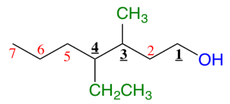
Number of Carbons	Prefix	Examples using alkanes (-ane suffix)
1	Meth-	CH_4 ; Methane
2	Eth-	C_2H_6 ; Ethane
3	Prop-	C_3H_8 ; Propane
4	But-	C_4H_{10} ; Butane
5	Pent-	C_5H_{12} ; Pentane
6	Hex-	C_6H_{14} ; Hexane
7	Hept-	C_7H_{16} ; Heptane
8	Oct-	C_8H_{18} ; Octane
9	Non-	C_9H_{20} ; Nonane
10	Dec-	$C_{10}H_{22}$; Decane

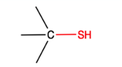
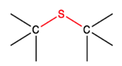
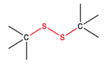
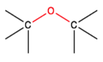
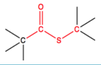
Systematic (IUPAC) Nomenclature Rules

1. Identify the longest CONTINUOUS chain of carbon atoms (Parent chain)
2. Number the carbons in the parent chain
   a. Begin with the end closest to the substituent group (any group other than the parent chain)
3. Identify substituent groups, note the primary functional group (located along parent chain)
4. Assign "locations" of the substituent groups using the numbers on the carbons

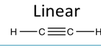
Locant-Prefix-Parent-Suffix



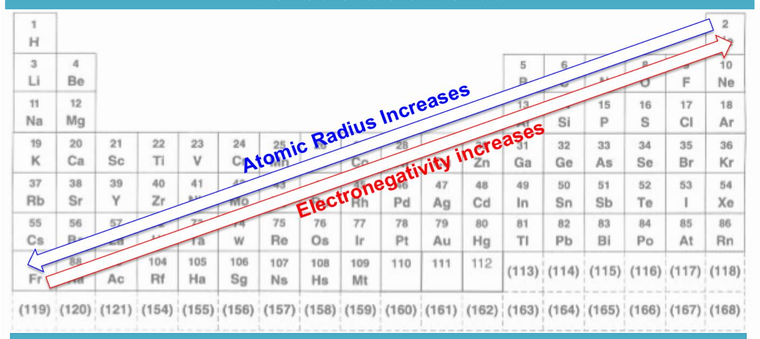
4-Ethyl-3-methyl-1-heptanol

Name	Structure	Suffix	Name	Structure	Suffix
Alkane		-ane	Thiol		-thiol
Alkene		-ene	Sulfide		… sulfide
Alkyne		-yne	Disulfide		… disulfide
Alcohol		-ol	Aldehyde		-al
Ether		… ether	Ketone		-one
Amine		-amine	Carboxylic Acid		-oic acid
Amide		-amide	Ester		-oate
Nitrile		-nitrile	Thioester		-thioate

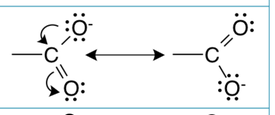
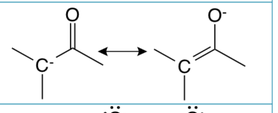
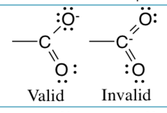
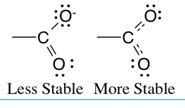
Orbital Hybridization of Carbon Atoms

Central Carbon Hybridization	# of Bonded Groups	# of Hybrid Orbitals	# of Unhybridized p Orbitals	# of Sigma Bonds	# of Pi Bonds	Geometric Shape of Molecule	Bond Angles
sp^3	4	4	0	4	0	Tetrahedral	109.5°
sp^2	3	3	1	3	1	Trigonal Planar	120°
sp	2	2	2	2	2	Linear 	180°

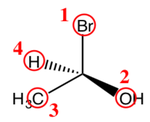
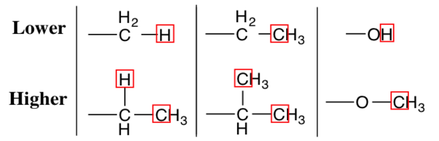
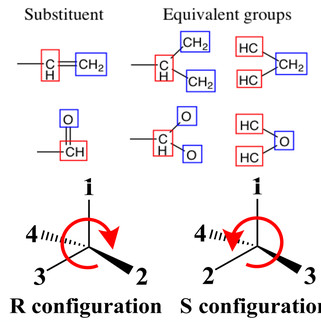
Periodic Table Trends

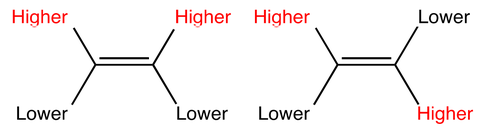


Rules for Resonance Forms

1. Individual resonance forms are imaginary, not real. Think of it as an instantaneous snapshot.
2. Resonance forms differ only in the placement of π or non-bonding electrons. 
3. Different resonance forms of compound don't have to be equivalent. 
4. Resonance forms obey normal rules of valency. 
   Valid Invalid
5. The resonance hybrid is more stable than any individual resonance form. 
   Less Stable More Stable

