Compounds of Carbon
Naming and Drawing Basic Hydrocarbons

Presented by

Amelia McCutcheon

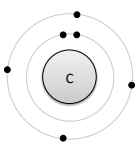
the zen of chemistry

Hydrocarbons

- Hydro = hydrogen
- Carbon = Carbon

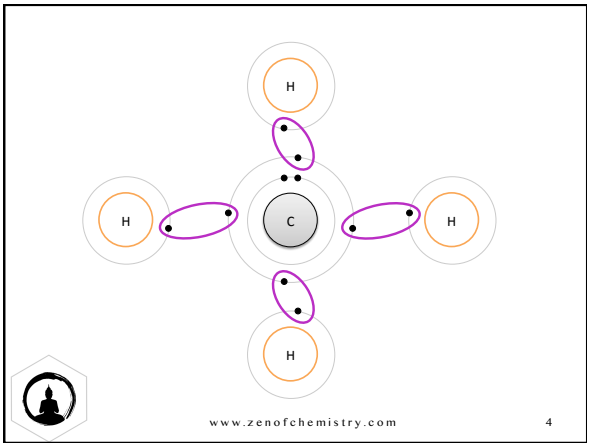
- Hydrocarbons: Molecules formed predominantly from hydrogen & carbon

Revision: Covalent Bonding



Carbon atom
Atomic Number: 6
Number of protons: 6
Number of electrons: 6

Hydrogen atom
Atomic Number: 1
Number of protons: 1
Number of electrons: 1


H
H
C
H
H
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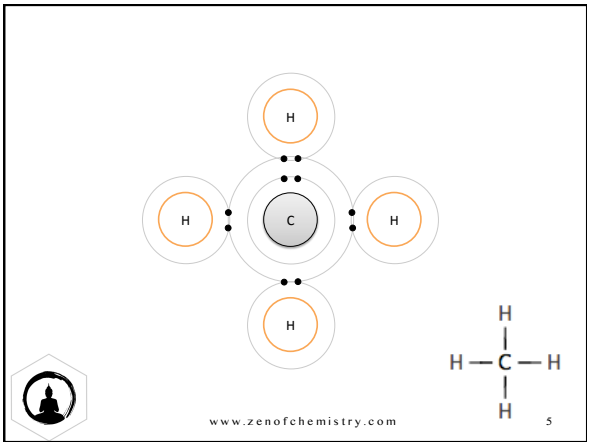
4


H
H
C
H
H
H
H—C—H
H
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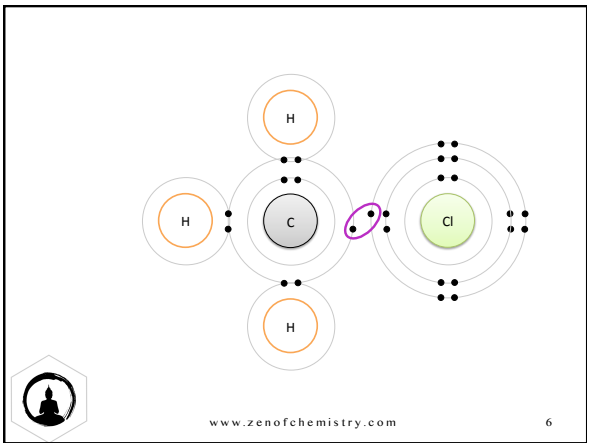
5


H
H
C
Cl
H
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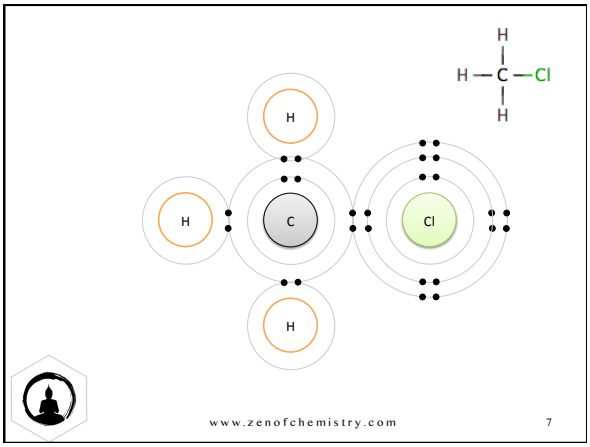
6


