https://www.youtube.com/watch?v=iKLXEAPjwAw&t=10s



9:57 AM Tue Mar 19
beaumontenterprise.com
91%
BEAUMONT ENTERPRISE
SUBSCRIBE FOR ONLY 25¢ Sign in
Spring Sale: Only 25¢! Dig into your local news with full digital access. ACT NOW

Brain cancer patient wins Gusher Marathon

By **Avi Zaleon**
Updated March 11, 2013 11:27 a.m.



Iram Leon and daughter Kiana Leon finish the Gusher Marathon in 3 hours 7 minutes and 35 seconds taking first place in the full marathon on Saturday, March 9, 2013. Photo taken: Randy Edwards/The Enterprise

A man racing against time crossed the finish line. His daughter, snugly sitting in a stroller he had been pushing for just over 26 miles, gained a memory that may live longer than her father.

"This is supposed to eat away at my memory in the end," Iram Leon said of the cancer in his left temporal lobe. "But I hope this memory is one of the last things to go and one she never loses."

Leon is 32 years old. He said his doctors have told him, "we're probably not going to beat this. We're just hoping to get you to 40."



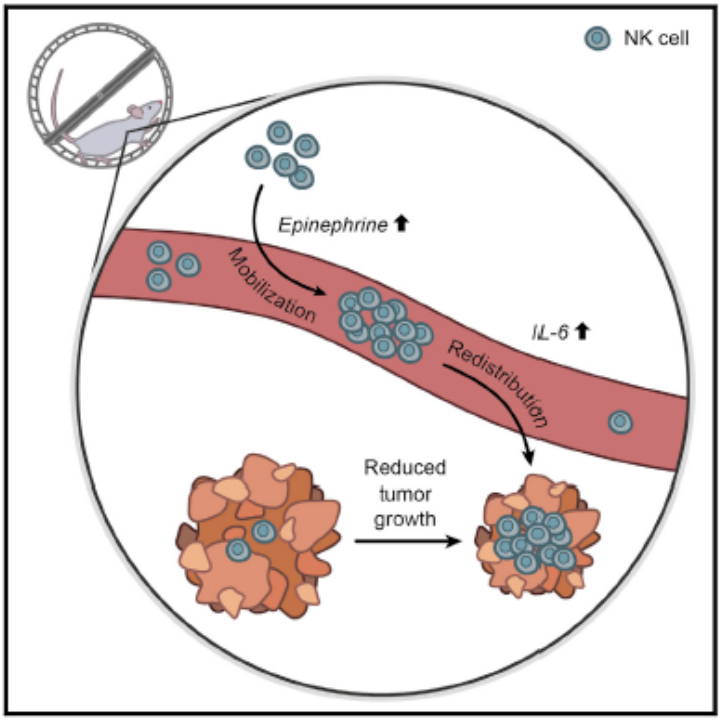


Short Article

Cell Metabolism

Voluntary Running Suppresses Tumor Growth through Epinephrine- and IL-6-Dependent NK Cell Mobilization and Redistribution

Graphical Abstract



Authors

Line Pedersen, Manja Idorn, Gitte H. Olofsson, ..., Bente K. Pedersen, Per thor Straten, Pernille Hojman

Correspondence

phojman@inflammation-metabolism.dk

In Brief

The beneficial effects of exercise are countless. Pedersen et al. now link exercise, cancer, and immunity and reveal that exercise decreases tumor incidence and growth by over 60% across several mouse tumor models through a direct regulation of NK cell mobilization and trafficking in an epinephrine- and IL-6-dependent manner.

Highlights

- Exercise reduces tumor incidence and growth in several mouse models
- Exercise increases NK cell infiltration, thereby controlling tumor growth
- Epinephrine mobilizes NK cells and β-blockade blunts the tumor suppression
- Exercise-induced muscle-derived IL-6 is involved in NK cell redistribution

Accession Numbers

GSE62628

Pedersen et al., 2016, Cell Metabolism 23, 1–9
March 8, 2016 ©2016 Elsevier Inc.
http://dx.doi.org/10.1016/j.cmet.2016.01.011

CellPress

It Can Keep Cancer in Remission. Why Is No One Talking About It?

Despite mounting evidence that exercise programs can improve cancer outcomes, access to them remains limited.

Listen · 5:48 min
Share full article
973



Jeff Swensen for The New York Times



By Nina Agrawal

Published Oct. 6, 2026 Updated Oct. 7, 2026

Leer en español

Sign up for the Well newsletter. Essential news and guidance to live your healthiest life. Get it sent to your inbox.

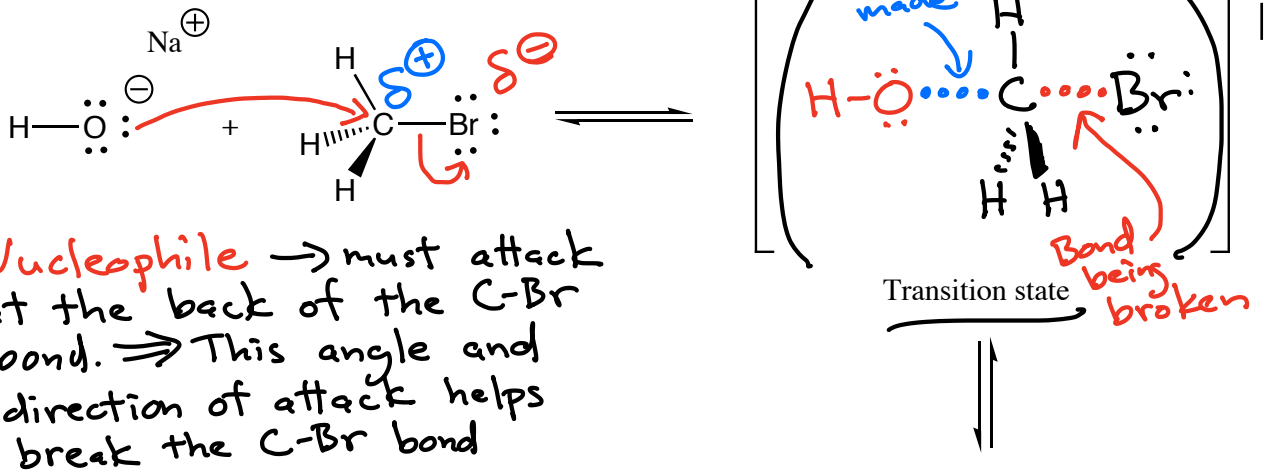
Lee Colker powered on an iPad in the basement of his Pittsburgh home and logged into a virtual exercise session with Olivia Masten, a trainer who specializes in working with cancer patients.

