

REVIEW: Naming Organic Compounds

1. HYDROCARBONS

- backbone is made of C atoms
- straight-chain (linear) vs. branched compounds

A) ALKANES - C_nH_{2n+2}

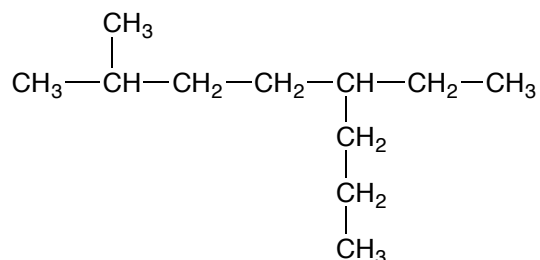
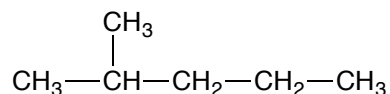
- only single bonds \rightarrow "aliphatics"
- "saturated" = all carbons are sp^3 hybridized and are bonded to the max. # of H atoms
- nomenclature:
 - prefix (# of C's) + suffix *-ane*
 - longest continuous C chain is the parent chain (or main chain)

Prefixes:

1 = meth	7 = hepta
2 = eth	8 = octa
3 = prop	9 = nona
4 = but	10 = deca
5 = penta	11 = undeca
6 = hexa	12 = dodeca

- STRUCTURAL ISOMERS
 - same molecular formulas but different *connectivity*
 - branches: count #C's in the parent chain, assign branch to lowest C = "address"
 - name branch: prefix (# of C's) + suffix *-yl*
 - multiple branches of the same # of C's are given prefixes *di-*, *tri-*, *tetra-*, *penta-* etc.

Examples:



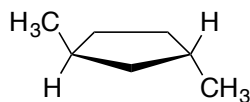
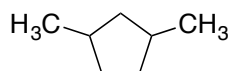
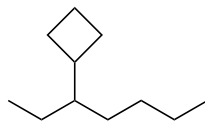
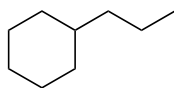
- trivial names for branched substituents

Number of C's	Name	Group
3	<i>iso</i> -propyl	
4	<i>sec</i> -butyl	
4	<i>iso</i> -butyl	
4	<i>tert</i> -butyl	
5	<i>neo</i> -pentyl	

- CYCLIC COMPOUNDS

- o rings are given the prefix *cyclo*-
- o more than two groups on ring: use "*cis*-" or "*trans*-" to indicate relative geometry

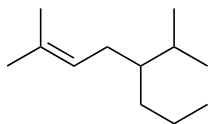
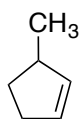
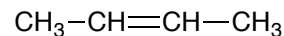
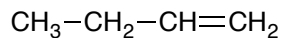
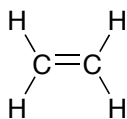
Examples:



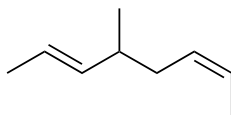
B) ALKENES - C_nH_{2n}

- contain at least one double bond
- contain unsaturated bonds → “olefins”
- nomenclature:
 - parent chain must contain the double bond
 - double bond between 2 lowest address C's
 - add suffix *-ene*
 - same rules as alkanes

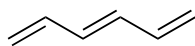
Examples



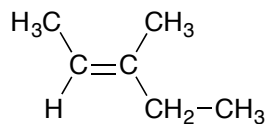
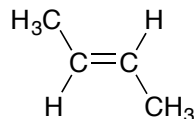
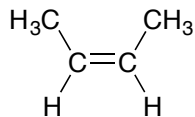
- diene = 2 double bonds



- triene = 3 double bonds



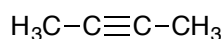
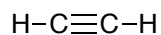
- no rotation around the double bonds → GEOMETRIC ISOMERS
 - use “Z-” or “E-” to indicate relative geometry



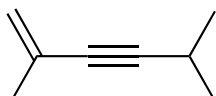
C) ALKYNES - C_nH_{2n-2}

- contain at least one triple bond
- nomenclature:
 - parent chain must contain the triple bond
 - triple bond between 2 lowest address C's
 - add suffix *-yne*
 - same rules as alkanes and alkenes

Examples:



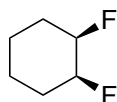
- for mixtures of double and triple bonds: *prefix-address-ene-address-yne*



D) HALIDES - C_xH_yX

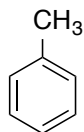
- X = halogen atom
- designations : fluoro-, chloro-, bromo-, iodo-

Examples:

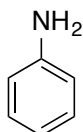


2. AROMATICS

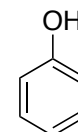
- mostly based on benzene, C_6H_6
- mono-substituted aromatics with trivial names:



toluene

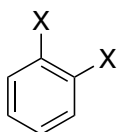


aniline

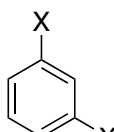


phenol

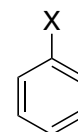
- di-substituted aromatics:



ortho-

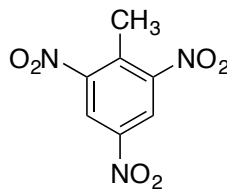
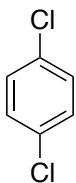


meta-



para-

Examples:



- some trivial names for aromatic substituents
 - C_6H_5- = phenyl group
 - $C_6H_5CH_2-$ = benzyl group

3. ALCOHOLS - R-OH

- functional group is the hydroxyl group:
- same rules as before, but use the suffix "ol"
 - alkane + alcohol = "-anol"
 - alkene + alcohol = "-enol"
 - alkyne + alcohol = "-ynol"
 - hydrocarbon + 2 alcohols = "-diol"

Examples

- Classifications:
 - primary alcohol (1°)
 - secondary alcohol (2°)
 - tertiary alcohol (3°)

4. ETHERS - R₁-O-R₂

- name each branch in alphabetical order
- number each branch from the O atom outwards
- add the suffix "*ether*"

Examples:

5. ALDEHYDES (RCHO) AND KETONES (R₁COR₂)

- functional group is the carbonyl group:

- same rules as above
- aldehydes: use suffix "*al*"; ketones: use suffix "*one*"

Examples:

6. CARBOXYLIC ACIDS - RCO₂H

- functional group is the carboxylic group:
- same rules as above + suffix "*anoic acid*"

Examples:

7. ESTERS - R₁CO₂R₂

- functional group is the ester group:
- made from the condensation of an alcohol + carboxylic acid

- name alcohol side first, then the carboxylic acid
- use suffix "*oate*"

Examples:

8. AMINES - R₃N

- primary amine (1°) =
- secondary amine (2°) =
- tertiary amine (3°) =
- name branches alphabetically
- use suffix "*amine*"

Examples:

9. AMIDES - R₁CONR₂

- functional group is the amide group:
- made from the condensation of a carboxylic acid + 1° or 2° amine

- prefix from the carboxylic acid, use the suffix "*amide*"
- for branches on the N atom: N-(*branch*)-rest of name

Examples:

MORE THAN ONE FUNCTIONAL GROUP?

The principal group (the one that dictates the final suffix) is assigned using the following prioritized list (not all groups are covered in this review):

1. Carboxylic acid
2. Anhydride
3. Ester
4. Acid halide
5. Amide
6. Nitrile
7. Aldehyde
8. Ketone
9. Alcohol
10. Thiol
11. Amine
12. Alkyne
13. Alkene
14. Alkane