ORGANIC CHEMISTRY 1 LECTURE GUIDE 2019

BY RHETT C. SMITH

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Organic Chemistry 1 Lecture Guide 2019

By Rhett C. Smith, Ph.D.

<u>Companion Books from the Proton Guru:</u>

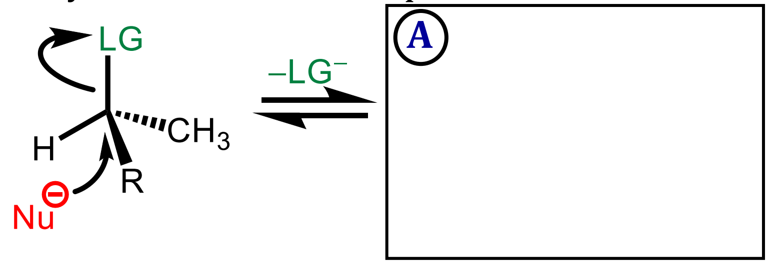
Organic Chemistry 1 Reactions and Practice Problems 2019

by Rhett C. Smith

Organic Chemistry 1 Primer 2019,

by Rhett C. Smith, Andrew G. Tennyson, and Tania Houjeiry

We learned the general form of the S_N2 reaction in **Lecture Topic 1.8**.
We will now study this mechanistic step is more detail.



B Unlike the S_N1 reaction, the S_N2 reaction occurs in a single step. This type of reaction is called a:

C That there is only one step means that Nu, substrate and leaving group all influence rate. The rate law is:

Like S_N1, then, more stable LG = faster reaction rate

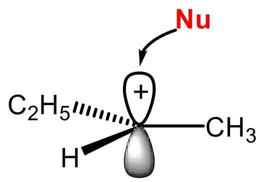
Notes

Lecture Topic II.4: The S_N2Mechanism

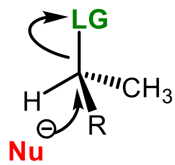
S_N2 Requires a "Good" Nucleophile

In S_N1, the nucleophile attacks a cation, which has a strong enough pull on electrons to pull in even poor nucleophiles. In S_N2, the nucleophile attacks a neutral compound, which has a significantly lower attraction for a nucleophile than does a cation. For this reason:

A



Nucleophilic attack in the coordination step of the S_N1mechanism



Nucleophilic attack in the concerted S_N2mechanism

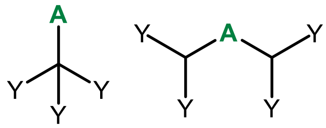
B The better the Nucleophile:

Notes

What structural features do we look for in order to identify ‘good’ nucleophiles for the S_N2 reaction?

A

General form of "Bulky" Poor Nu

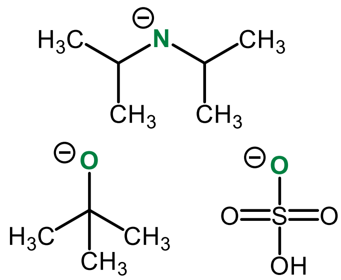


three branches *four branches*

A = Nucleophilic site, Y = non-H branch

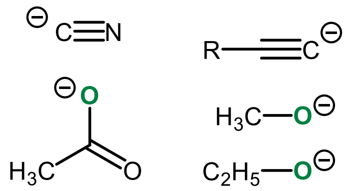
Examples of Poor Nu

F^-, H_2O, HOR



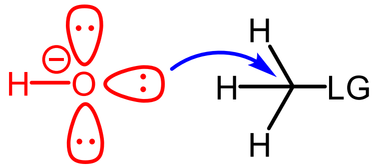
Examples of Good Nu

Cl^-, Br^-, I^-, HO^-

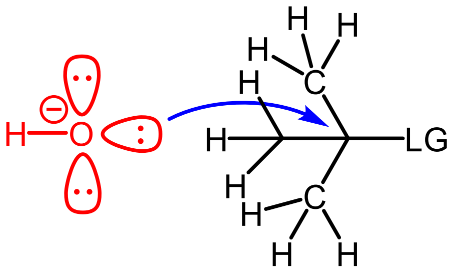


RSH or PR_3
(R = primary, secondary)

Notes



A



B

Similar to how steric hindrance slows bulky Nucleophiles

C This observation about sterics allows us to predict S_N2 rates:

Tertiary halides do not work for S_N2 due to sterics!

Notes

Lecture Topic II.4: The S_N2 Mechanism
Solvent Influences S_N2 Rate

A

Solvent weakens Nu strength

B

Solvent can stabilize anions
(we saw this for bases)

The influence on Nu strength influences the rate to a greater extent than does the stabilization of the anion, so:

C

Notes