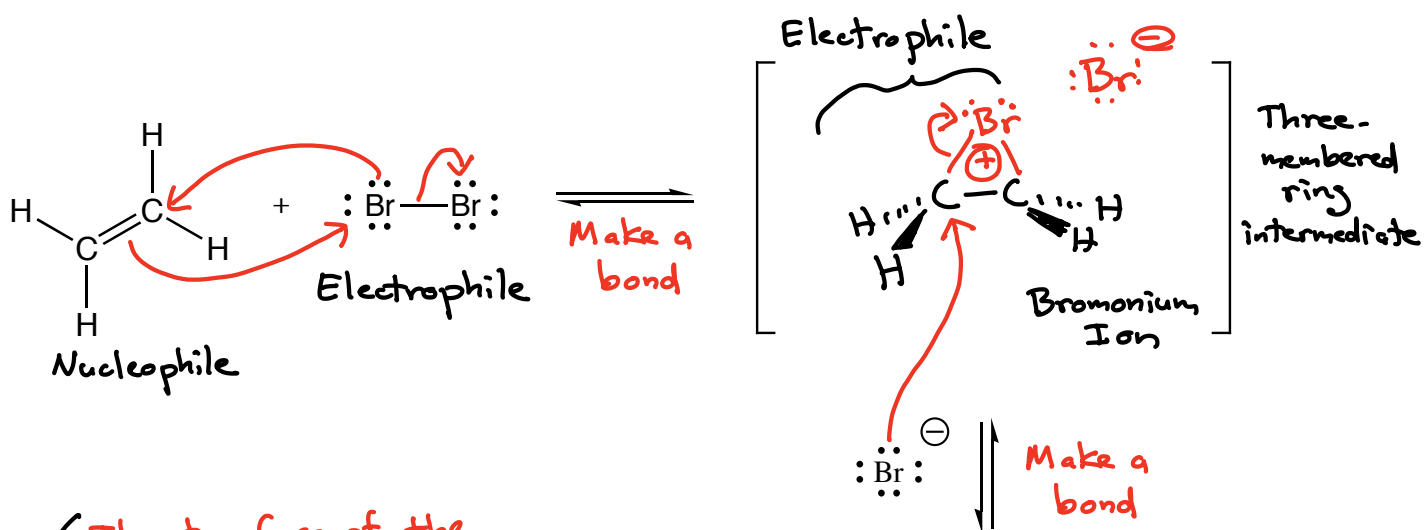
Anti → groups add to opposite faces of the original double bond

Syn → groups add to the same face of the original double bond

Mixed → groups add both anti and syn in the reaction



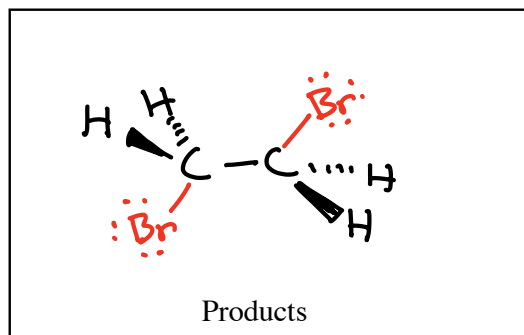
Alkene Halogenation



Called "anti" addition stereochemistry

The top face of the intermediate is "blocked" by the Br atom, so the Br^- nucleophile must react from the opposite face

⇓
Gives only a "trans" product—never "cis"

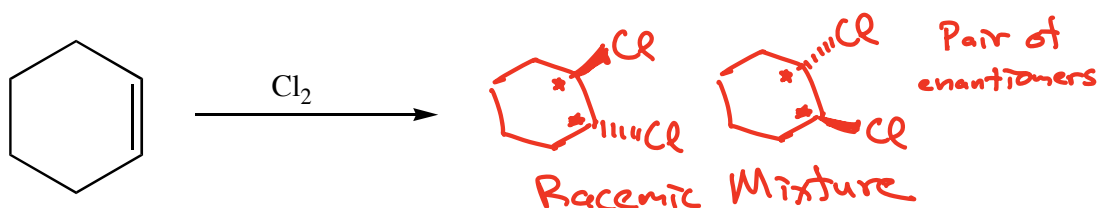


Summary: Alkenes react with X_2 to give a three-membered ring intermediate, then a new bond is made by X^- reacting from behind the C-X bond of the intermediate.