H
H — C — Cl
H
H
H
C
Cl
H
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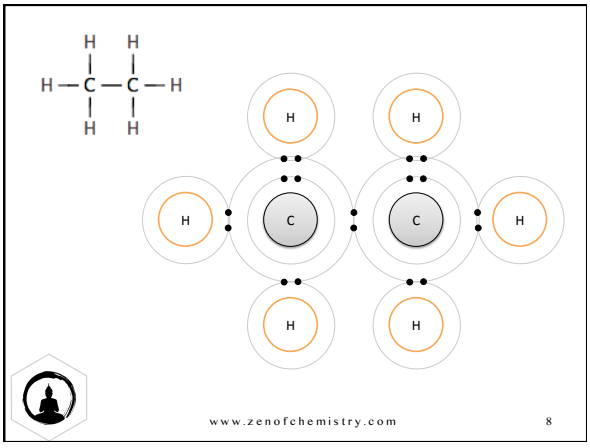
7


H H
H — C — C — H
H H
H
H
C
C
H
H
H
H
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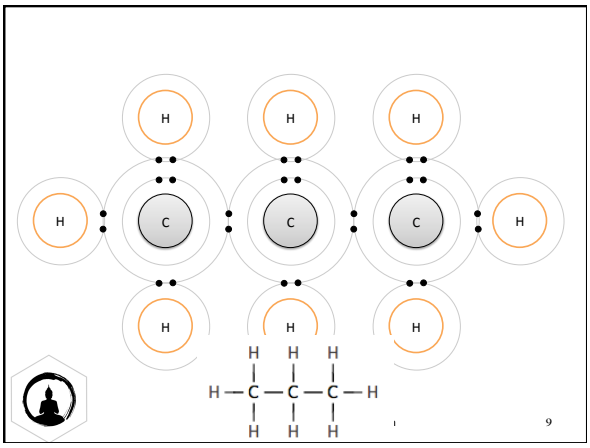
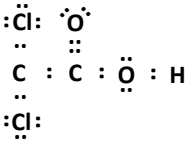
8

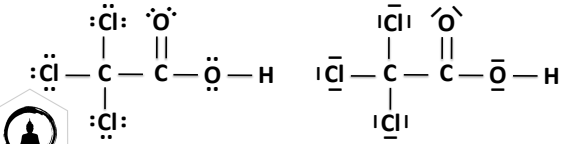

H
H
H
H
C
C
C
H
H
H
H
H — C — C — C — H
H H H
9

Hydrocarbon Drawing & Representations

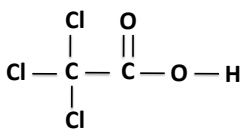
- Electron Dot or Lewis Structures
- Molecular Structure or Structural Formula
- Semi-structural formula or Condensed Structural Formula
- Skeletal structure
- Molecular Formula

Electron dot/ Lewis Structures





Other Structures



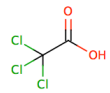
Molecular Structure or Structural Formula

Cl_3CCOOH
CCl_3COOH
CCl_3COH

Semi-structural formula or Condensed Structural Formula

$C_2HO_2Cl_3$

Molecular Formula



Skeletal Structure

Hydrocarbon Naming

IUPAC systematic nomenclature

1. Identify the parent chain
   - longest chain
   - contains the parent functional group & most number of multiple (double & triple) bonds
2. Identify the parent functional group
   - according to order of precedence
3. Identify any side-chains
4. Identify all other functional groups
5. Identify all multiple bonds
6. Number the parent chain and assign locants to all functional groups, side chains and multiple bonds

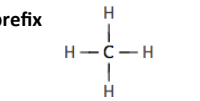
Hydrocarbon Naming

Carbon chain length prefix	Side chain alkyl groups
1 = meth	1 = methyl
2 = eth	2 = ethyl
3 = prop	3 = propyl
4 = but	4 = butyl
5 = pent	5 = pentyl
6 = hex	6 = hexyl
7 = hept	7 = heptyl
8 = oct	8 = octyl
9 = non	9 = nonyl
10 = dec	10 = decyl

