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

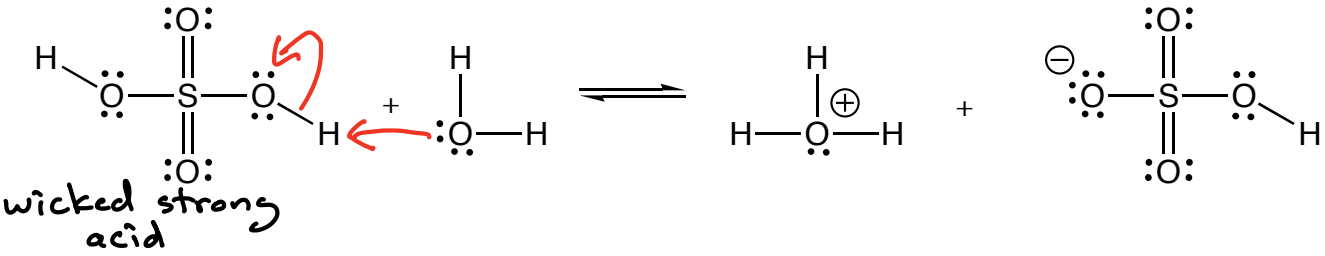
Here is Team Ochem Iverson's unique registration link:
https://raceroster.com/events/2025/102453/run-for-the-water/register?team=871280

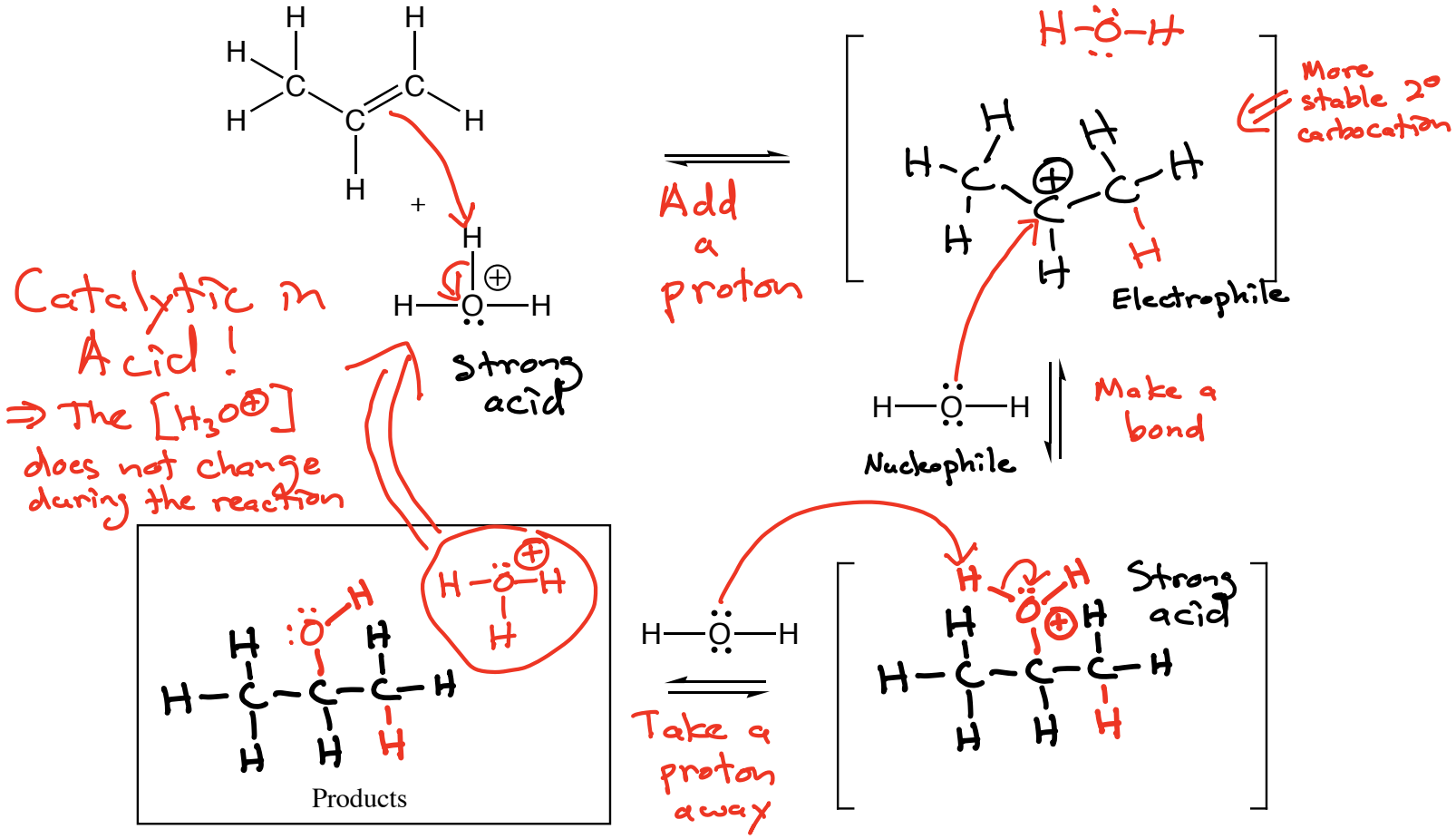
And if you won't be running but would like to support Gibert and the Gazelle Foundation, you can volunteer at the packet pickup before the race, or during the race you can work at a water stop (water stops 3,4,5 and 6 are going to be staffed by UT students like you!) where you provide water for the runners.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