Mr. Colker, 66, had been dealing with unpredictable fatigue and brain fog since beginning a clinical trial for metastatic kidney cancer this year. When staff at the University of Pittsburgh Medical Center told him an exercise program could improve his energy, he jumped at the opportunity. “That was a clincher for me,” he said.

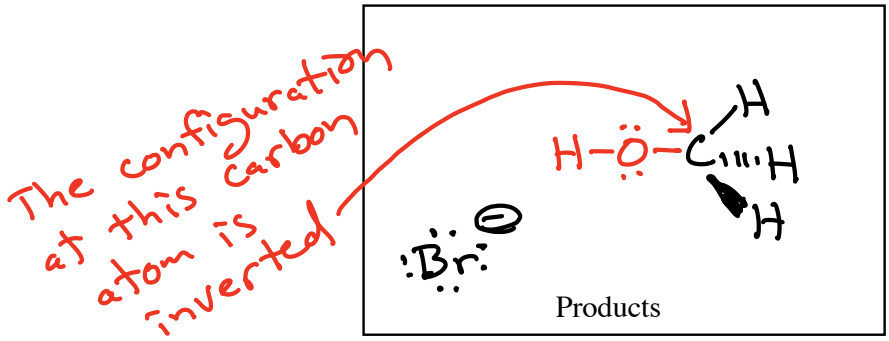
The program is part of a growing effort around the country to help cancer patients exercise, as the benefits of doing so become increasingly clear.

Observational research has long suggested that exercise improves cancer survival, particularly for breast cancer patients. Last year, a landmark randomized controlled trial showed that colon cancer patients who participated in a structured exercise program with a trainer-coach over three years were less likely to see their cancers come back and had a better quality of life. Among those in the program, 90 percent were alive after eight years, compared with 83 percent in the control group.

The S_N2 Mechanism



Nucleophile → must attack at the back of the C-Br bond. ⇒ This angle and direction of attack helps break the C-Br bond

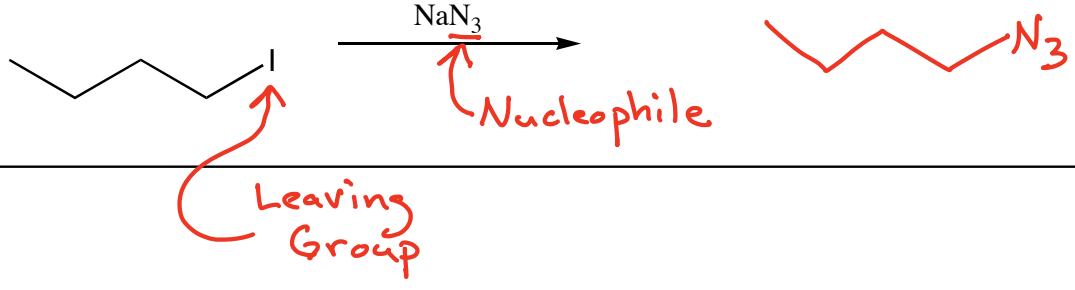


Summary: The nucleophile attacks by making a new bond to C from the back of the C-X bond just as X leaves

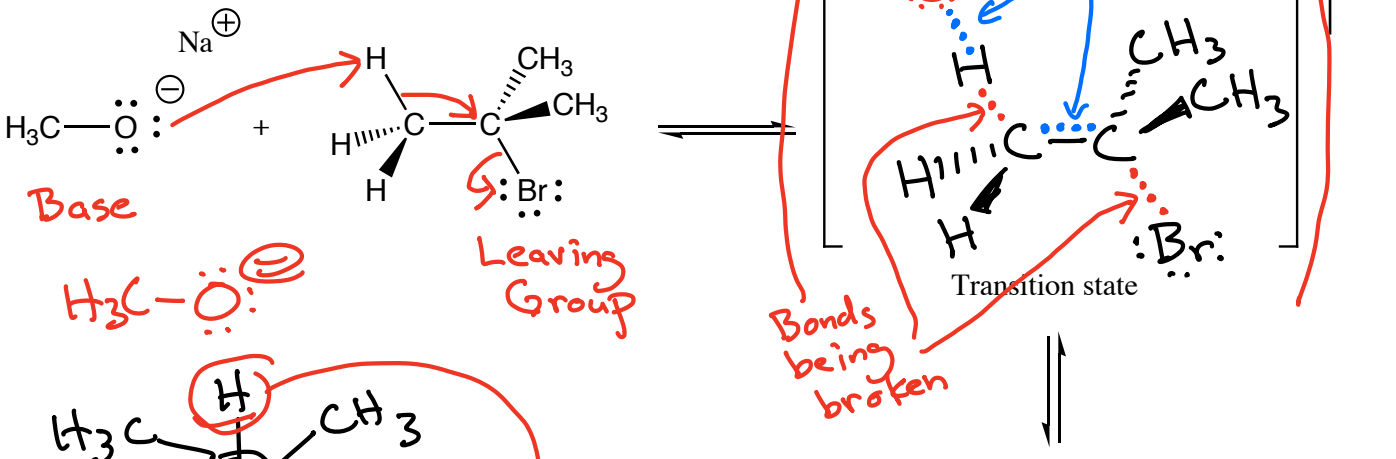
Regiochemistry: N/A

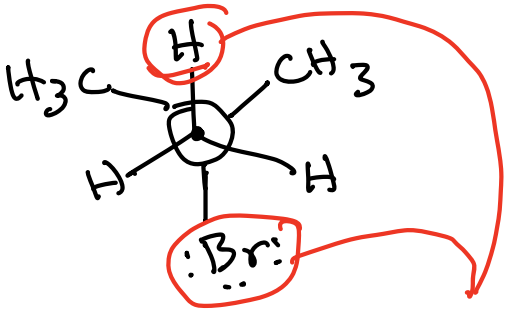
Stereochemistry: INVERSION at the site of reaction