Regiochemistry: Not applicable → Br is on both atoms

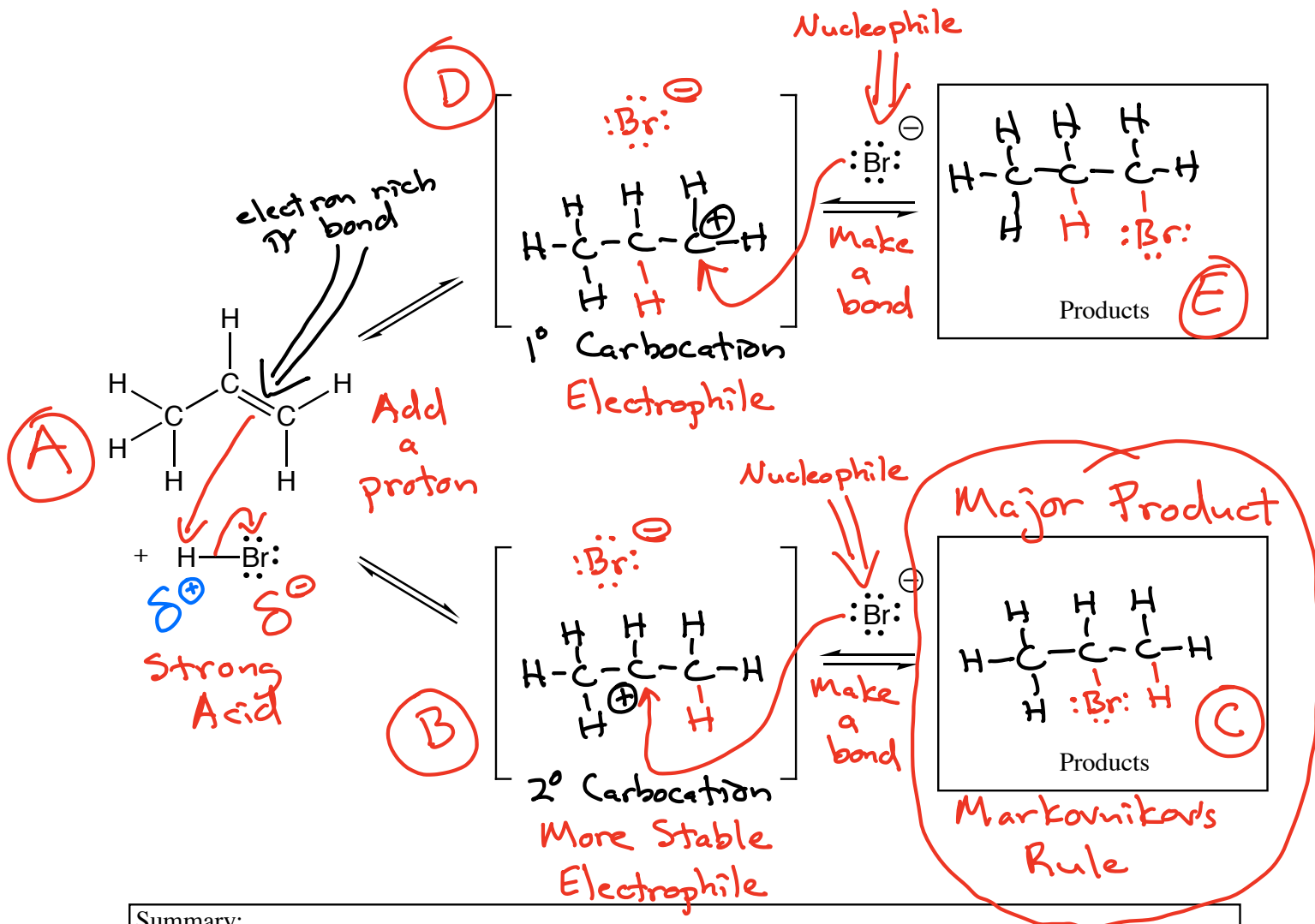
Stereochemistry: Anti addition geometry → trans products

Example:



Addition of H-X to an Alkene

X = Cl, Br, I
but not F



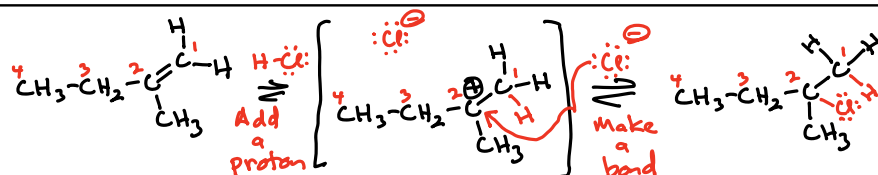
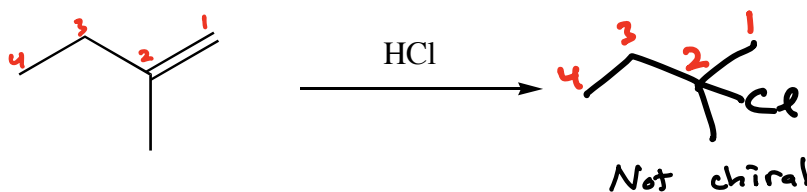
Summary:

The alkene π bond reacts with H-X to add a proton to create a carbocation intermediate that makes a bond with X^- to give the product