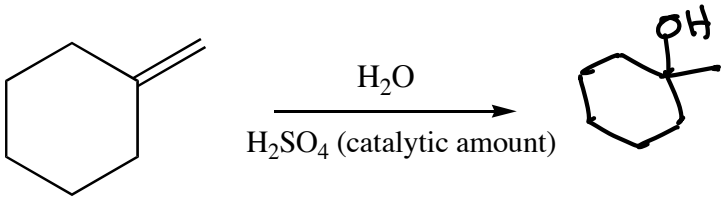


Summary: Proton adds to make a carbocation intermediate, water attacks to make a new bond, take a proton away to make the product alcohol. Catalytic in $H_3O^{\oplus}$

Regiochemistry: Markovnikov's Rule

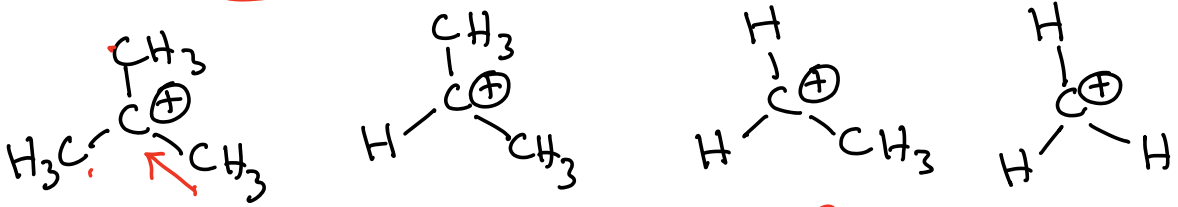
Stereochemistry: Mixed (time capsule)

Example:



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

Carbocation stability → the more C atoms bonded to the C⊕ the more stable



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

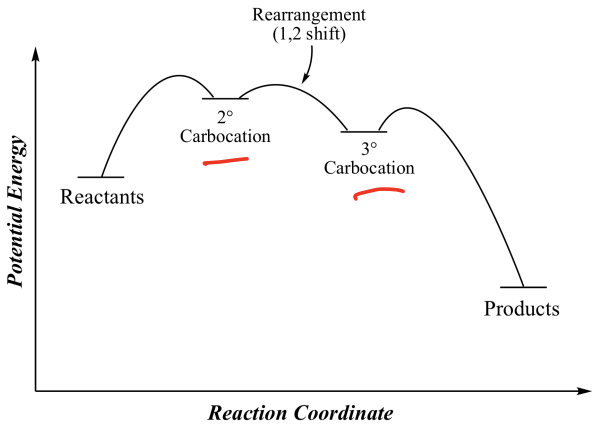
Hyperconjugation stabilization

Inductive effect stabilization

Carbocation Stability

Markovnikov's Rule → For alkene reactions involving a carbocation intermediate the nucleophile (ex. :Br:⊖) will make a bond to the more substituted C atom → derived from the more stable carbocation

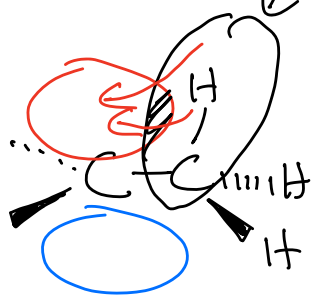
Carbocation intermediates can sometimes rearrange (Called 1,2 Shift) If a carbocation intermediate of equal or greater stability can be produced by shifting an adjacent H atom (or rarely an alkyl group), rearrangement will compete with product formation to give a mixture of products.



