

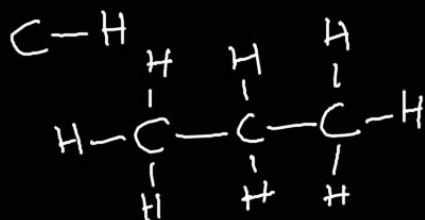
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Organic Chemistry

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Abbreviated Line Structures: Line Angle Structures

Abbreviated Line Structures



- 1) Carbons are vertices
- 2) C-H bonds are not drawn
- 3) H bonds to atoms other than C are drawn

Basic Organic Chemistry Nomenclature

Number	Prefix	Alkanes	Name	
1	meth-	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \end{array}$	methane	
2	eth-	$\begin{array}{c} \text{H} \\ \\ \text{H}_3\text{C}-\text{CH}_3 \end{array}$	ethane	
3	prop-		Propane	Cyclohexane
4	but-		butane	
5	pent-		Pentane	
6	hex-		hexane	Cyclopropane
7	hept-		heptane	
8	oct-		octane	
9	non-		nonane	
10	dec-		decane	Cyclopentane

Substituents - add -yl



- $\text{R}-\text{CH}_3$ methyl
- CH_2CH_3 ethyl
- $\text{CH}_2\text{CH}_2\text{CH}_3$ propyl
- butyl
- isopropyl
- isobutyl
- sec-butyl
- tert-butyl
- n-butyl
- t-butyl

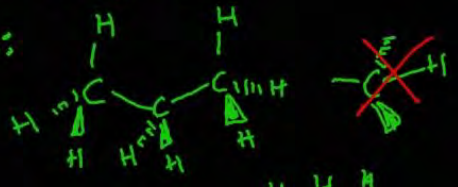
Different Ways to Draw Organic Molecules

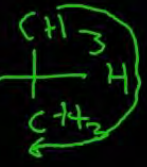
Line Angle: 

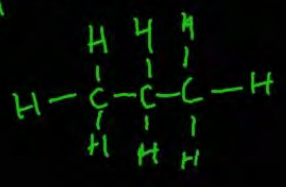
Sawhorse: 

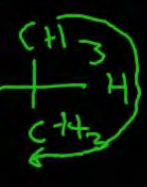
Condensed: $\text{CH}_3\text{CH}_2\text{CH}_3$

Newman Projections: 

Wedge-dash: 

Fisher: 

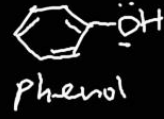
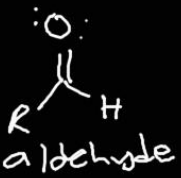
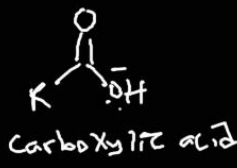
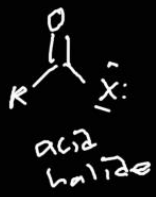
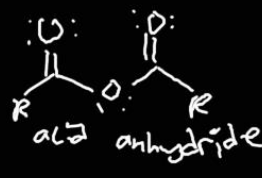
Lewis structure: 



Common Functional Groups

Common Functional Groups

R = rest of the molecule X = halogen (F, Cl, Br, I)

$R-CR$ alkane	$R=CR$ alkene (olefin)	$R\equiv CR$ alkynes	$R-X$ halide	$R-\ddot{O}H$ alcohol
$R-\ddot{S}H$ thiol	$R-O-R$ ether	 epoxide oxirane	 phenol	 aldehyde
 ketone	 amine	 carboxylic acid	 acid halide	 anhydride
 ester	 amide			

Organic Chemistry Periodic Table Trick: BEAN, Basicity, Electrophilicity, Acidity, Nucleophilicity