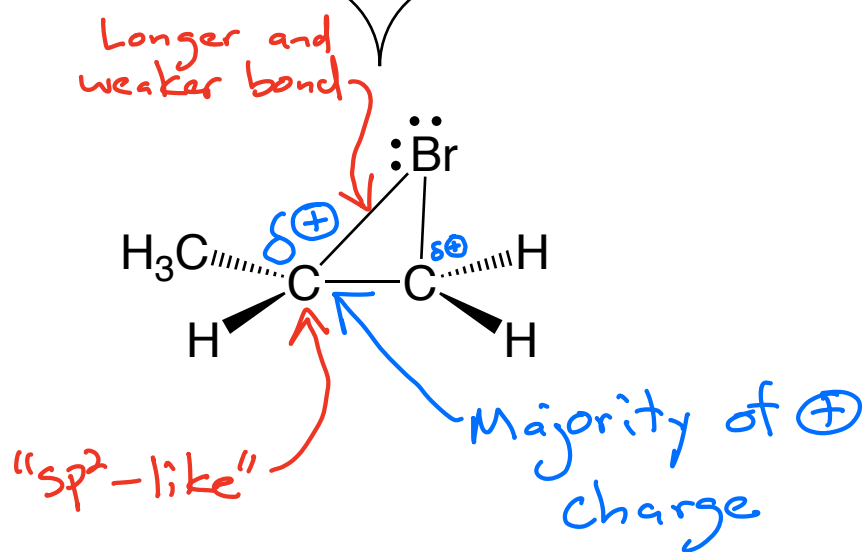
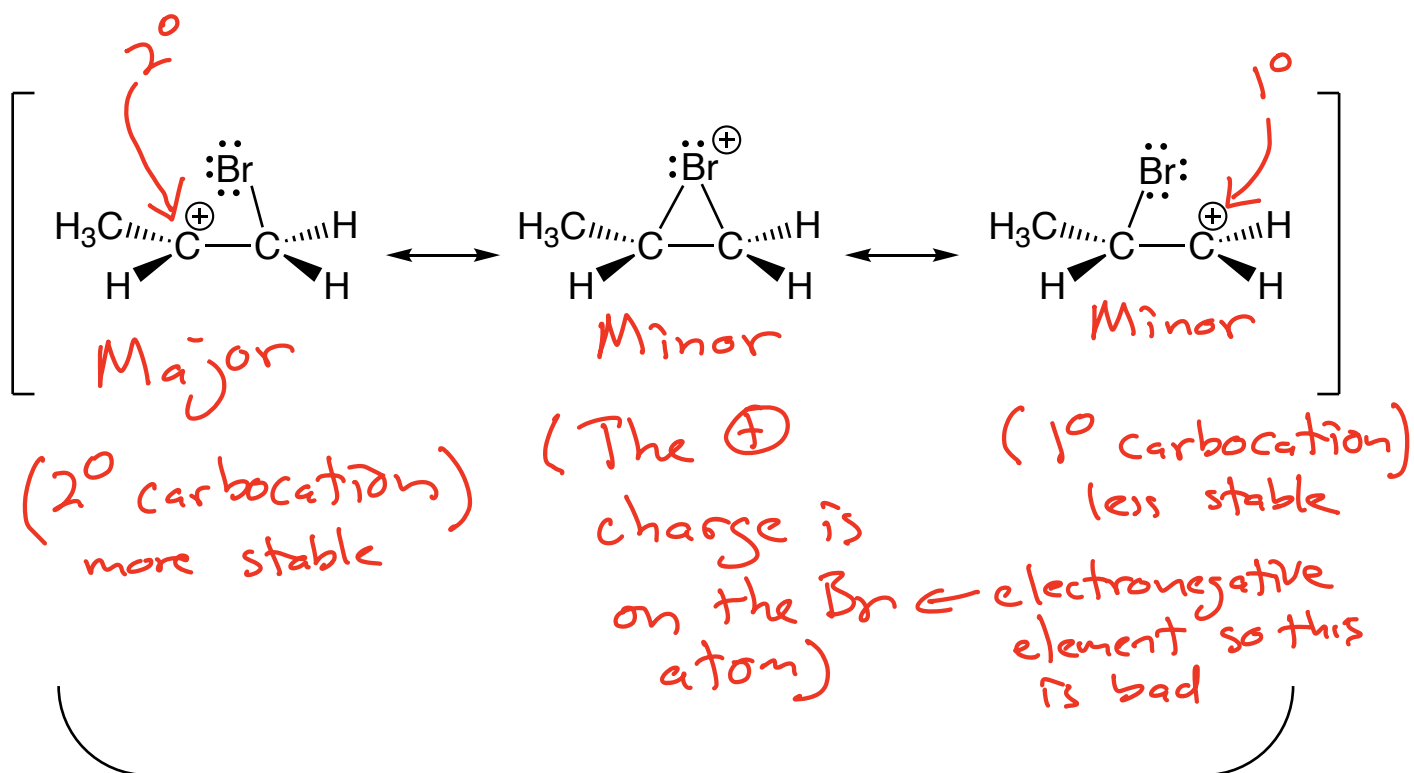
Regiochemistry: Markovnikov's Rule