Example:

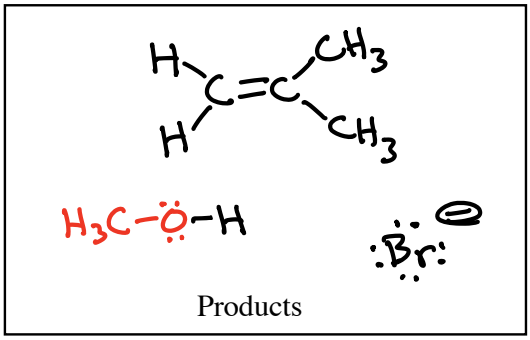


The E2 Mechanism





The H that is leaving and the Br must be anti-periplanar

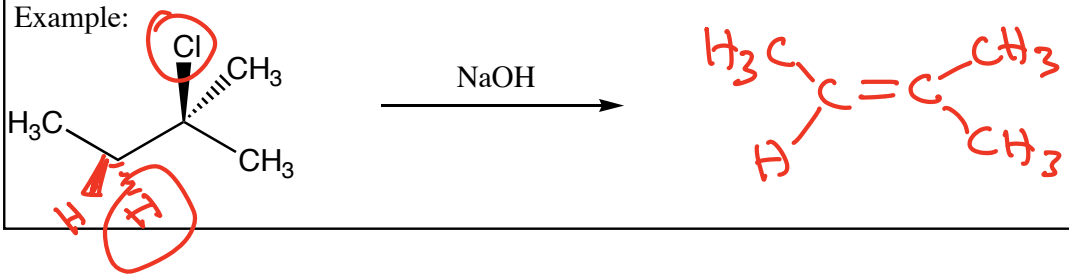


Summary: Base removes an H atom as a pi bond forms and the Br atom leaves → The H and Br must be anti-periplanar

Regiochemistry: Zaitsev's Rule → most stable alkene product

Stereochemistry: Determined by anti-periplanar transition state

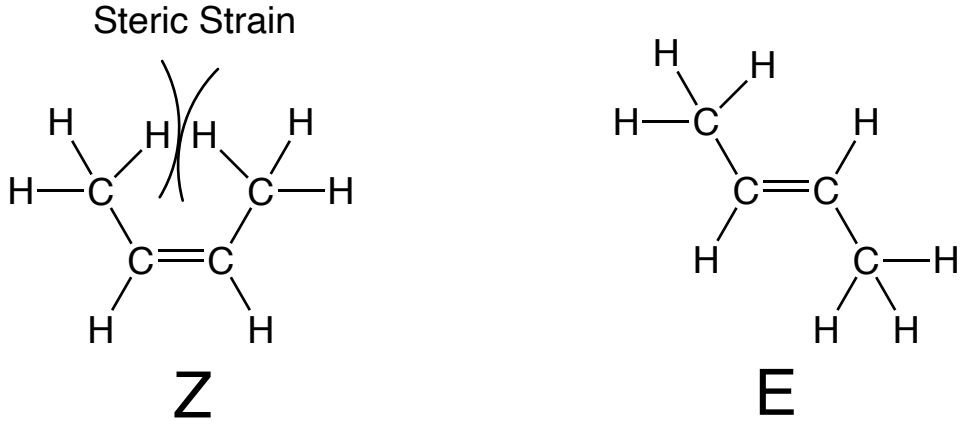
Example:



From Week 6

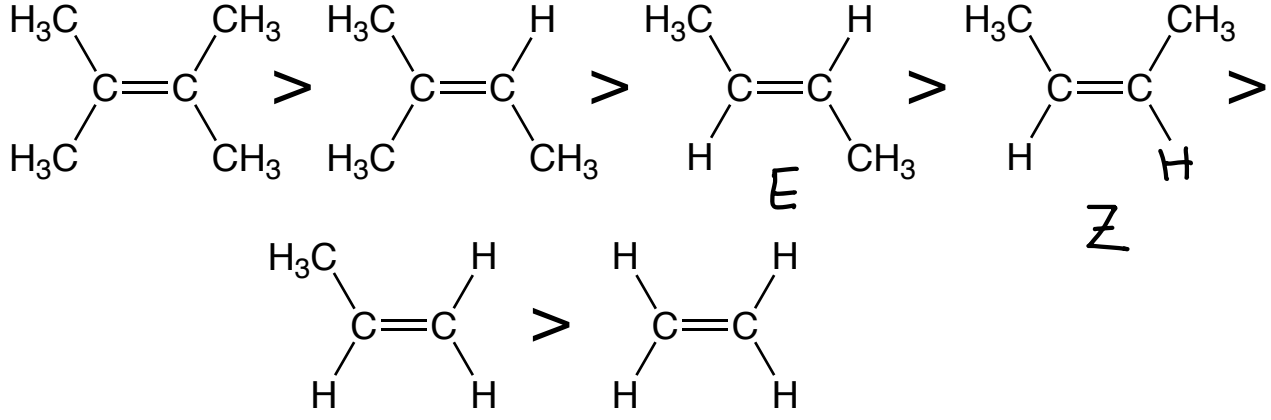
Special Alkene Bonus: Important material you will need to know!

Alkene stability part 1: Z (cis) groups larger than H atoms will crunch into each other causing steric strain.



Alkene stability part 2: For reasons we are not able to tell you, more substituted alkenes have more stable (stronger) pi bonds than alkenes with more H atoms on their sp^2-hybridized C atoms (despite there being steric strain present in the most substituted alkenes).

Strongest Pi Bond



Weakest Pi Bond



Time Capsule: Zaitsev's rule follows this trend!!

Zaitsev's Rule ⇒ When there is a choice, the more stable alkene will be the predominant product.