Basicity

E
Electro-negativity

Nucleophilicity

Acidity

hydrogen 1 H 1.0079	beryllium 4 Be 9.0122																	helium 2 He 4.0026					
lithium 3 Li 6.941		boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180																
sodium 11 Na 22.990	magnesium 12 Mg 24.305	aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948																
potassium 19 K 39.098	calcium 20 Ca 40.078	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80																
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29																
cesium 55 Cs 132.91	barium 56 Ba 137.33	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]																
francium 87 Fr [223]	radium 88 Ra [226]																						

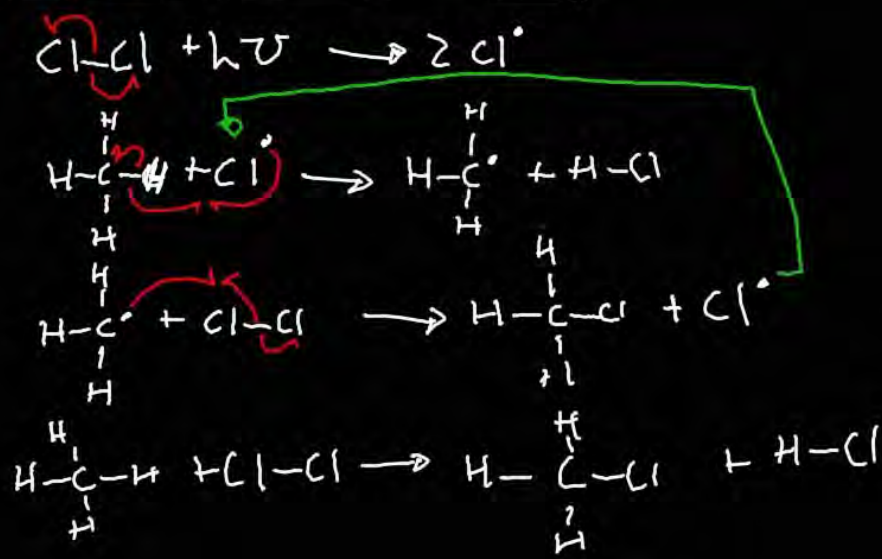
* Lanthanide series

** Actinide series

lanthanum	cerium	praseodymium	neodymium	promethium	samarium	europium	gadolinium	terbium	dysprosium	holmium	erbium	thulium	ytterbium
57	58	59	60	61	62	63	64	65	66	67	68	69	70
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
139.91	140.12	140.91	144.24	[145]	150.36	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.04
actinium	thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium	fermium	mendelevium	nobelium
89	90	91	92	93	94	95	96	97	98	99	100	101	102
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No
[227]	232.04	231.04	238.03	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]