Stereochemistry: Mixed (time capsule) $\rightarrow$ Racemic Product

Example:



How to think about unsymmetrical halonium ions

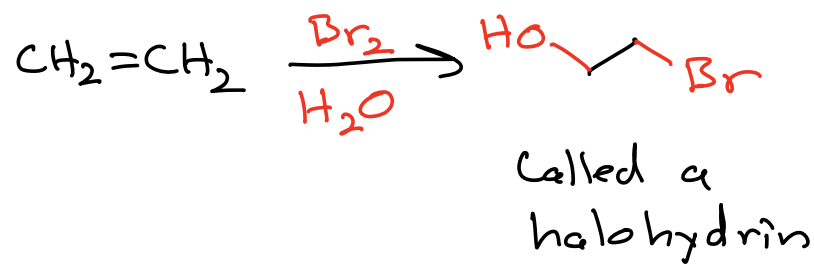


Complication → Some intermediates and products are chiral

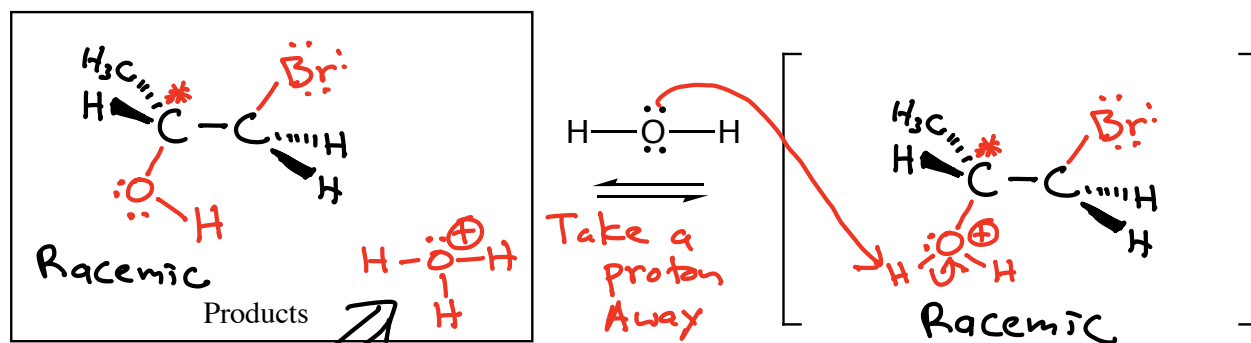
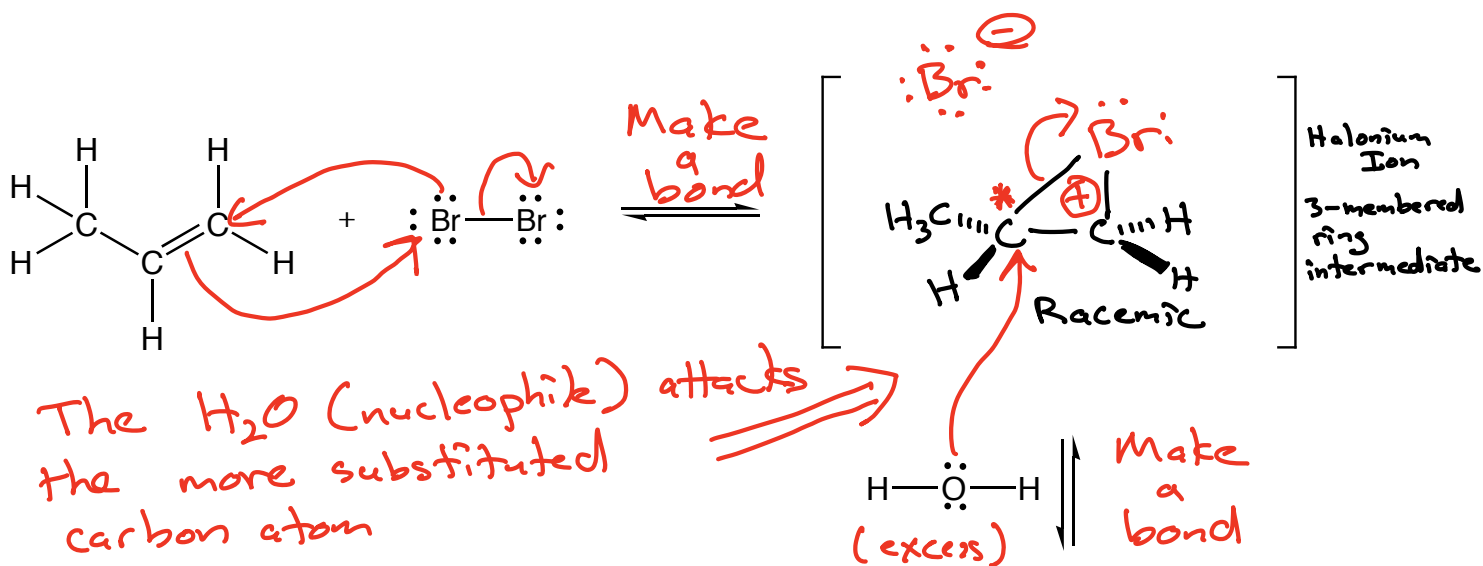
Solution → Label all chiral centers in intermediates and products
IN MECHANISM QUESTIONS
with an asterisk (*) and
write "Racemic" if appropriate.
No need to draw all of the
stereoisomers → just one of
them using wedges and dashes.