Cahn-Ingold-Prelog Rules for ranking substituents

	Rule Description	Example
RULE 1	Rank the atoms directly attached to the chirality center or the carbon of the double bond according to atomic number.	 Element Br > O > C > H Atomic number 35 > 8 > 6 > 1 Ranking order 1 2 3 4
RULE 2	If a tie is present, rank the second atoms of the substituent and any subsequent atoms until a difference is found.	 Lower / Higher
RULE 3	Multiple-bonded atoms are equivalent to the same number of single-bonded atoms.	 Substituent / Equivalent groups



Cis-isomer or Z isomer

Trans-isomer or E isomer

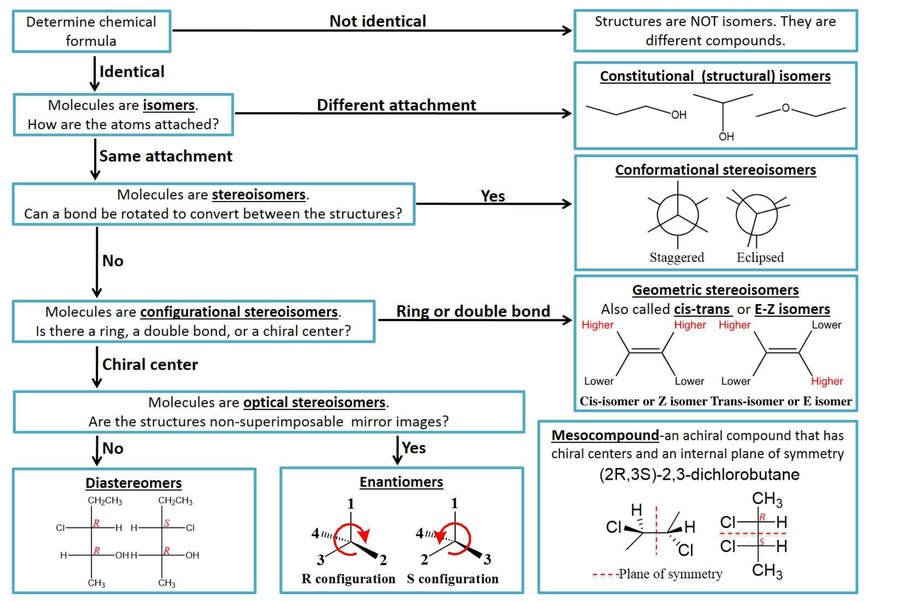
R configuration

S configuration

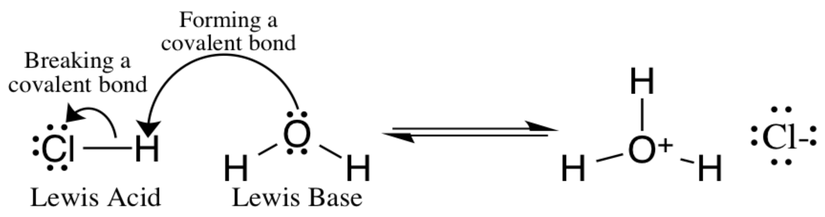
Degree of Unsaturation Calculation

Rules	Example: Given $C_{10}H_{13}Br_3N_2O_3$
1. Add the number of halogens to the number of hydrogens in the given formula	$C_{10}H_{13}$ + 3 H equivalent (from Br_3) = $C_{10}H_{16}$
2. Ignore the number of oxygens	No change; still $C_{10}H_{16}$
3. Subtract the number of nitrogens from the number of hydrogens	$C_{10}H_{16}$ – 2 H equivalent (from N_2) = $C_{10}H_{14}$
5. Determine the formula of the saturated hydrocarbon with the same number of carbons using the formula C_nH_{2n+2}	C_nH_{2n+2}; where n = 10 from $C_{10}H_{14}$ Fully saturated formula = $C_{10}H_{22}$
6. Subtract the resulting formula from the fully saturated formula	$C_{10}H_{22}$ - $C_{10}H_{14}$ = H_8 therefore 8 hydrogens are missing
7. Divide this number by 2 to obtain the degree of unsaturation	8/2 = 4 degrees of unsaturation

Basic Isomer Flowchart

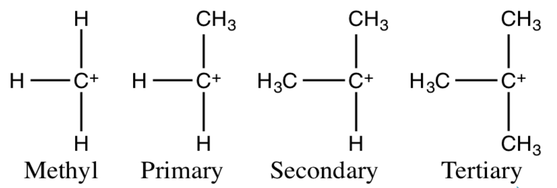


Drawing Mechanisms



- The curved arrow indicates a movement of a *pair of electrons* from the tail to the head of the arrow.
- Each arrow represents the *formation* or *destruction* of a covalent bond.

Carbocation Stability



Increasing Stability

KILOHANA K THE ACADEMIC SUCCESS CENTER

Kehau A. Hagiwara (2015)