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

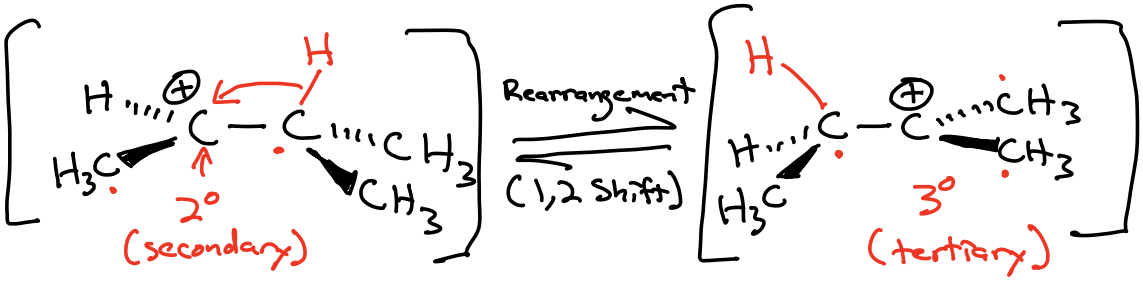
Opportunity → The mechanism is really just hyperconjugation "taken to the extreme"

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



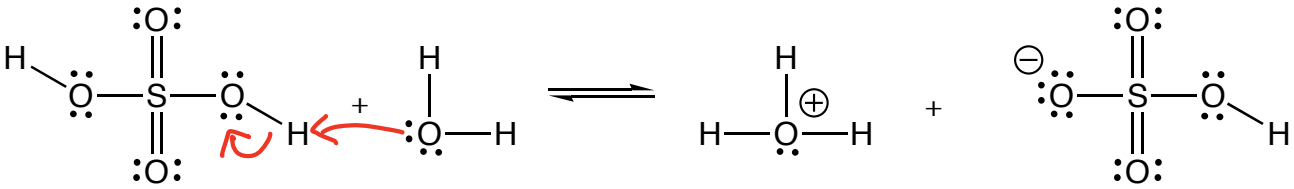
delocalizes the ⊕ charge

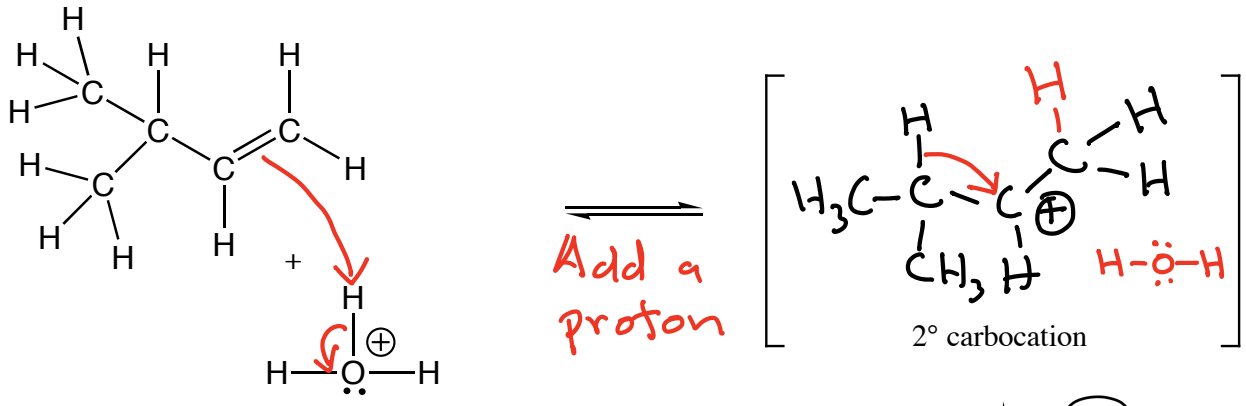
Some electron density of the C–H σ bond is pulled into the empty 2p orbital (red arrows in the figure)