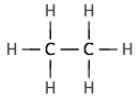
Hydrocarbon Naming

Carbon chain length prefix

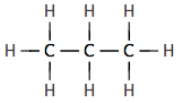
1 = meth
2 = eth
3 = prop
4 = but
5 = pent
6 = hex
7 = hept
8 = oct
9 = non
10 = dec



methane



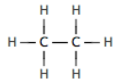
ethane



propane

Hydrocarbon Naming

- Alkanes: Compounds containing ONLY C-C single bonds



ethane

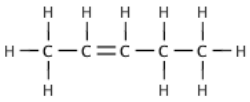
- Alkenes: Compounds containing one or more C=C double bond(s)

ethene

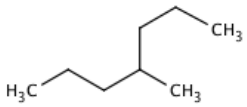
- Alkynes: Compounds containing one or more C≡C triple bond(s)

ethyne

Hydrocarbon Naming

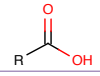


pent-2-ene

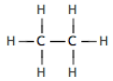


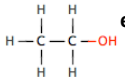
4 - methylheptane

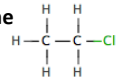
Functional Groups

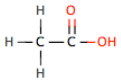
Group	Group name	Prefix (P) / suffix (S)
R-F	Fluoro	fluoro- (P)
R-Cl	Chloro	chloro- (P)
R-Br	Bromo	bromo- (P)
R-I	Iodo	iodo- (P)
R-OH	Alcohol/Hydroxyl	hydroxy- (P) or –ol (S)
	Carboxylic acid	-oic acid (S)
R-NH_2	Amine	amino- (P) or -amine (S)
	Amide	amido- (P) or –amide (S)
	Ester	Ester (S) Or ___yl ___oate

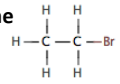
Ethane with different functional groups

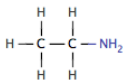
ethane 

ethanol 

chloroethane 

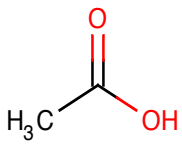
ethanoic acid 

bromoethane 

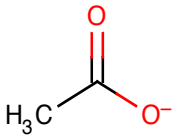
ethanamine 

Naming esters

Ethanoic acid

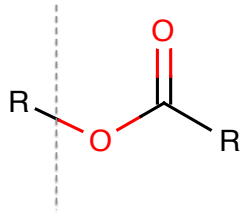


Ethanoate



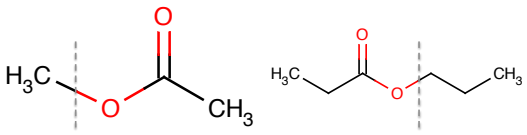
Naming esters

-yl -oate



Examples

Methyl ethanoate **Propyl propanoate**



Beware of the directionality of the ester group!

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Order of Precedence

	Group	Group name	Prefix (P) / suffix (S)
5	R-F	Fluoro	fluoro- (P)
	R-Cl	Chloro	chloro- (P)
	R-Br	Bromo	bromo- (P)
	R-I	Iodo	iodo- (P)
3	R-OH	Alcohol/Hydroxyl	hydroxy- (P) or –ol (S)
1		Carboxylic acid	-oic acid (S)
4	$R\text{-}NH_2$	Amine	amino- (P) or -amine (S)
2		Amide	amido- (P) or –amide (S)
2		Ester	Ester (S) Or ___yl ___oate

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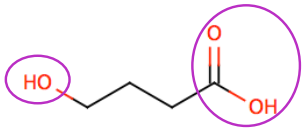
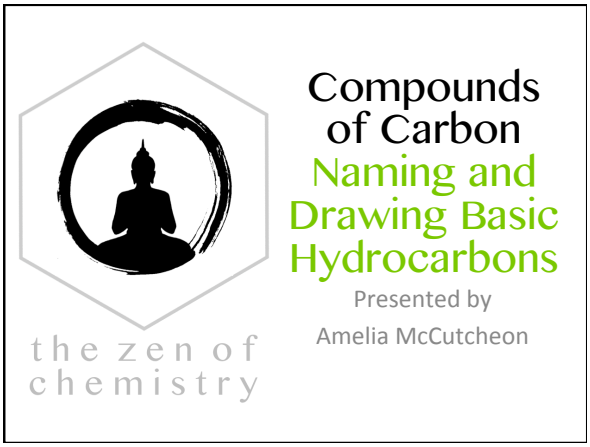
Example



4- hydroxybutanoic acid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