

### Hydrocarbons

- Organic chemistry deals with compounds made mostly of C and H.
- Memorize these covalent bonding rules!!!  
C makes 4 bonds, N makes 3 bonds, O makes 2 bonds, H makes 1 bond, Halogens make 1 bond

### IUPAC

- International Union of Pure and Applied Chemistry
- Developed a naming system for hydrocarbons

### Alkanes

- Carbon chains – all single bonds
- Saturated hydrocarbons

Number of carbons	Name
1	methane
2	ethane
3	propane
4	butane
5	pentane
6	hexane
7	heptane
8	octane
9	nonane

- Write the formulas and structures of:  
3-methylpentane, 2,3-dimethylpentane

### Alkenes

- Carbon chains – at least one double bond
- Unsaturated hydrocarbons
- Write the formula and structure of propene, 3-methyl-2-hexene

### Alkynes

- Carbon chains – at least one triple bond
- Unsaturated hydrocarbons
- Write the formula and structure of 1-butyne

### Alkyl Halides

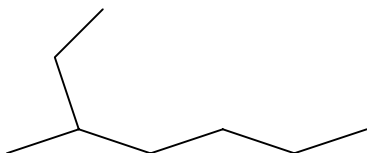
- Write structures and formulas for 1-chloropropane, 4,4-dichloro-2-heptyne

### Shorthand (stick-figure) Notation

- Zig-zag lines are often used as a quick way to draw structures.
- Each “point” represents a C atom. H atoms are left out.
- Draw stick-figure structures of pentane, propene, 1,3-dichlorohexane, 2-methylbutane

### Common Mistake!

- This compound is 3-methylheptane, NOT 2-ethylhexane



### Constitutional Isomers

- Isomers are compounds with the same formula, but different structure.
- 1-pentene, 2-pentene, and 3-pentene all have the formula  $C_5H_{10}$

- 1,1-dichloroethane and 1,2-dichloroethane have the formula  $C_2H_4Cl_2$

- Butane and 2-methylpropane have the formula  $C_4H_{10}$

- $C_4H_{10}$  can be written as:  $CH_3CH_2CH_2CH_3$  to specify butane
- $C_4H_{10}$  can be written as:  $CH_3CH(CH_3)CH_3$  to specify 2-methylpropane

**Geometric Isomers**

- 1,2-dichloroethane can only be drawn one way – NOT geometric isomers
  
  
  
  
  
  
  
  
  
  
- 1,2-dichloroethene can be drawn in a *cis* or *trans* arrangement

**Benzene vs. Cyclohexane**

- Cyclohexane has the formula  $C_6H_{12}$
  
  
  
  
  
  
  
  
  
  
- Benzene has the formula  $C_6H_6$
  
  
  
  
  
  
  
  
  
  
- Benzene is delocalized and has two resonance structures
- When benzene is attached to a carbon chain, it is called phenyl
- Draw the structure of 2-phenylbutane

**Functional Groups**

Name	Suffix/Prefix	Structure	
Amine	amino-	$R - NH_2$	can go on any carbon
Alcohol	-ol	$R - OH$	can go on any carbon
Aldehyde	-al	$\begin{array}{c} O \\    \\ R - C - H \end{array}$	must be at the end of a carbon chain
Carboxylic Acid	-oic acid	$\begin{array}{c} O \\    \\ R - C - OH \end{array}$	must be at the end of a carbon chain
Ketone	-one	$\begin{array}{c} O \\    \\ R - C - R \end{array}$	cannot go on an end carbon
Ether	-oxy-	$R - O - R$	cannot go on an end carbon

- Draw the structures of:  
Ethanol, 2-butanol, butanal, butanoic acid, butanone, 2-pentanone, ethoxybutane, 2-ethoxybutane