Again
this is
for
mechanism
problems
only

New overall reaction: Halohydrin Formation



Alkene Hydrohalogenation

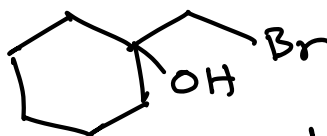
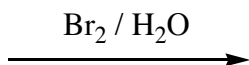
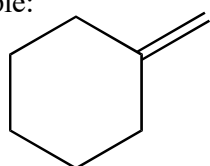


Summary: Alkene reacts with X_2 to give a 3-membered ring intermediate (halonium ion) $\rightarrow$ H_2O attacks the more substituted C atom and we take a proton away to give the halohydrin product.

Regiochemistry: Markovnikov (OH on more substituted C atom)

Stereochemistry: Anti

Example:



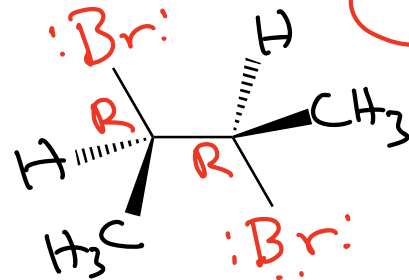
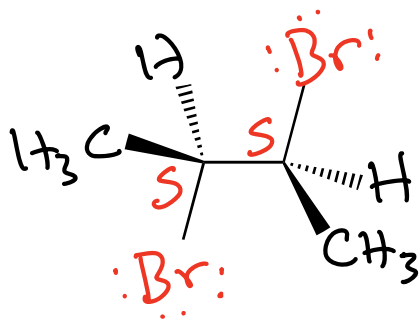
Not Chiral

Only carbocations rearrange!
Halonium ions (3-membered ring)
DO NOT

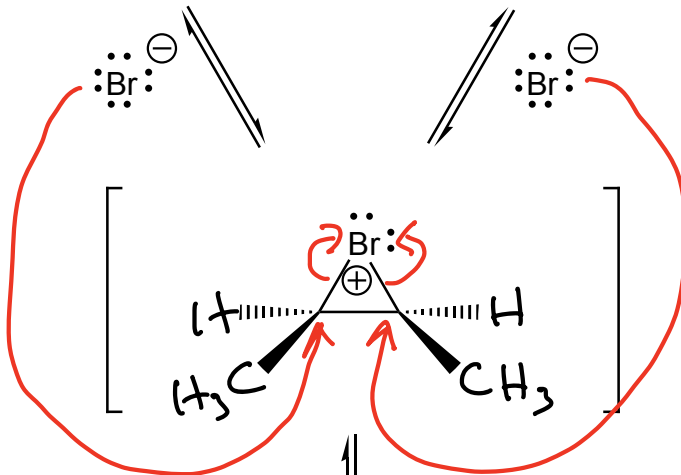


To get stereochemistry
correct when predicting
reaction products, you
need to analyze each
reaction on a case by
case basis

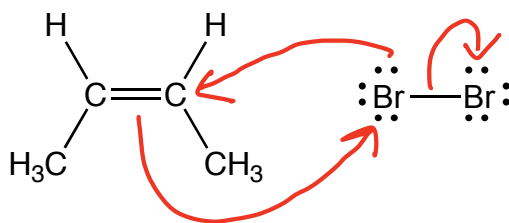
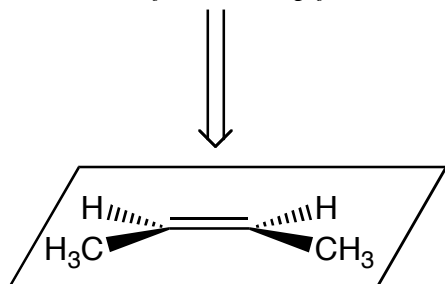
(2)