More alkyl groups (fewer H atoms on the sp^2 C atom of alkene (trans over cis)

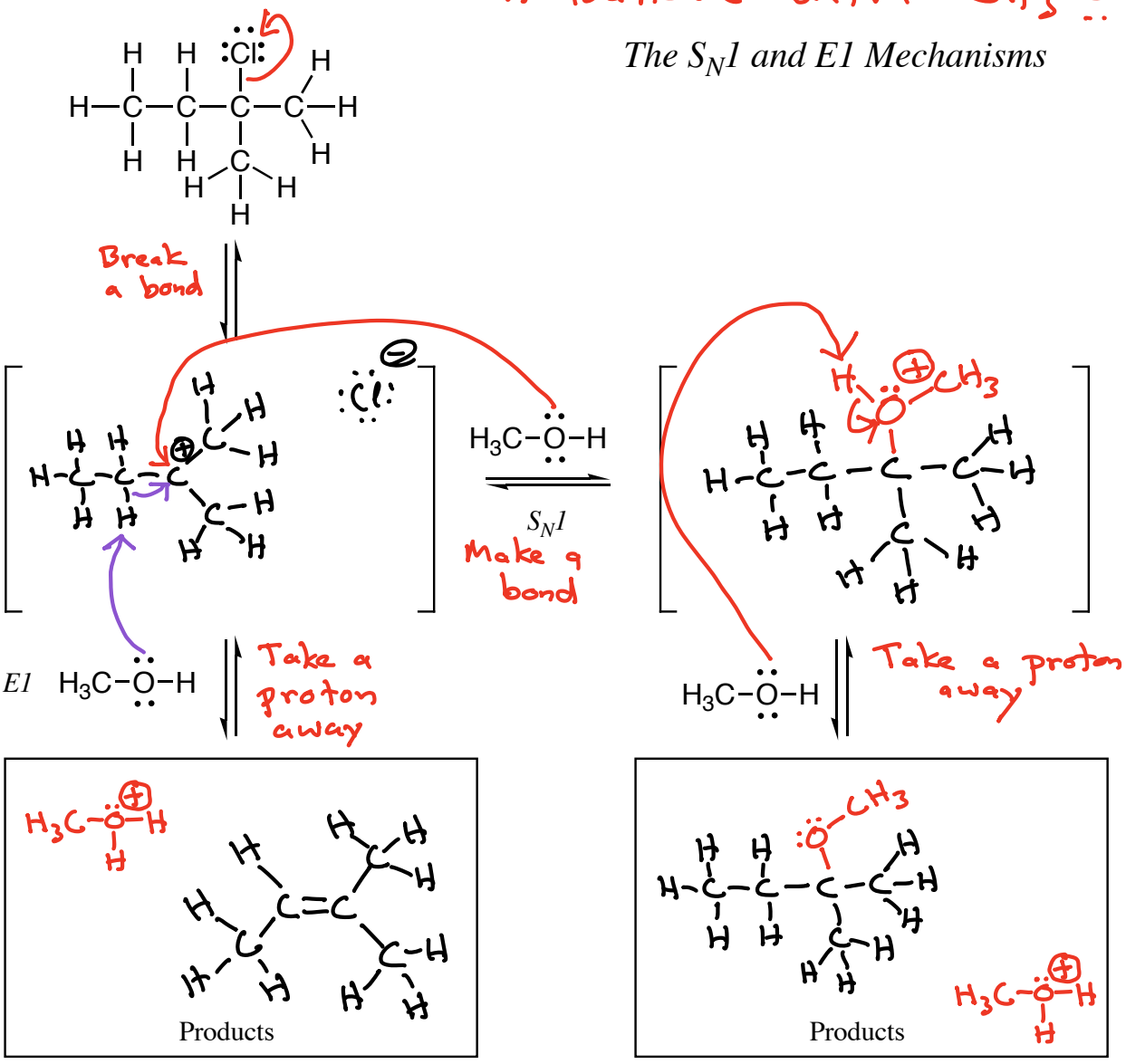
3rd and 4th Mechanisms → these always occur together

S_N1 and E1

Unimolecular → only the haloalkane is involved in the rate-limiting (slow) step of the reaction

Haloalkane with $CH_3\ddot{O}-H$

The S_N1 and E1 Mechanisms

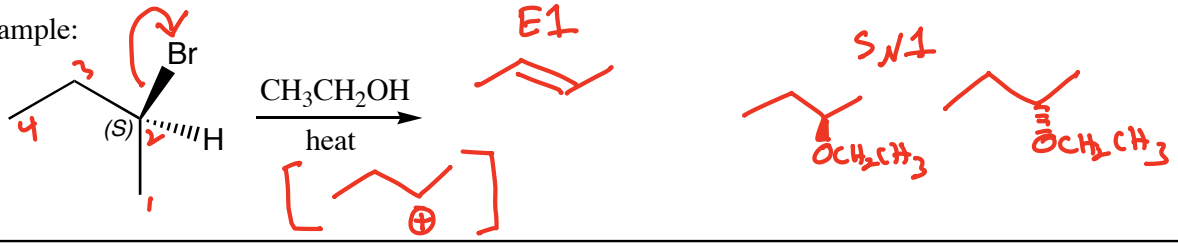


Summary: For sterically hindered haloalkanes, the C-X bond breaks to give a carbocation intermediate that either reacts as an electrophile (S_N1) or has a proton taken away (E1)

Regiochemistry: E1 → Zaitsev's Rule

Stereochemistry: S_N1 → Scrambled → not quite 1:1 exactly

Example:



These four mechanisms $S_N2, E2, S_N1, E1$ compete with each other

To understand which mechanism is appropriate, we analyze:

1) The nucleophile/base
2) The nature of the haloalkane

Nucleophiles are also bases

↓ Electron rich molecule that can make a new bond

↓ Electron rich molecule that can bond to a proton

Table of Nucleophiles

Strong Nucleophiles

Br^-, I^-, $R\text{-}S^-$, $H\text{-}S^-$, $N{\equiv}C^-$, N_3^-

$R\text{-}C{\equiv}C^-$, $R\text{-}O^-$, $H\text{-}O^-$ **Strong Bases**

Medium Nucleophiles

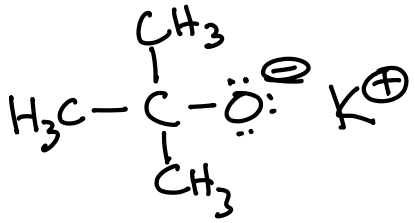
$R\text{-}CO_2^-$, R-S-H, R_2S,
NH_3, RNH_2, R_2NH, NR_3

