

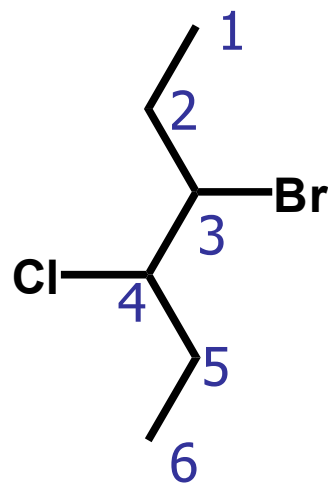
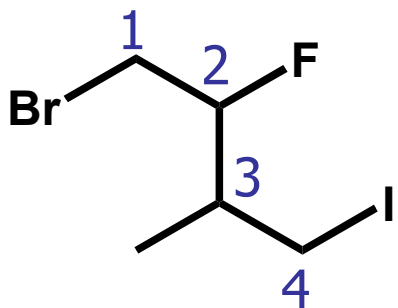
Chapter 7: **Part 1:** **Substitution Reactions - SN2**

Today Chapter 7 (7.1-7.4)

1. Alkyl Halides
2. Substitution and Elimination Reactions
3. The SN2 Mechanism
4. Inversion of Configuration/ Stereochemistry
5. Factors Affecting SN2 Reactions
 1. The Leaving Group
 2. The Nucleophile
 3. Steric Hindrance
 4. The Solvent

Naming Alkyl Halides

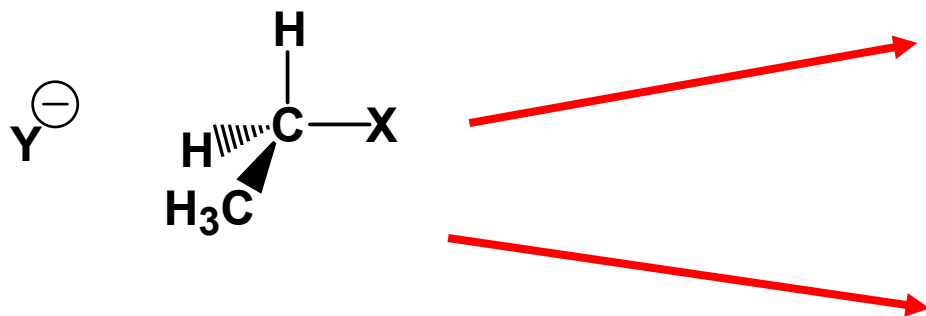
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Substitution and Elimination Reactions

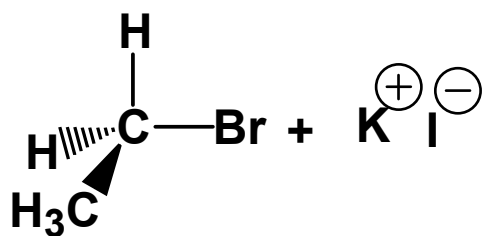
In Chapters 7 -

- 2 kinds of reactions - Substitution and Elimination
- Key to this - understanding the factors which determine which mechanism predominates and which products form.

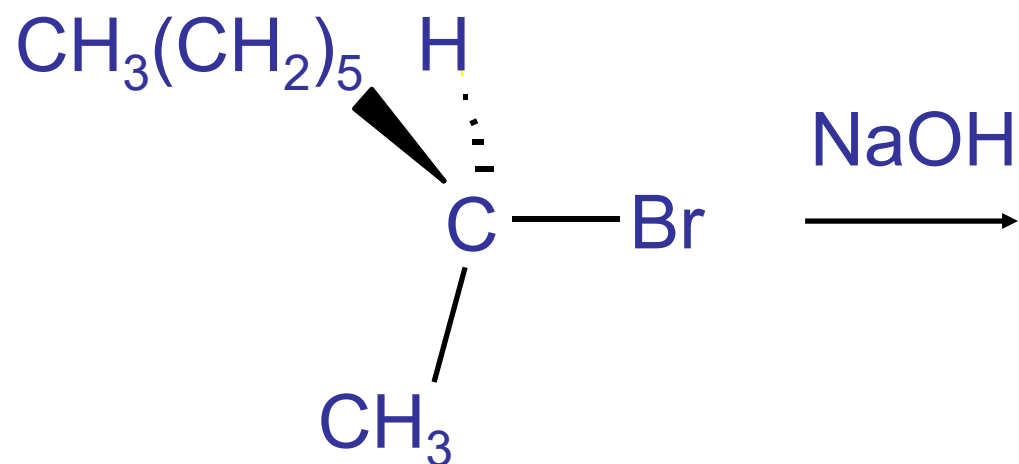


The S_N2 reaction:

Substitution Nucleophilic *Bimolecular*



Stereospecific Reaction



(S)-(+)-2-Bromooctane

The reaction mechanism which predominates depends on the following factors:

Remember-

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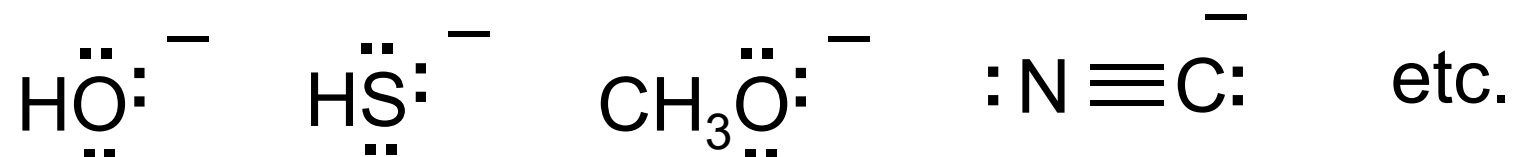
S_N2 Reactions Are Affected by the Leaving Group

•Leaving Group	Relative Rate	Conjugate acid of leaving group	pK_a of conj. acid
• F^-	10^{-5}	HF	3.5
• Cl^-	1	HCl	-7
• Br^-	10	HBr	-9
• I^-	10^2	HI	-10
• H_2O	10^1	H_3O^+	-1.7
• TsO^-	10^5	TsOH	-2.8
$CF_3SO_2O^-$	10^8	CF_3SO_2OH	-6

A single organic product was obtained when 1-bromo-3-chloropropane was allowed to react with one molar equivalent of sodium cyanide in aqueous ethanol. What was this product?



Nucleophilicity. What is a Nucleophile? What Makes a Good One?

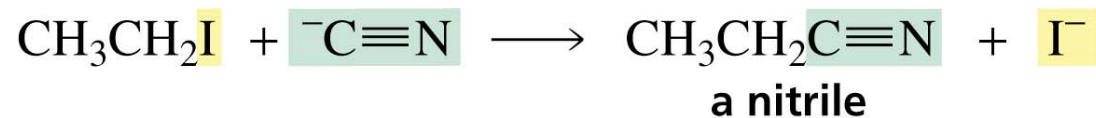
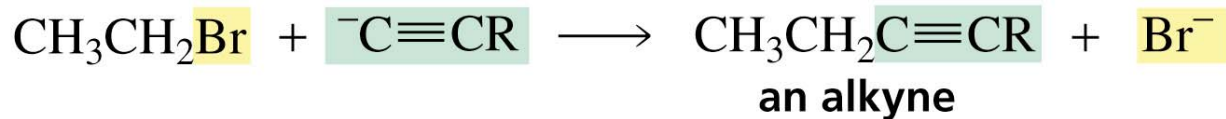
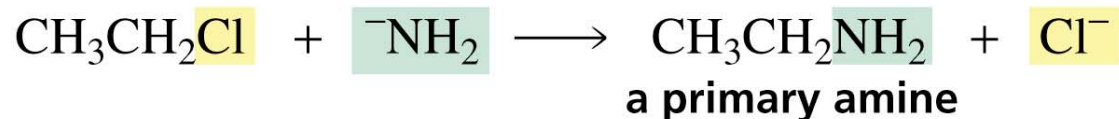
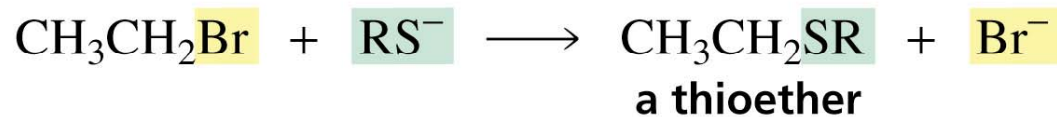
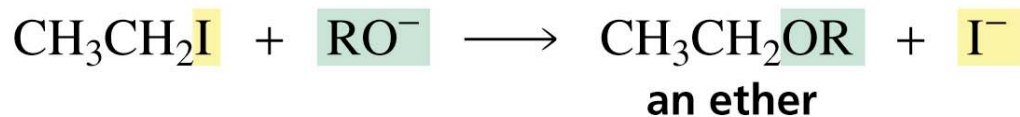
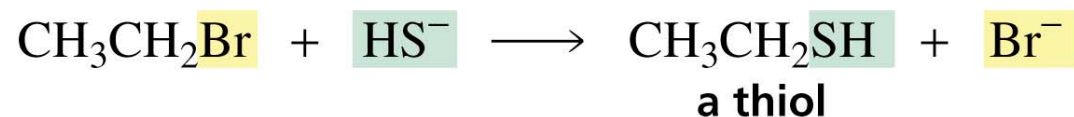
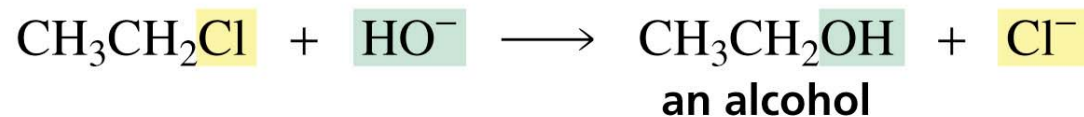