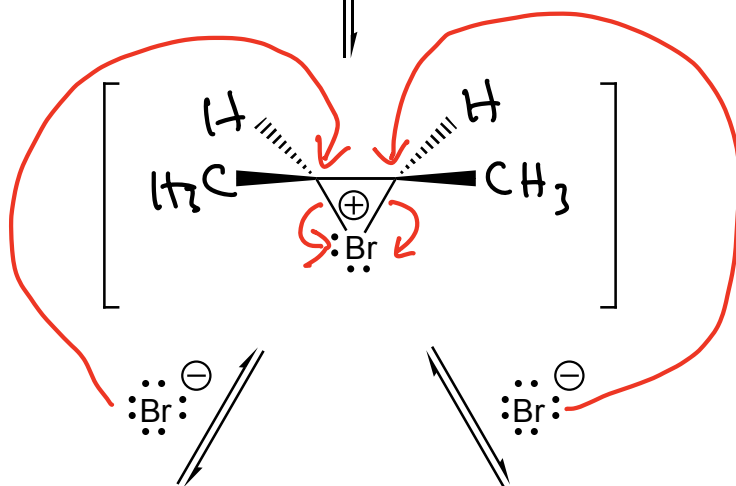
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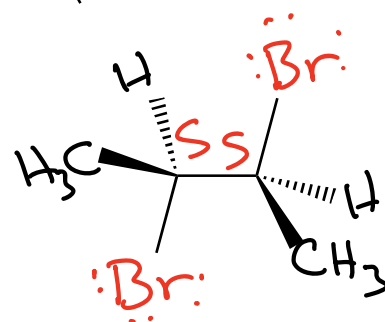
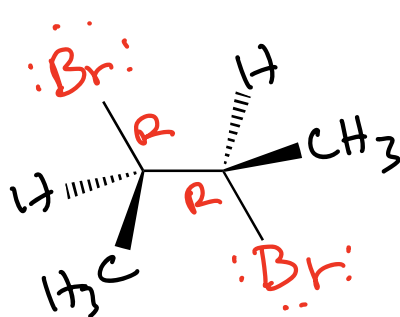
Attack from the top face



