Predicting Sn1, Sn2, E1, E2 Reactions

Leaving groups: Acidic & basicity

Acid & base eqilibria & pKa's

Intro to Alcohols
  - Classification
  - Acidity / basicity

Dehydration Reactions of Alcohols

Act: Sn1, Sn2, E1, E2: understand these and rest of course will be easier.

Know tendencies & stereochemistry

Me = -CH3

SMe = S-trityl methyl triflate

SMMe = strong base

Rule: If your SM is not optically active, your product will not be optically active

AKA: If you make a chiral product from achiral reagents, you will get a racemic mixture.

Br

MeO

E2

drawn flat:

Sm: Not Chiral

(to see without art)

 favors symmetry plane

You get racemic mix

product is chiral!

but if eliminate H, instead you get:

write on this side only - do not double side for genchem office
SmI:
- 1° Alkyl halide
- Small base
- Good nucleophile

Mech:

\[ \text{Cl} \xrightarrow{\text{S}_2\text{O}_5} \text{MeO}^{\ominus} \rightarrow \text{C} \xrightarrow{T_{\text{Me}}} \rightarrow \text{C}^{\ominus} \xrightarrow{\text{Cl}^{-}} \]

Me

\[ \xrightarrow{\text{Me} \xrightarrow{\text{C}^{-} \xrightarrow{\text{CL}} \text{E}^{-}} \text{C} \rightarrow \text{HO}^{-} \xrightarrow{\text{C}^{\ominus}} \text{C} \]

1° alkyl halide
- Big base
- See mech
- Good base

\[ \text{Br} \xrightarrow{\text{H}^{+}} \text{HO}^{-} \xrightarrow{\text{E}^{-}} \]

2° alkyl halide
- Strong base
- Better

2° alkyl halide
- Good nucleophile
- Weak base

You should now be able to make a lot of simple compounds.

Halides are good leaving groups — makes these reactions possible.

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Stronger base = poorer LA  
Weaker base = better LA  

LA = leaving group  
Ex = example  

Acid/Base Definitions

Brønsted-Lowry Acid or Base: 
Acid = proton donor  
Base = proton acceptor

Ex:  
\[ \text{HA} + \text{B}^{\text{-}} \rightarrow \text{H}^+ + \text{A}^{\text{-}} \]

Lewis Acid/Base

Acid: Electron pair acceptor  
Base: Electron pair donor

Ex:  
\[ \text{F}_2\text{B} + \text{NH}_3 \rightarrow \text{F}_2\text{B} - \text{NH}_3 \]

Acid/Base Equilibria

\[ \text{HA} \leftrightarrow \text{H}^+ + \text{A}^{\text{-}} \]

\[ k_a = \frac{[\text{H}^+] [\text{A}^{\text{-}}]}{[\text{HA}]} = \log k_a = -\log K_a \]

* Lower pK_a = stronger acid *

Tests: given pH scale

1. Know how to use
2. *Go hand-in-hand*

E.G.:  
\[ pK_a < 0 \quad \text{very strong acids (very weak conjugate base)} \]
\[ 0 < pK_a < 10 \quad \text{intermediate (acids of conjugate bases weak to moderate strength)} \]
\[ 10 < pK_a \quad \text{very weak acids (strong conjugate bases)} \]
Weaker base = better LG

base        conj acid      pK= conj acid
C1^-        HCl           7
Br^-        HBr           -4
I^-         HI            -10

H2O^-       H2O           15.7
            MeOH          15.5
               Methanol
               *AKA "wood alcohol"
               Makes you go blind.

H3N^-       H3N           38

It's back!

\[ \text{Cl} \rightarrow \text{HCl} \rightarrow \text{Ca} \rightarrow \text{OH} \]

Can you make it go backwards? Find out Wed, @11:00, in Chem348!