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Nucleophilicity

Rank	Nucleophile	Relative rate
•strong	I ⁻ , HS ⁻ , RS ⁻	>10 ⁵
•good	Br ⁻ , HO ⁻ ,	10 ⁴
•	RO ⁻ , CN ⁻ , N ₃ ⁻	
•fair	NH ₃ , Cl ⁻ , F ⁻ , RCO ₂ ⁻	10 ³
•weak	H ₂ O, ROH	1
•very weak	RCO ₂ H	10 ⁻²

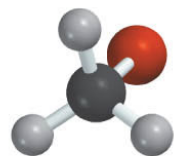
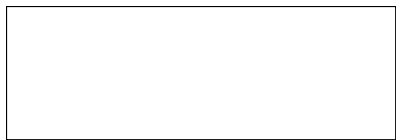


S_N2 Reactivity versus Type of Solvent

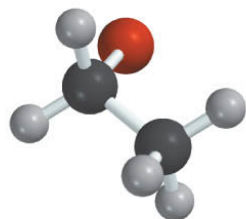
S_N2 Reaction Rates Increase in Polar Aprotic Solvents



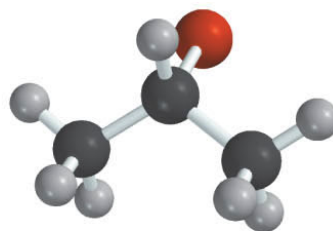
•Solvent	Type	Relative rate
•CH ₃ OH	polar protic	
•H ₂ O	polar protic	
•DMSO	polar aprotic	
•DMF	polar aprotic	
•Acetonitrile	polar aprotic	



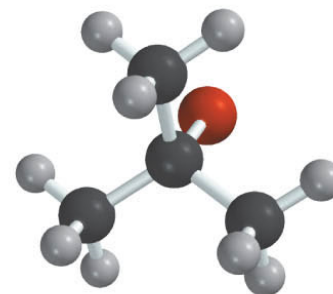
CH_3Br



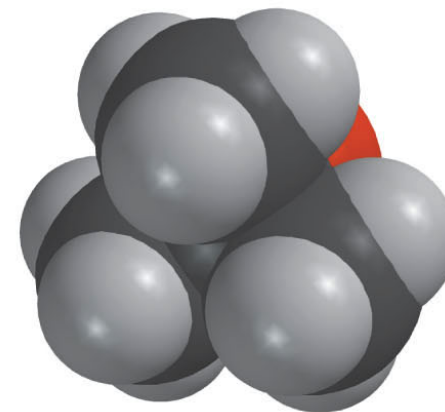
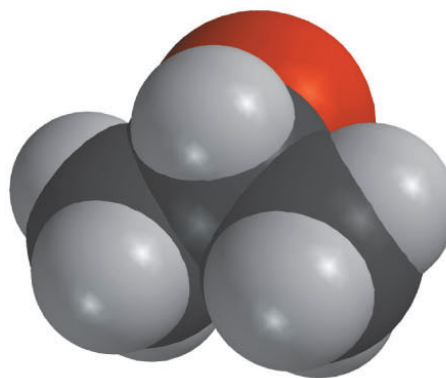
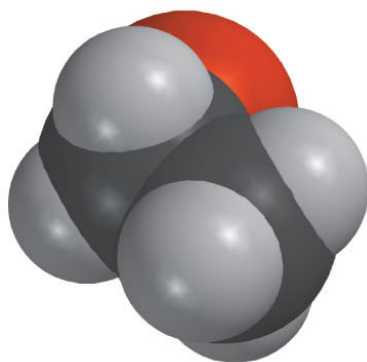
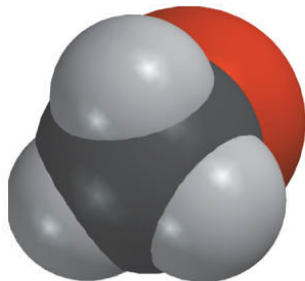
$\text{CH}_3\text{CH}_2\text{Br}$



$(\text{CH}_3)_2\text{CHBr}$



$(\text{CH}_3)_3\text{CBr}$



Summary of SN2

For Next Time....

WEDNESDAY Chapter 7 (7.1-7.4)

FRIDAY Chapter 7: Alkenes and Eliminations (7.5-7.8)

NEXT MONDAY Chapter 7: Unimolecular Reactions (7.9-7.10)

FRIDAY Chapter 7: Putting it all together 7.11

Suggested Homework Problems Chapter 6

#4, 7, 11, 17, 24, 26, 28, 34-36

Suggested Homework Problems Chapter 7

#1,3,5,16, 18, 21, 37, 41, 47, 48, 54, 56, 60, 62-65, 70, 76