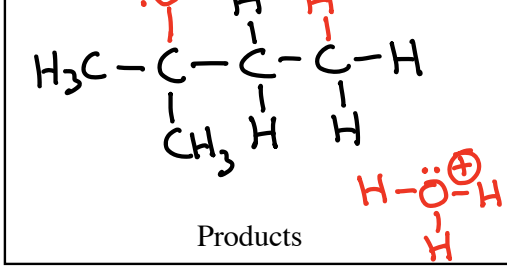


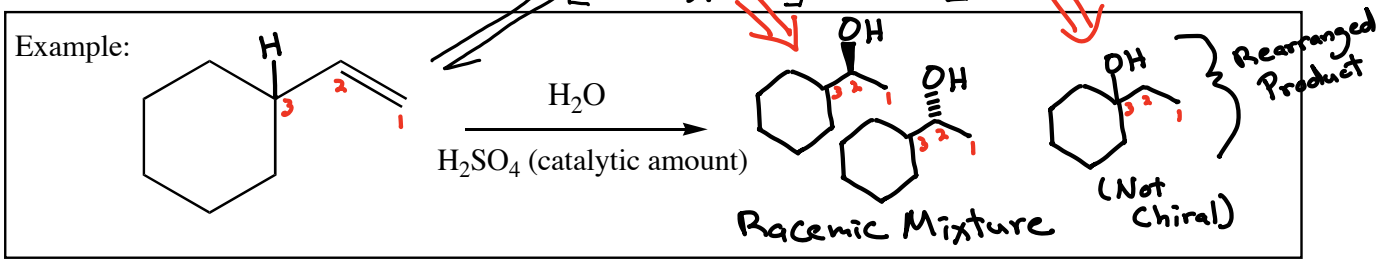
More Stable Carbocation

Cation Rearrangement

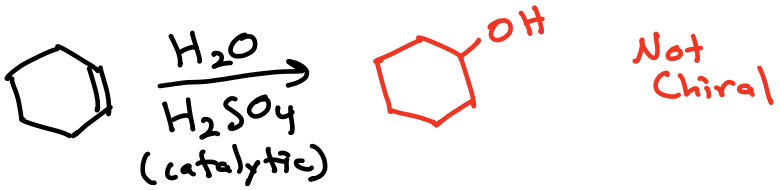




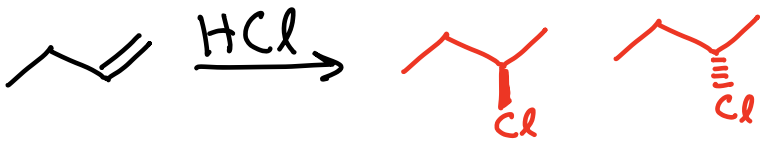




Examples



Not Chiral



Racemic Mixture

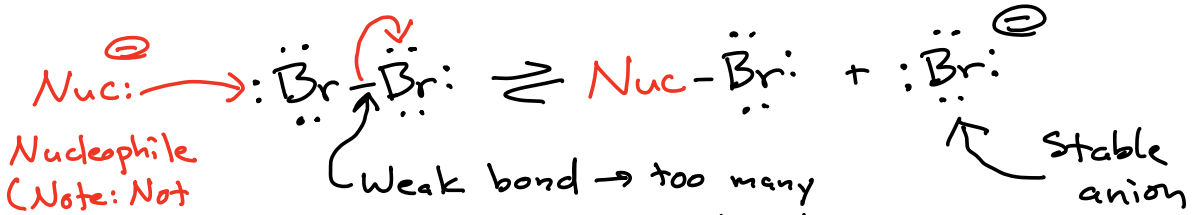
Not Chiral

(Only draw the rearranged product)

Not Chiral

New definition of an electrophile →

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



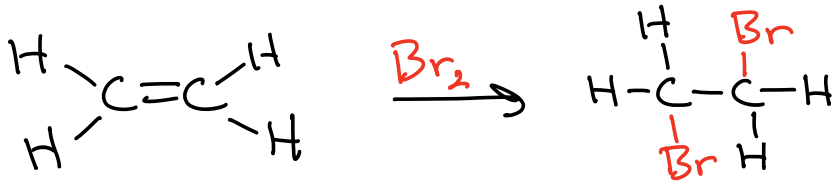
Nucleophile (Note: Not all nucleophiles have a ⊖ charge)

Weak bond → too many lone pairs close to each other

Cl_2, Br_2, I_2 (not F_2)

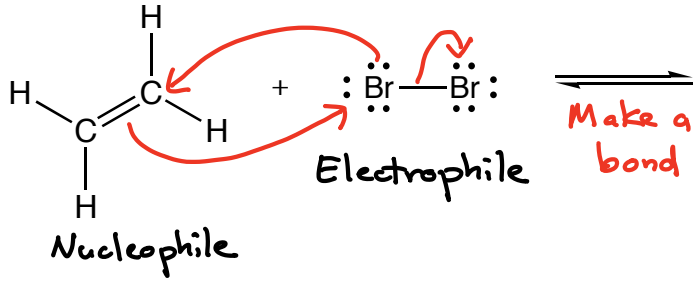
Electrophiles

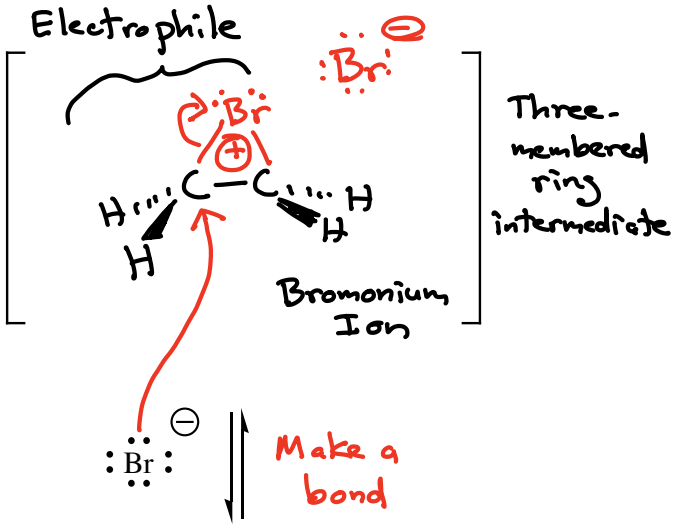
Overall New Reaction



"adjacent" → Vicinal Dihalide

Alkene Halogenation

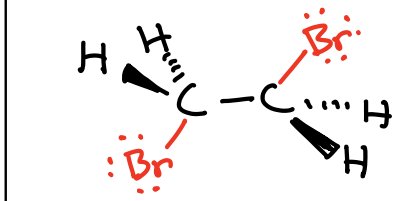




Called "anti" addition stereochemistry

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"