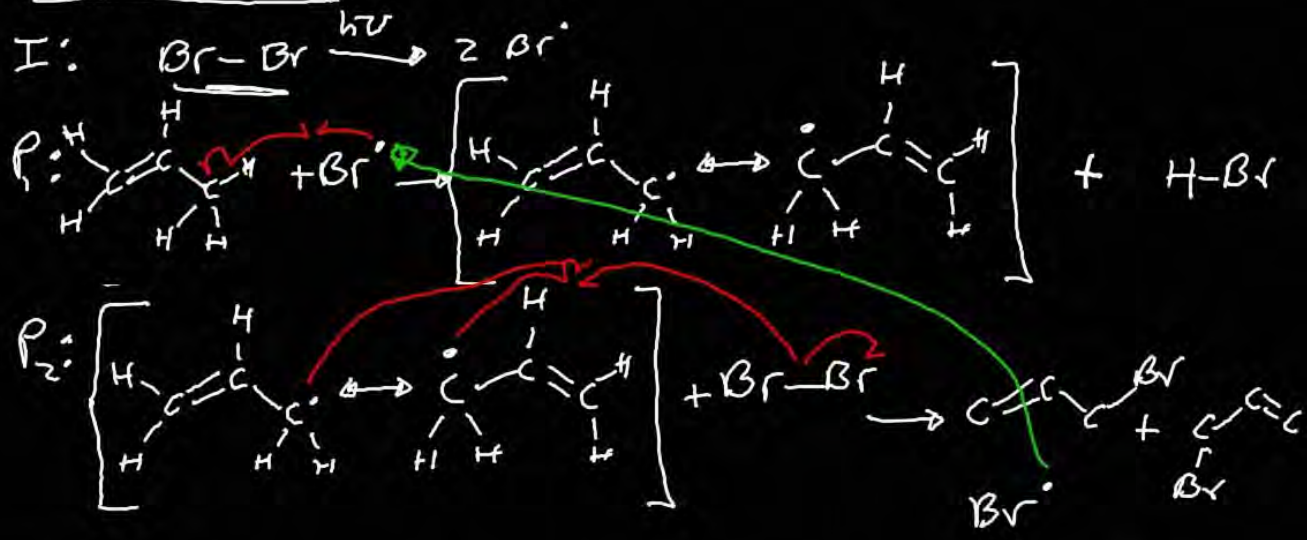
Free Radical Halogenation Mechanism

Free Radical Halogenation



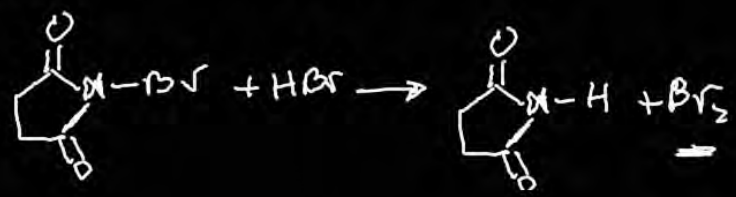
Allylic Bromination Mechanism

Allylic Bromination



NBS (N-bromosuccinimide)

Allylic shift



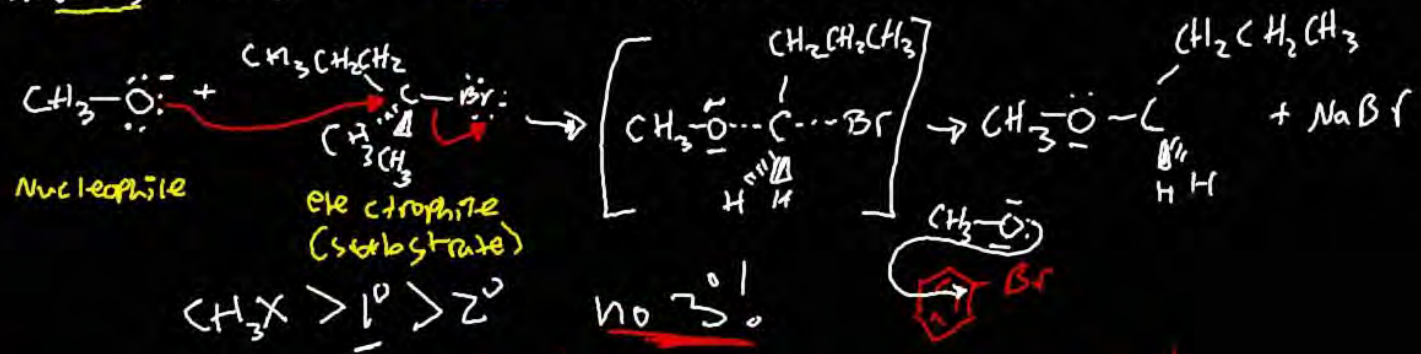
The SN2 Reaction

The SN2 Reaction

The SN2 reaction takes place in a single (concerted) step. A strong nucleophile attacks the electrophilic carbon, forcing the leaving group to leave. (Substitution, Nucleophilic, Bimolecular)

$$\text{Rate} = [\text{R-X}][\text{Nuc}^-]$$

Example



No SN2 on 3°! No SN2 on SP₂!