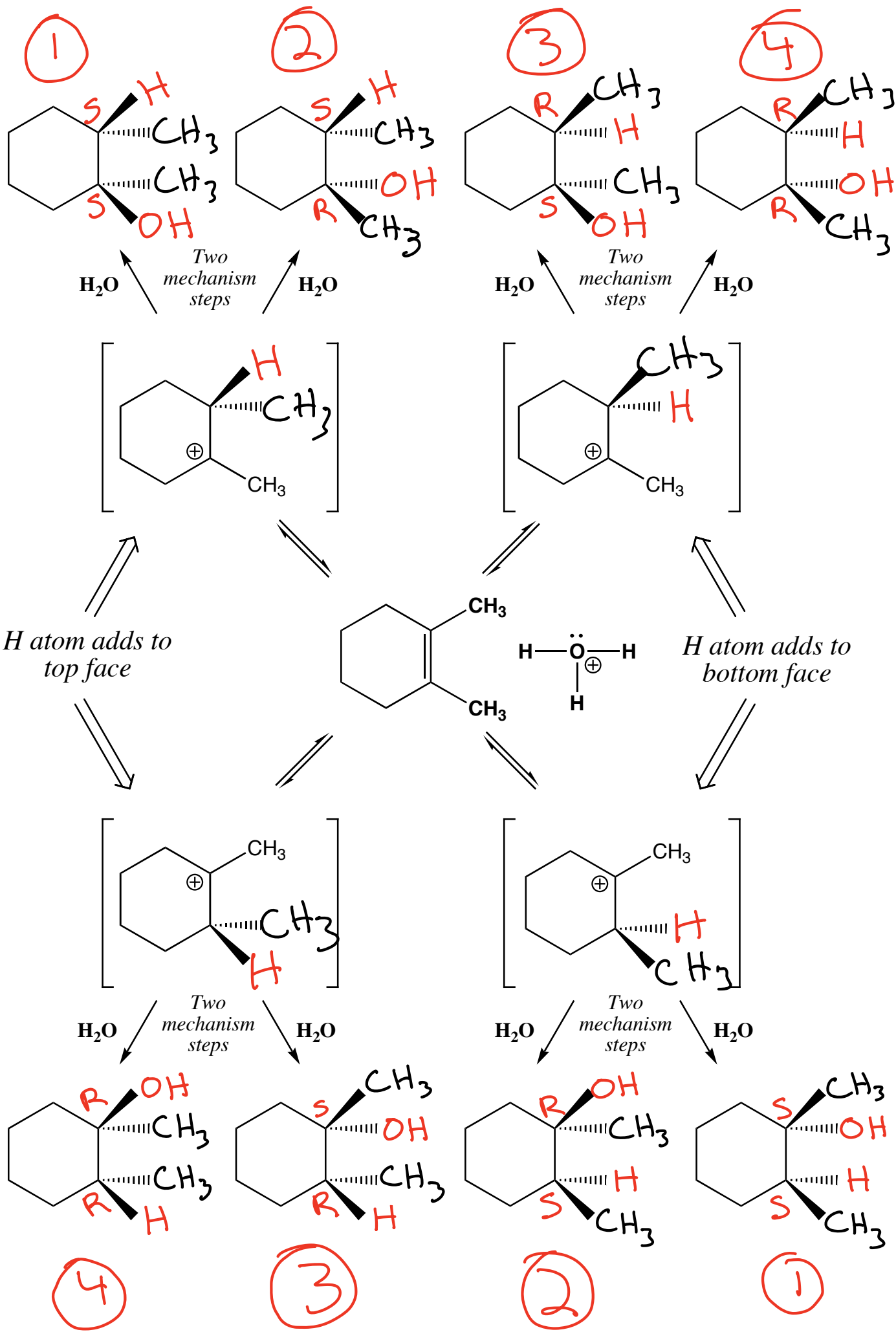
Attack from the bottom face



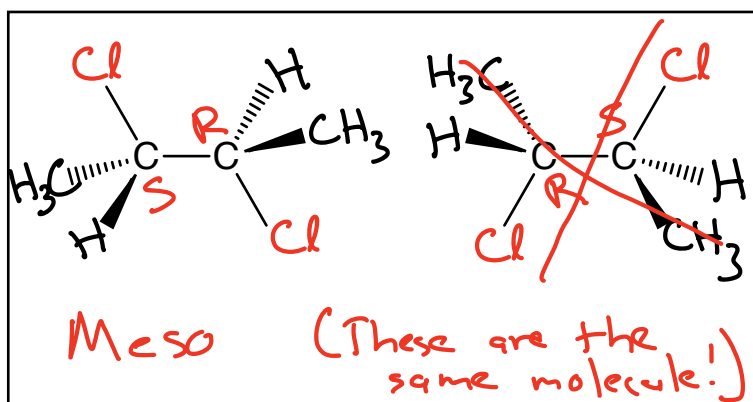
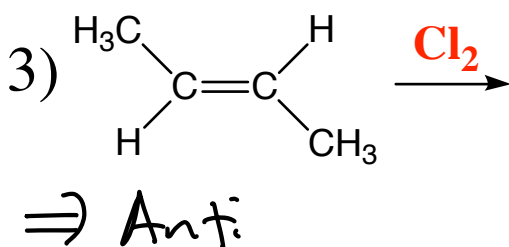
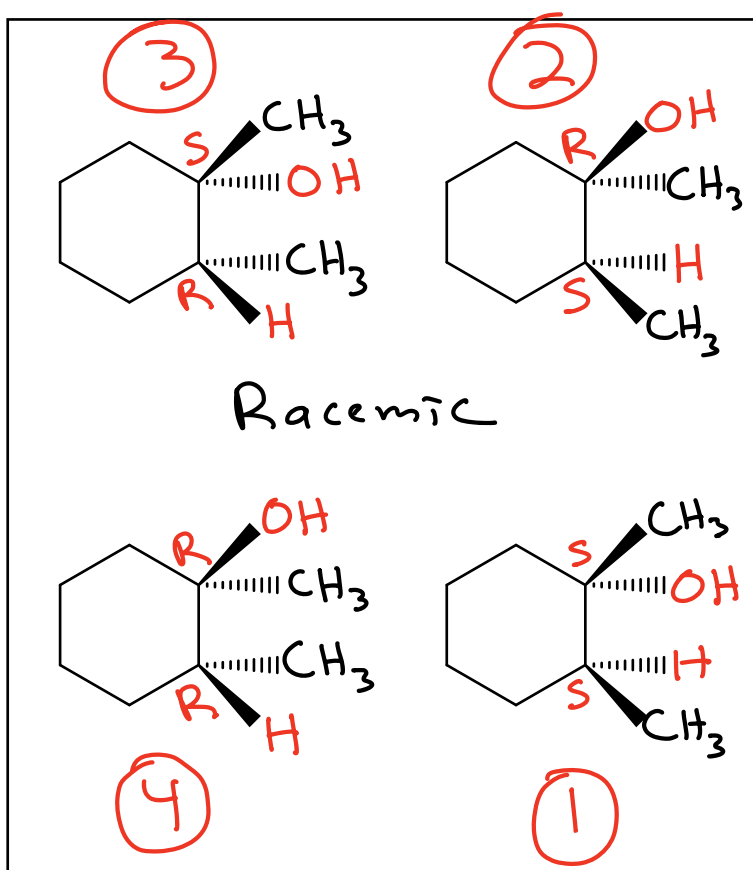
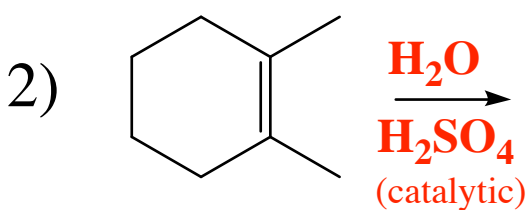
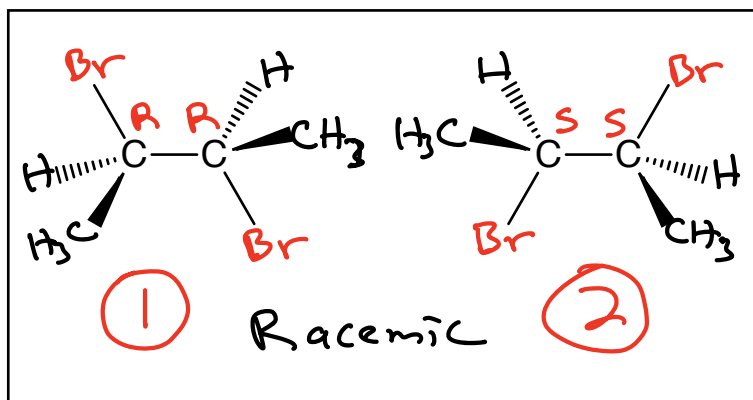
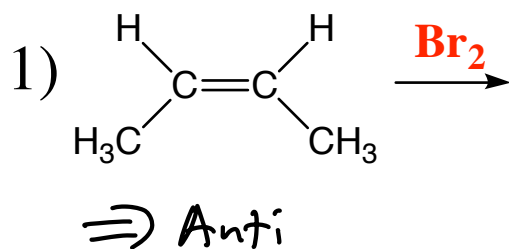
(1)