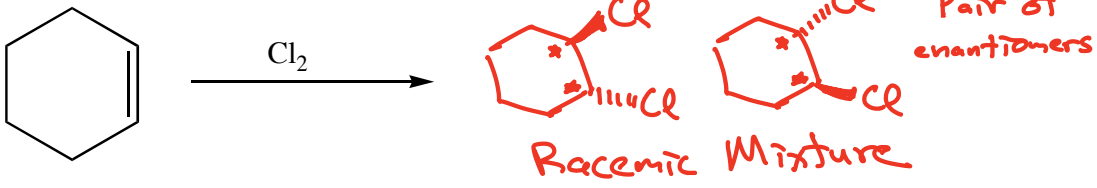


Summary: Alkenes react with X_2 to give a three-membered ring intermediate, then a new bond is made by $X^{\ominus}$ reacting from behind the C-X bond of the intermediate.

Regiochemistry: Not applicable → Br is on both atoms

Stereochemistry: Anti addition geometry → trans products

Example:

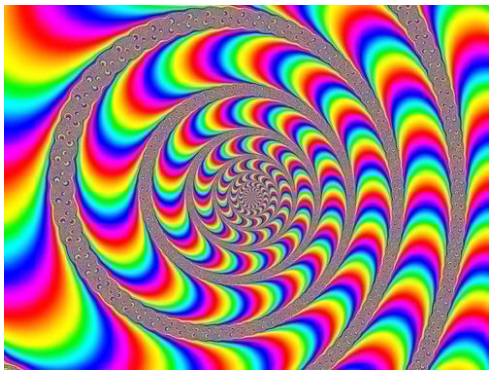


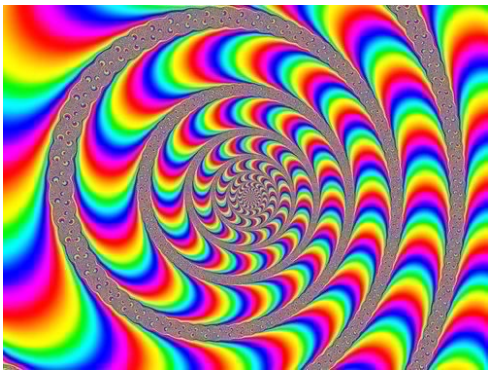
Alkene Reaction Stereochemistry Possibilities

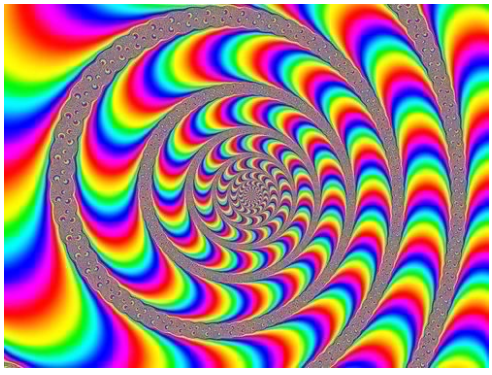
Anti → groups add to opposite faces of the original double bond

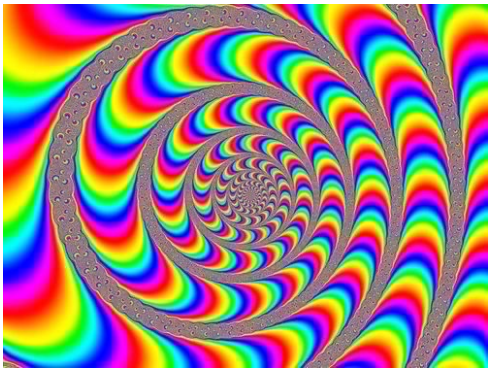
Syn → groups add to the same face of the original double bond