The SN1 Reaction

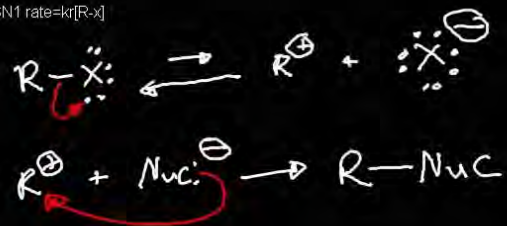
The S_N1 Reaction

(Substitution, nucleophilic, unimolecular)

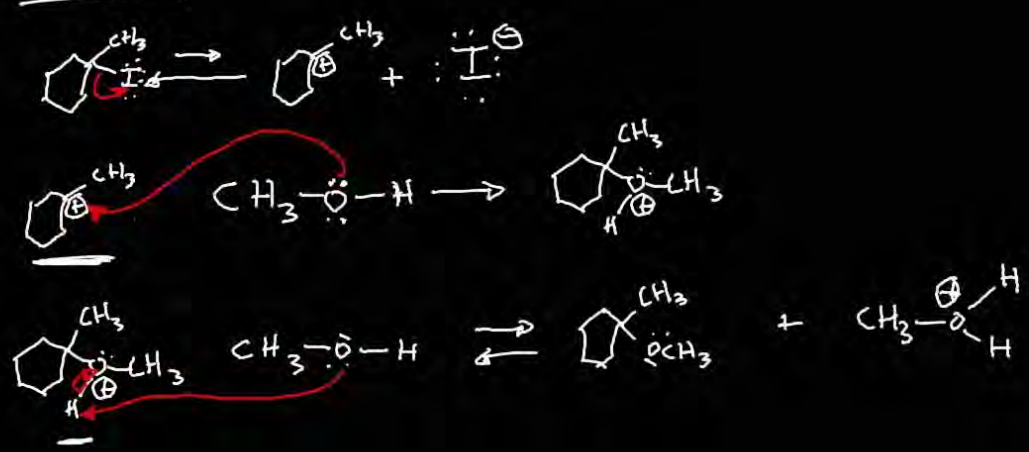
A two step mechanism. A slow ionization gives a carbocation that reacts quickly with a (usually weak) nucleophile.

Reactivity: 3° > 2° > 1°

SN1 rate = k[R-X]



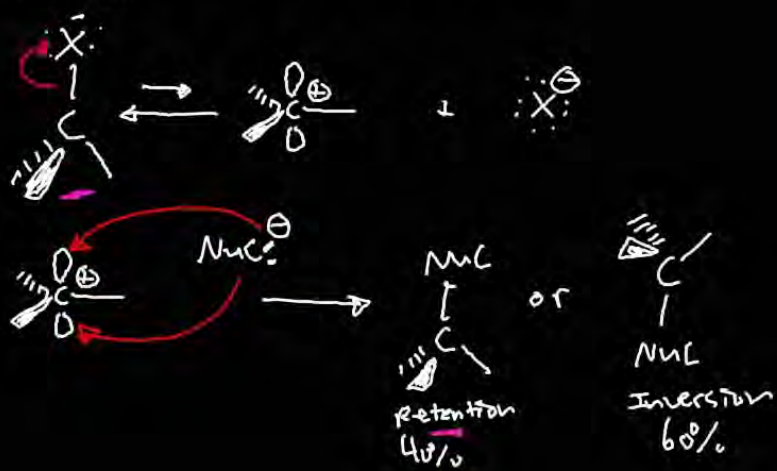
Example



Racemization in the SN1 Reaction

Racemization in the SN1 Reaction

The SN1 reactions carbocation intermediate is flat, which can be attacked from either side.

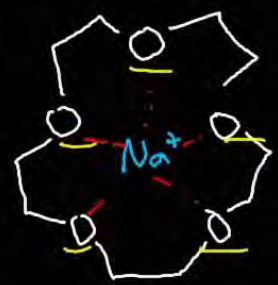


Crown Ether Nomenclature

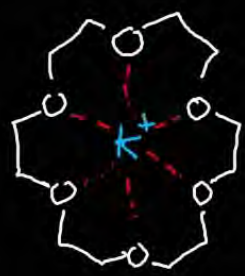
Crown Ethers



12-crown-4



15-crown-5



18-crown-6

Reading an IR Spec Simplified