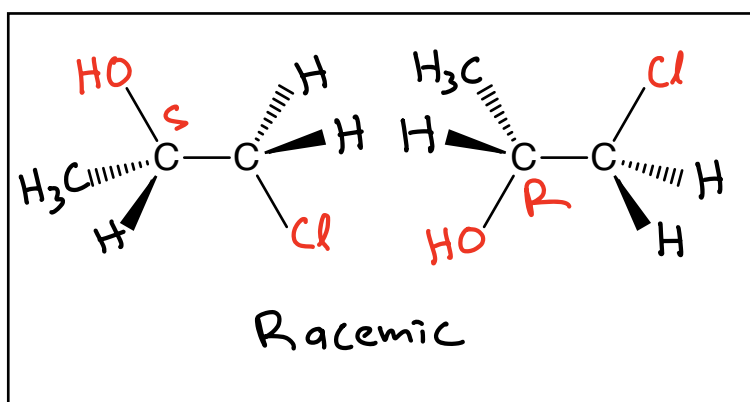
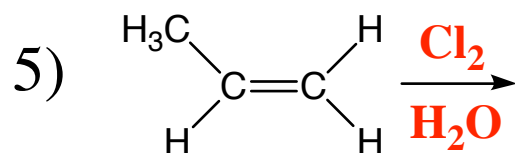
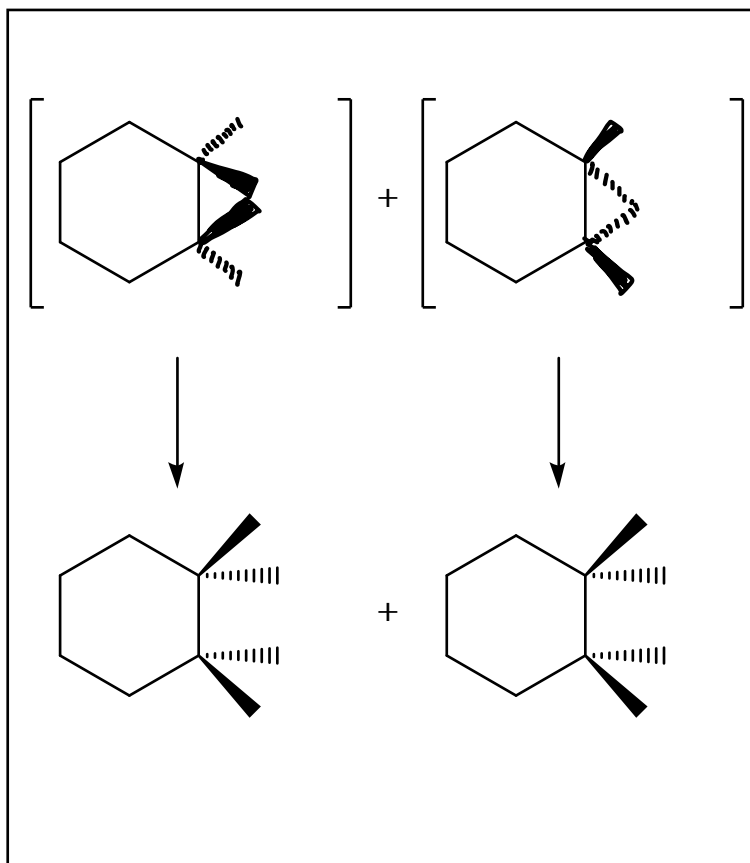
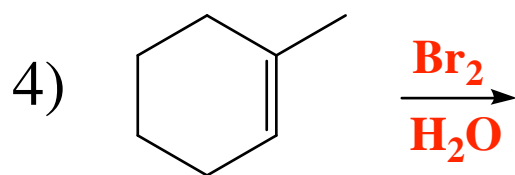
(2)



Examples



More Examples



⇒ Mixed

⇒ Markovnikov