Mixed → groups add both anti and syn in the reaction



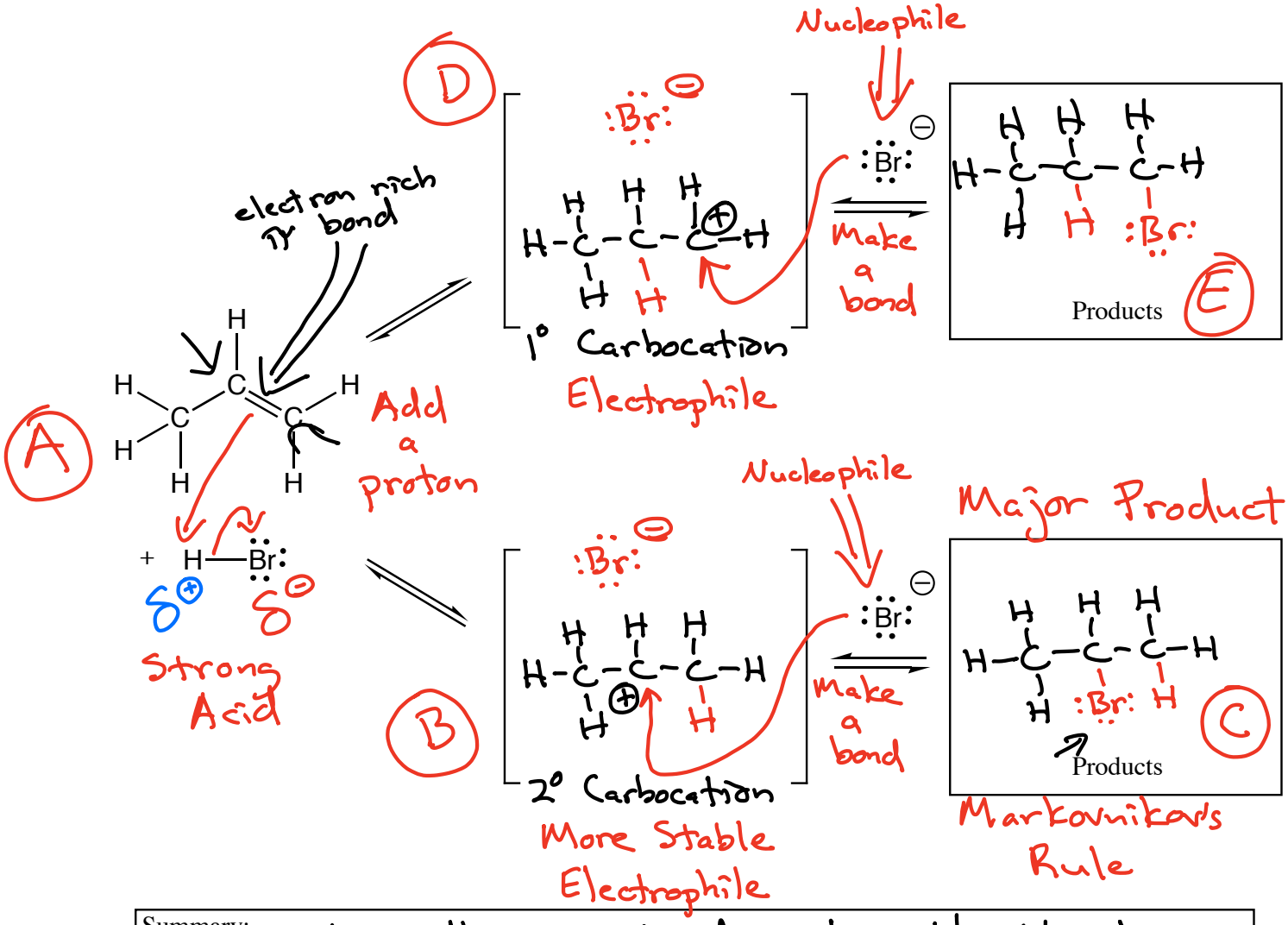






Addition of H-X to an Alkene

X = Cl, Br, I but not F

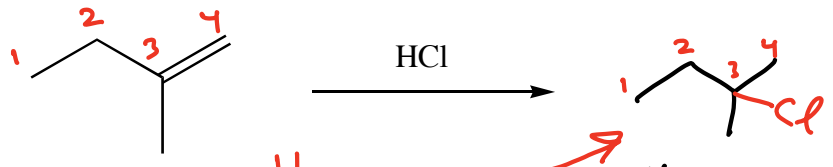


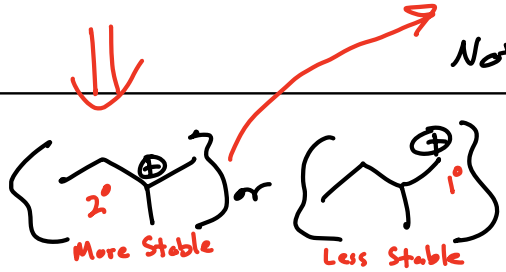
Summary: The alkene pi bond reacts with the strong acid H-X to add a proton, creating a carbocation intermediate that makes a bond with the nucleophile $X^{\ominus}$ to give the product.