Weak Nucleophiles

$R\text{-}CO_2H$, R-O-H, H_2O **Very Weak Bases**

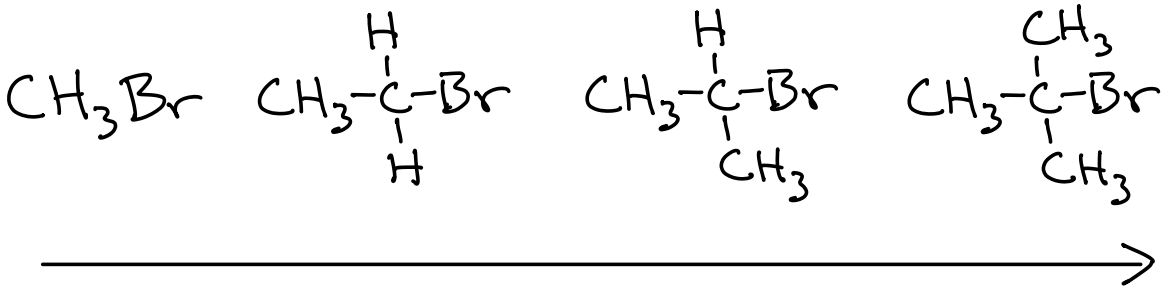
Special Case

***Tert*-Butoxide ($tBuO^-$) is a strong base, but is not a nucleophile due to steric hindrance.**



"KOtBu"
or
"$tBuO^-$"

Haloalkanes



S_N2 preferred

S_N2 prevented (steric strain)



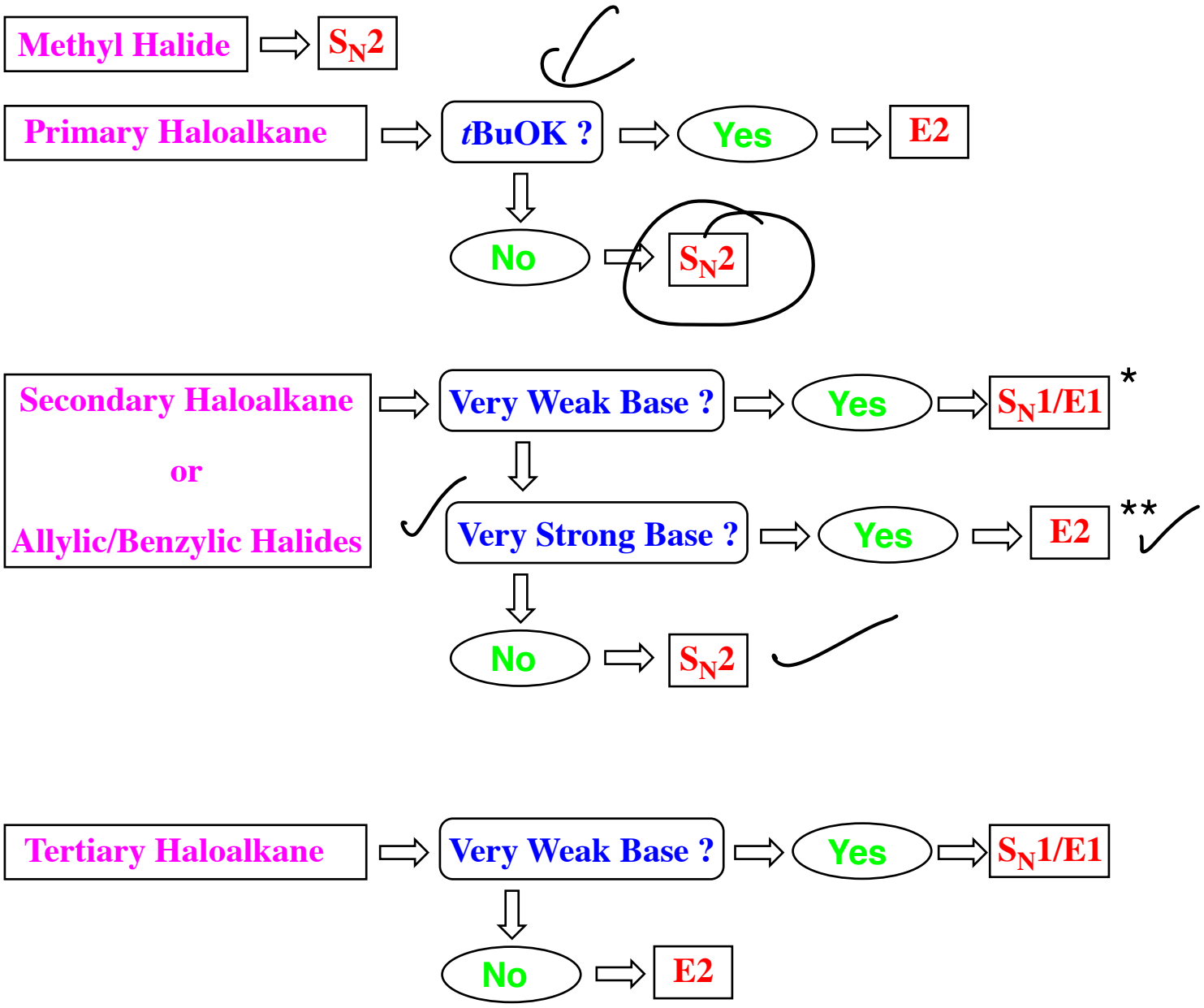
Carbocation Stability

No $S_N1/E1$ (unstable carbocation)

Favors $S_N1/E1$ (more stable carbocation)

Strong base prefers E2

Substitution/Elimination Decision Map

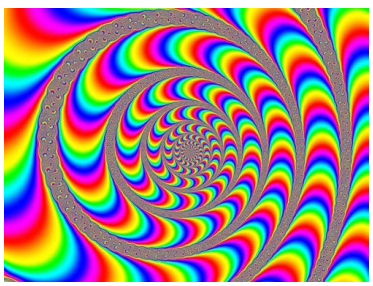


For S_N2 Remember Chiral Center InVERSiON
For E2 Remember anti-periplanar and Zaitsev
For S_N1 Remember Chiral Center Scrambling
For E1 Remember Zaitsev

* Note: With Very Weak Bases, SN2 can compete here, but for the purposes of this class, assume SN1 / E1 predominate

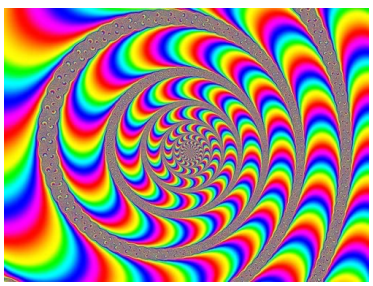
** Note: If tBuOK is the very strong base, an appreciable amount of a non-Zaitsev product can be formed because the bulky tBuOK will tend to react with the most accessible H atom.





