Elimination Reactions:



Base vs. Nucleophile:

Y: H[⊕]





Base

Nucleophile

Elimination (E₁ and E₂)

Substitution (S_N 1 and S_N 2)

Types of Elimination Reactions:

1) Dehalogenation



2) Dehydrohalogenation



3) Dehydration

2 Types of Mechanisms: E_1 and E_2

<u>E₂ Reaction</u> (E=Elimination):

- Rate depends on two concentrations
- Stereospecific
- Concerted (bonds being formed and broken at the same time) - No intermediate
- Anti-periplanar geometry
- 1°, 2°, 3°, but especially primary and secondary

Dehalogenation

Example 1:



Example 2:



Dehydrohalogenation

Example 1:





need hydrogen on adjacent carbon for loss of HBr

Example 2:



Zaitsev Rule: Get the more substituted alkene



Bredt Rule: Bridged alkenes are only okay if one of the bridges is a "zero" (0) bridge in small rings <9

Example 5:



Example 6:



Example 7:



Example 8:



Example 9 A:



(anti-periplanar)

Example 9 B: Start with different stereochemistry get different product stereochemistry (a diastereomer)



Example 10:



The tert-butyl group must be placed in the equatorial position



<u>E₁ Reaction</u>:

- Rate depends on one concentration
- Not concerted (carbocation intermediate)
- Not stereospecific
- Favored with leaving group being 3°



Dehydration

-OH and -OR are not leaving groups, but H-OH and H-OR are okay

Example 1:







Elimination vs Substitution

<u>Substitution</u>

- Low Temp
- Weaker Base
- Dilute H⁺
- Leaving group on 1° carbon
- Small Nucleophile

Example 1:



VS.

$S_N 1 \longrightarrow OCH_3 \longrightarrow OCH_2CH_3 + HOCH_3$

vs.

Example 2:



Elimination

- High Temp
- Stronger Base
- Conc. H⁺
- 2°, 3°
- Large Nucleophile

Example 3: bulky nucleophiles/bases favor elimination



Example 4: small nucleophiles/bases favor substitution



Other Example 1:



Due to mechanism of Zn, the double bond is stuck at less substituted end.

Double bond can go to more substituted if it is left in acid

Addition Reactions



For alternate regiochemistry (addition of Br onto the less substituted carbon) need dialkyl peroxide



Examples of peroxides



Hydrogen peroxide HO-OH