Regiochemistry: Markovnikov

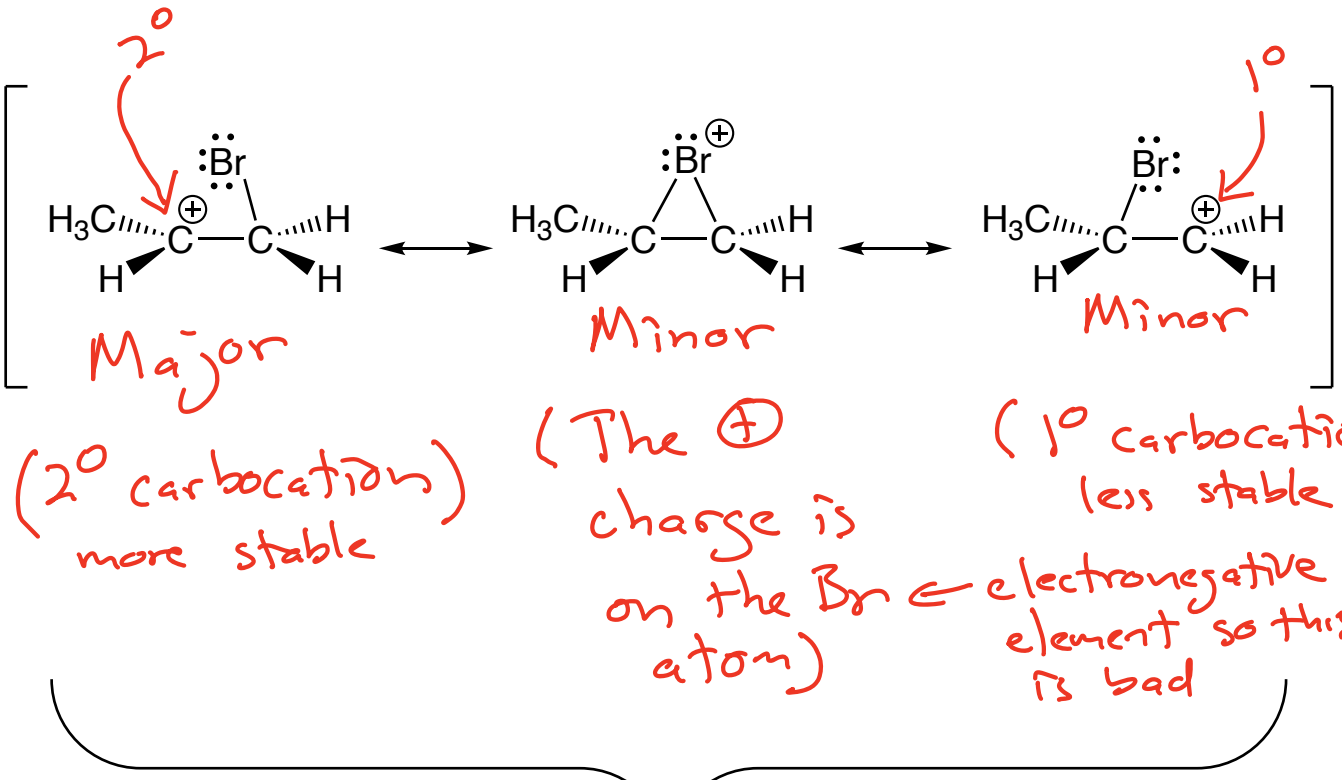
Stereochemistry: Mixed (fine capsule) → Racemic Product

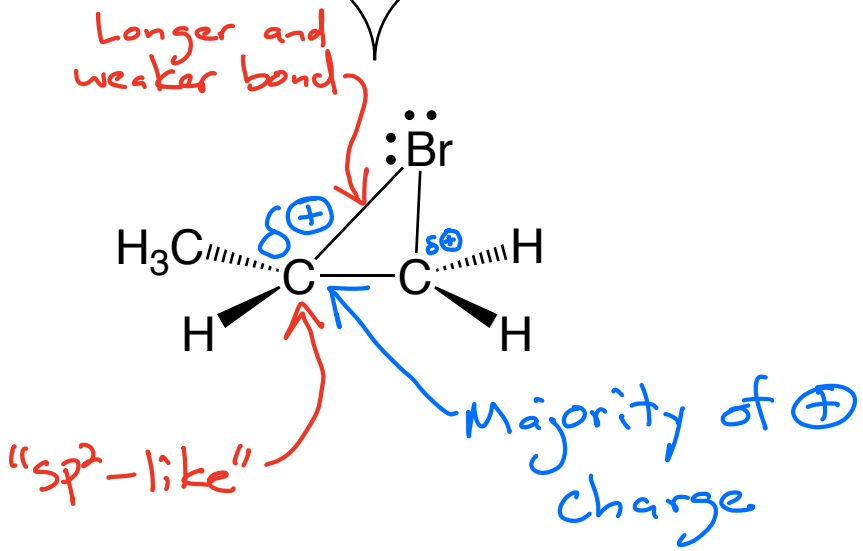
Example:





How to think about unsymmetrical halonium ions



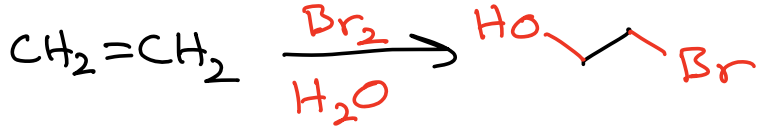


Complication → Some intermediates and products are chiral

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.

