# Image result for organic chemistryOrganic Chemistry: The chemistry of carbon and carbon-based compounds

## Organic Chemistry in everyday life:

* + 1. Smells & tastes: fruits, chocolate, fish, mint
		2. Medications: Aspirin, Tylenol, Decongestants, Sedatives
		3. Addictive substances: Caffeine, Nicotine, Alcohol, Narcotics
		4. Hormones/Neurotransmitters: Adrenaline, Epinephrine
		5. Food/Nutrients: Carbohydrates, Protein, Fat, Vitamins
		6. Genetics: DNA, RNA
		7. Consumer products: Plastics, Nylon, Rayon, Polyester
	1. Drawing Organic Structures - Butane: C4H10
		1. Line Structure
			1. Only shows bonds
			2. C atoms assumed at each end and intersection of bonds
			3. H atoms not shown
			4. Assume 4 bonds to each C
			5. Fulfill C’s 4 bonds by adding H’s
	2. Types of Organic Compounds
		1. Classified according to functional groups
			1. Alkanes
			2. Alkenes
			3. Alkyne
			4. Haloalkane
			5. Alcohol
			6. Ether
			7. Ketone
			8. Aldehyde
			9. Carboxylic Acid
			10. Amine
			11. Amide
			12. Amino Acid
	3. Big Idea in Organic Chemistry
		1. Structure controls Function
1. Alkanes
	1. All C atoms are tetrahedral and sp3 hybridized (only C-C single bonds)
	2. General formula = CnH2n+2 (CH4, C2H6, C3H8, C4H10, etc.)
	3. Can have linear or branched alkanes
	4. Same molecular formula, different structure: structural isomers
	5. Branches are called substituents
	6. Primary (1°) carbon atom: bound to 1 other C atom
	7. Secondary (2°) C atom: bound to 2 other C atoms
	8. Tertiary (3°) C atom: bound to 3 other C atoms
	9. Quaternary (4°) C atom: bound to 4 other C atoms
	10. Names of Linear Alkanes and Alkyl Substituents
		1. 1 carbon – methane & methyl
		2. 2 carbons – ethane & ethyl
		3. 3 carbons – propane & propyl
		4. 4 carbons – butane & butyl
		5. 5 carbons – pentane
		6. 6 carbons – hexane
		7. 7 carbons – heptane
		8. 8 carbons – octane
		9. 9 carbons – nonane
		10. 10 carbons – decane
	11. Naming Branched Alkanes (IUPAC)
		1. Root name: name of longest continuous C chain (parent chain)
			1. 2 equally long? Choose the one with more branches
		2. Number C atoms in chain, starting at end with first branch
		3. Identify substituents, give each a number (C it is connected to)
			1. Two or more identical substituents: use prefixes (di-, tri-, tetra-, etc.)
		4. List substituents alphabetically after prefix
			1. Do not alphabetize prefixes
		5. Punctuation:
			1. commas separate numbers from each other
			2. hyphens separate numbers from names
			3. no space between last substituent & root name
2. Isomers = Two molecules that have the same molecular formula but different properties
	1. Orientation of the atoms is different in each compound
	2. The more carbons an alkane has, the more isomers it will have
3. First Ten Hydrocarbon Properties - As number of carbons increases:
	1. The boiling point increases
	2. The melting point increases
		1. Linear Alkanes
			1. 1 - 4 C atoms: gas at room temp
			2. 5 - 15 C atoms: liquid at room temp
			3. >15 C atoms: solid at room temp
				1. Due to:

Non-polar 🡪 only London Dispersions Forces

Larger molecular weight 🡪 Stronger LDPs

1. Cycloalkanes - Alkanes with closed ring(s) of C atoms
	1. General formula: CnH2n (C3H6, C4H8, C5H10, etc.)
	2. Angles of alkanes need to be near 108 which makes some cyclos unstable
	3. Naming: use cyclo- prefix before alkane name
		1. Find the longest carbon chain
			1. If it is in the cycloalkane – use it as the base name
			2. If it is in a straight chain, the cycloalkane becomes an alkyl group
			3. Name the alkyl groups coming off of the cycloalkane
			4. If there is only one, numbering is not needed
			5. If there are 2 or more alkyl groups
				1. Place the highest alphabetical alkyl group on the 1st carbon then followed by the others.
			6. In numbering the carbons, you want the sum of the numbers to be the least possible.
2. Difference between sigma and pi bonds
	1. Sigma bonds are the strongest type of covalent chemical bond. They are formed by head-on overlapping between atomic orbitals.
	2. Pi bonds are not as strong and form where two lobes of one involved atomic orbital overlap two lobes of the other involved atomic orbital.



1. Alkenes
	1. Contain at least one C=C double bond
	2. General formula: CnH2n (like cycloalkanes)
	3. Each carbon atom in a C=C double bond is sp2 hybridized
	4. The double bond consists of a σ bond and a π bond
		1. σ bond from head-on overlap of sp2 orbitals
		2. π bond from side-on overlap of p orbitals
	5. A σ bond is stronger than a π bond.
	6. Rotating a double bond requires breaking the π bond
		1. **NO FREE ROTATION** at room temperature
	7. Alkene Nomenclature (Naming)
		1. Parent chain = longest chain that includes the double bond(s)
		2. The double bonds have priority and must have the lowest number(s) possible
		3. The first C atom in the C=C bond indicates the double bond’s location (or number in naming)
		4. Name, number, & alphabetize substituents as usual
		5. Replace –ane ending with –ene ending
			1. Two double bonds: -diene; three double bonds: -triene
		6. Put double bond number in front of entire root name
			1. (i.e. 2-pentene indicates the double bond starts on carbon 2)
		7. Cyclic alkenes: number the atoms in the ring starting with the double bond
	8. Cis-trans isomerism in alkenes
		1. Substituents will **stay** on the same or opposite sides of the double bond (no C=C bond rotation)
		2. For cis-trans isomerism, each C in the double bond must have 2 different substituents attached (i.e. a C and a H, etc.)
		3. Determining *cis* or *trans*: follow the parent chain through the double bond 
2. Alkynes
	1. Contain at least one C≡C triple bond with sp-hybridized C atoms
	2. Triple bond: one σ bond (sp orbitals), two π bonds (p orbitals)
	3. Naming: triple bond indicated by –yne ending