Flashback

Oct. 20



Epic New Reaction



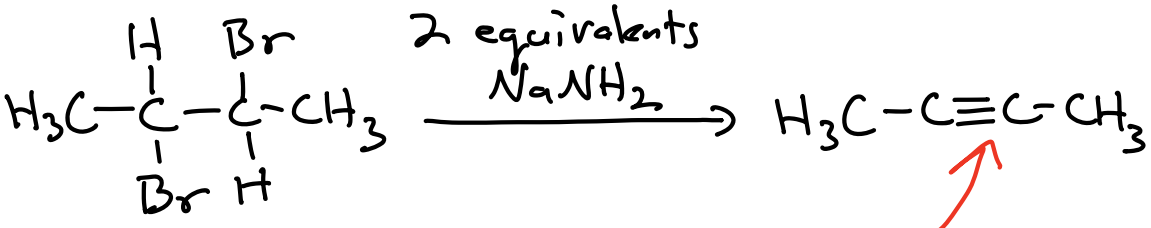
A primary haloalkane



Time capsule: This is an S_N2 reaction. The haloalkane must be primary to avoid an E2 reaction.



c) Conversion of a vicinal dihalide into an alkyne



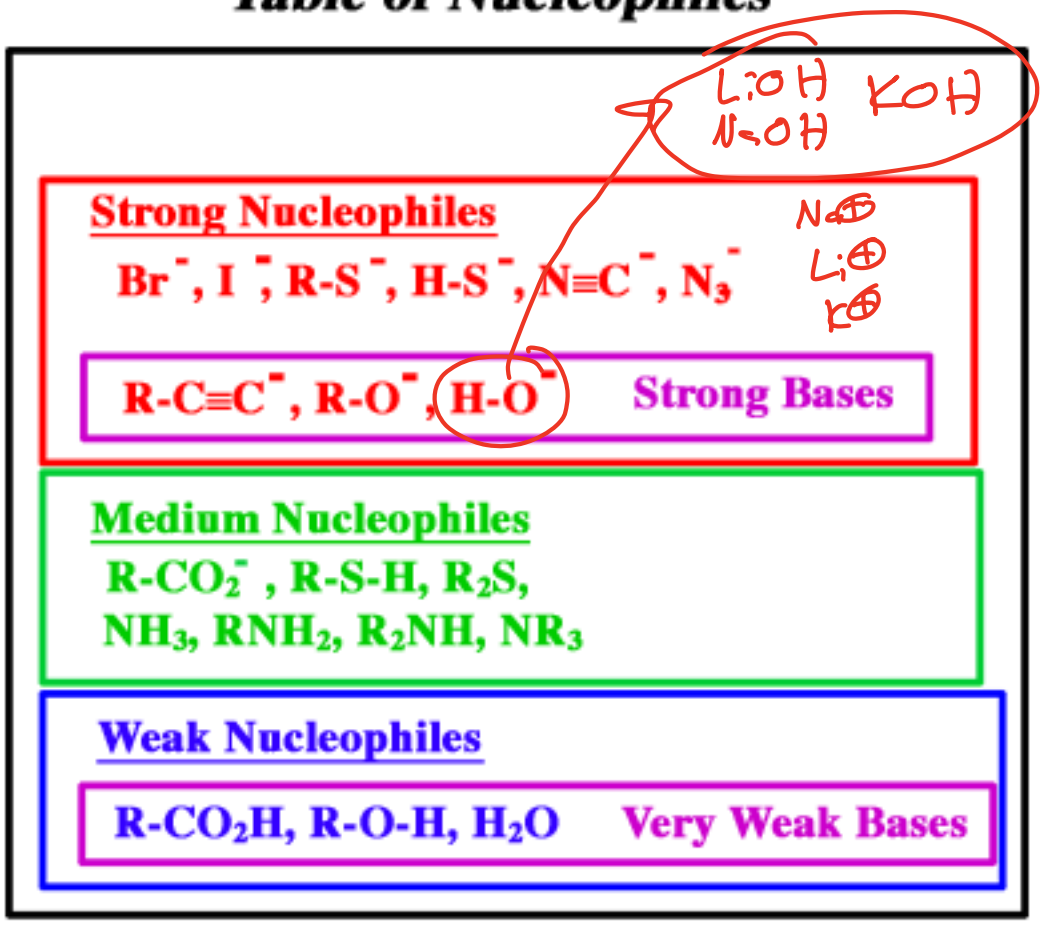
Vicinal dihalide

Note this alkyne is not terminal (it is not on the end)



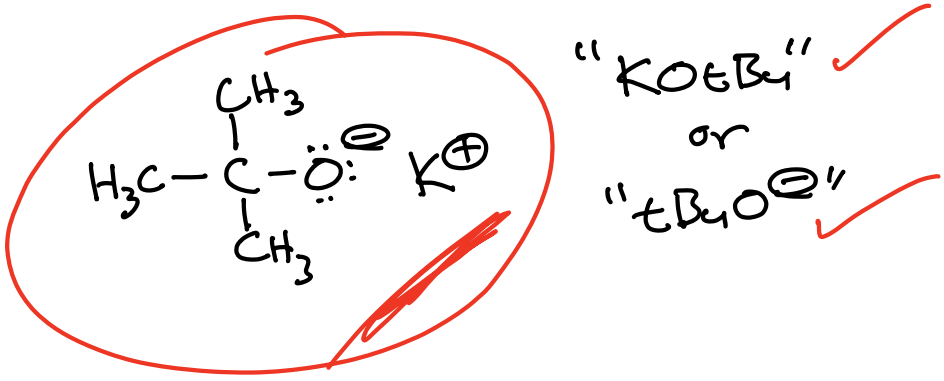
Time capsule → This is a double E2 reaction

Table of Nucleophiles

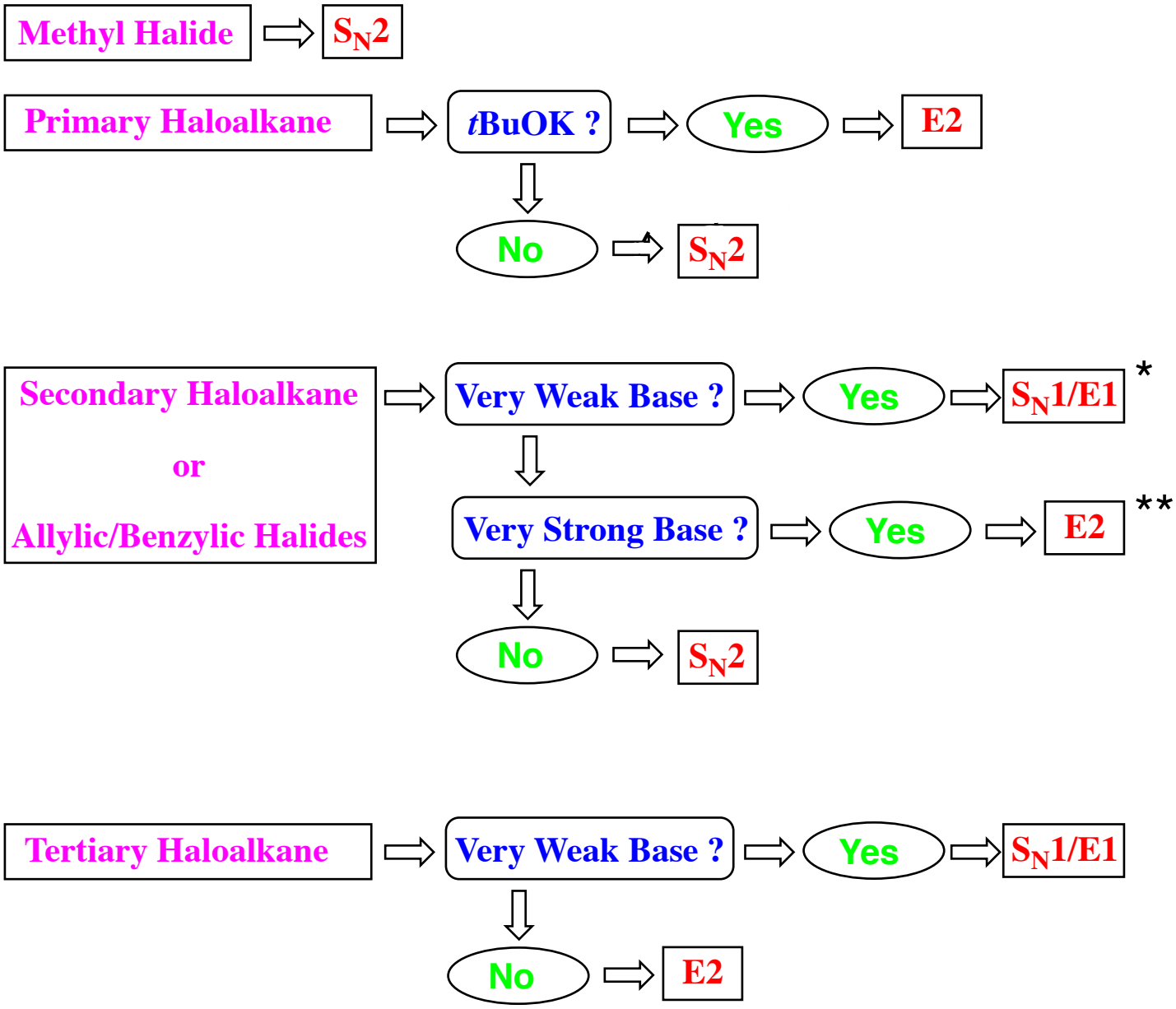


Special Case

Tert-Butoxide ($tBuO^-$) is a strong base, but is not a nucleophile due to steric hindrance.



Substitution/Elimination Decision Map



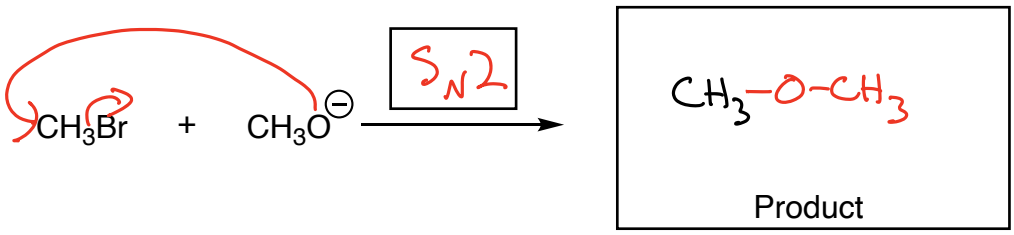
For S_N2 Remember Chiral Center InVERSiON
For E2 Remember anti-periplanar and Zaitsev
For S_N1 Remember Chiral Center Scrambling
For E1 Remember Zaitsev

* Note: With Very Weak Bases, SN2 can compete here, but for the purposes of this class, assume SN1 / E1 predominate

** Note: If tBuOK is the very strong base, an appreciable amount of a non-Zaitsev product can be formed because the bulky tBuOK will tend to react with the most accessible H atom.

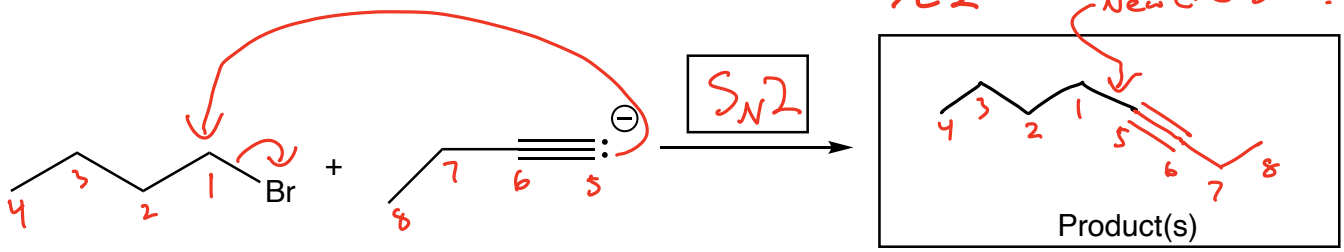
Substitution vs. Elimination Examples:

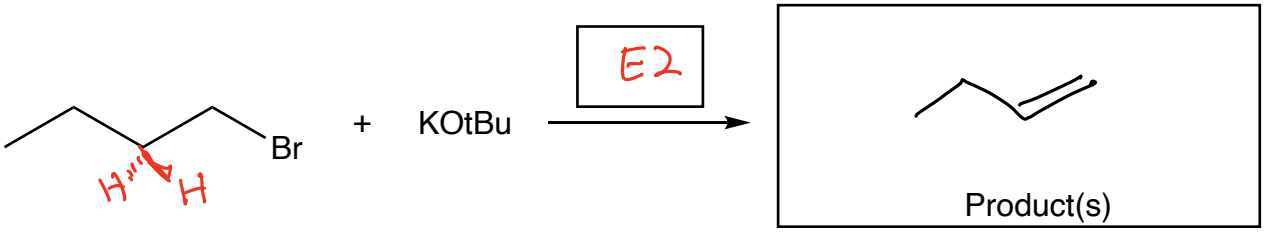
Methyl Haloalkanes (CH_3X) → Only S_N2 is possible



Primary (1°) Haloalkanes

S_N2 with all but KOtBu ($tBuO^{\ominus}K^{\oplus}$) → E2

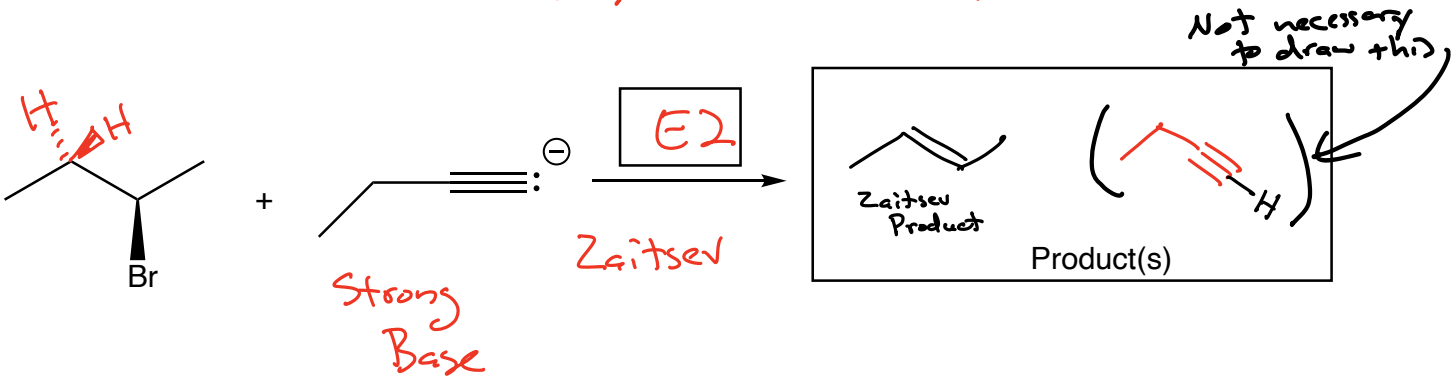


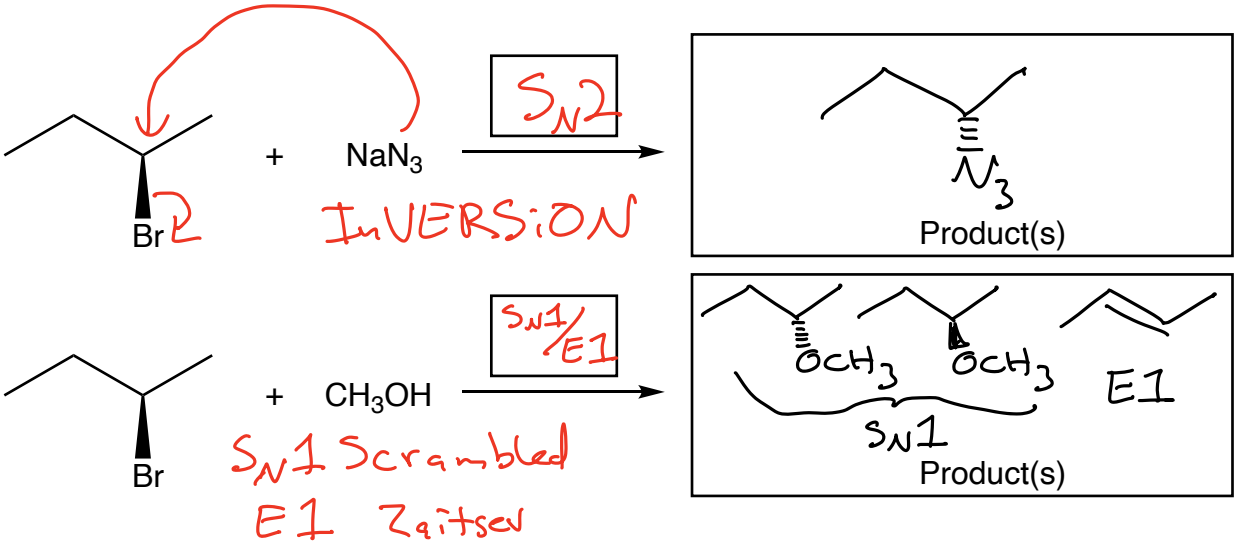


Secondary (2°) Haloalkanes → S_N2 with all but strong bases or very weak bases

→ E2 with strong bases

→ S_N1/E1 with very weak bases





Tertiary (3°) Haloalkanes