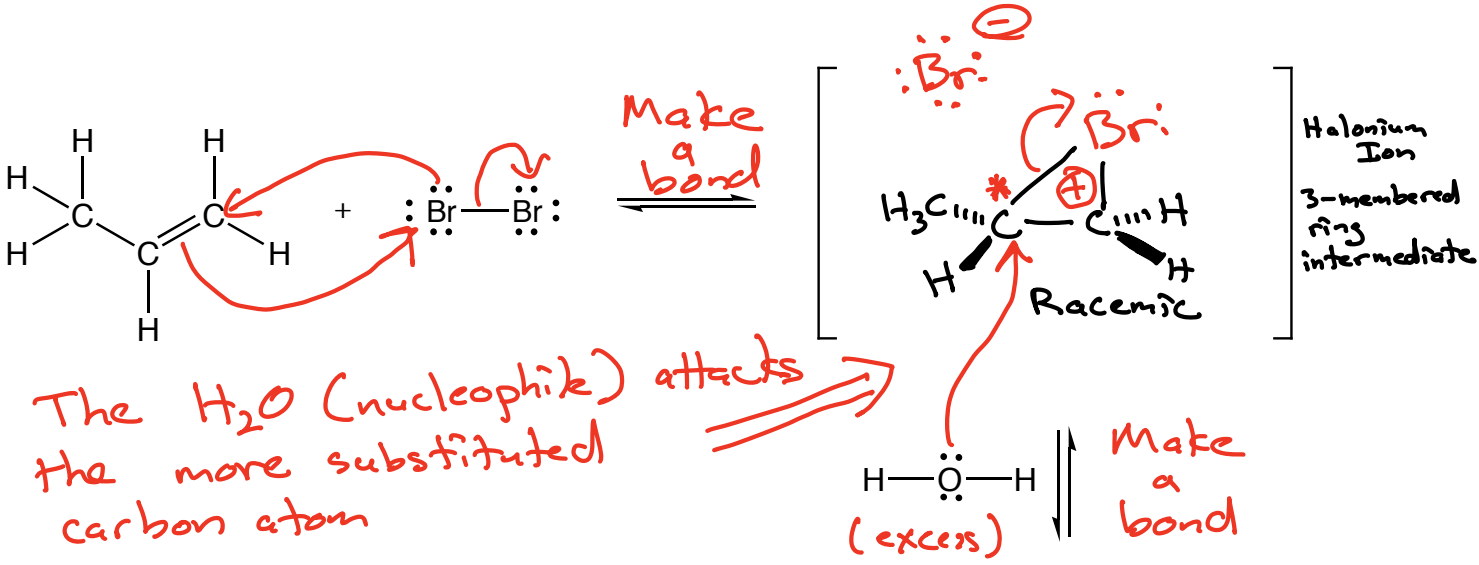
Again this is for mechanism problems only

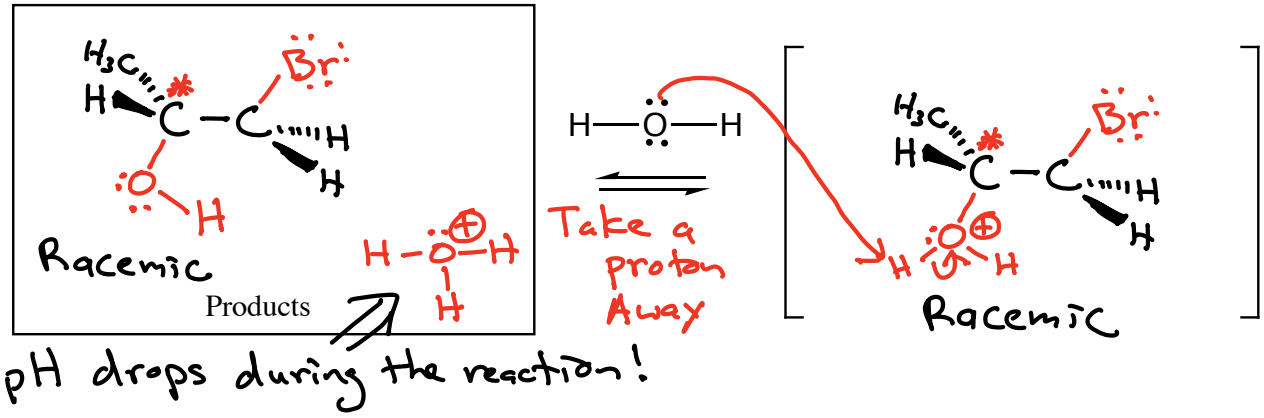
New overall reaction: Halohydrin Formation



Called a halohydrin

Alkene Hydrohalogenation





Summary: Alkene reacts with X_2 to give a 3-membered ring intermediate (halonium ion) → 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: