Elimination Reactions:



VS.

Base vs. Nucleophile:



Base

Elimination (E_1 and E_2)

Substitution (S_N 1 and S_N 2)

Nucleophile

 $H_3C - X$

y⊖́

Types of Elimination Reactions:

1) Dehalogenation AwayS E2



2) Dehydrohalogenation



3) Dehydration

2 Types of Mechanisms: E1 and E2

<u>E2</u> Reaction (E=Elimination):

- Rate depends on two concentrations
- Stereospecific
- Concerted (bonds being formed and broken at the same time) - No intermediate
- follows Zaitsev Rule: most substituted alkene will be the major product
- Anti-periplanar geometry
- 1°, 2°, 3°, but especially primary and secondary

<u>E₁ Reaction</u>

- Rate depends on the concentration of one species
- Carbocation intermediate
- Teritiary carbon preferred
- Favored by heat, acid

Dehalogenation

Example 1:



(E2 elimination)

Example 2:



Dehydrohalogenation



Example 1:



Example 2:





need hydrogen on adjacent carbon for loss of HBr

Example 3:



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 4:



Trisubstituted product is preferred when using t-BuOK (Hofmann product) Tetrasubstituted product is preferred when using KOH (Zaitsev's rule product)



Example 5:



Example 6:



(too unstable - will not form according to Bredt's rule

Example 8:



Example 9:



Example 10 A:



Example 10 B: Start with different stereochemistry get different product stereochemistry (a diastereomer)



Example 11:



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



RADICAL ADDITION REACTIONS & POLYMERS

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



Examples of peroxides



Hydrogen peroxide HO-OH

Radical mechanism



O-Br bond is not strong as both atoms are electron withdrawing elements. Therefore, tert-butyl alcohol is formed

 $\xrightarrow{H \sqcup Br} H_2 C - C H_3 + :Br:$



Radical forms on that carbon with the maximum number of alkyl groups attached: radicals are electron deficient and electron-donating substituents stabilize them Propagation -



Polymers

Poly = manyMeros = parts

Natural Polymers (Biopolymers)

Br

- 1. Polysaccharides - polymers of sugars (e.g. cellulose, glycogen)
- 2. Proteins and peptides - polymers of amino acids
- 3. Nucleic acid polymers (DNA and RNA) - polymers of nucleotides
- 4. Fats and polyketides - polymers of fatty acids
- 5. Polyisoprenoids/terpenoids - polymers of isoprene (i. e. natural compound rubber)

Polyethylene





n



Polyacrylonitrile can form HCN if it is heated to decomposition. **Teflon (Polytetrafluoroethylene)**

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Teflon is very unreactive and does not adhere substances Many polymers degrade into their components if heated enough, and can further decompose.