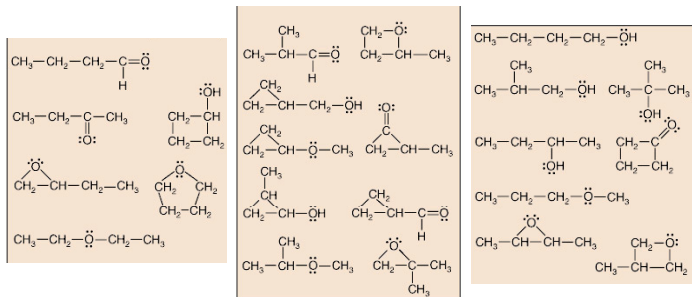


Organic

1.1 Incredible Diversity

- Possible compounds with 4 C, 1 O and enough H to complete the "octets"



Organic

1.2 Special Properties of C

- Carbon typically forms four bonds
- Carbon forms non-polar ($\Delta EN \approx 0$) σ -bonds with C and H
 - C-C and C-H bonds are stable and typically unreactive
- Carbon forms bonds with heteroatoms (N, O, S, P, halogens)
- Carbon readily forms π -bonds with C, N, O
 - π -bonds are typically reactive

Organic

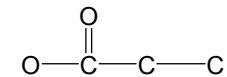
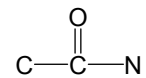
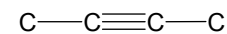
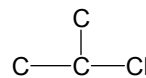
1.3 Normal Bonding Tendencies

- Normally, elements form bonds as follows
 - C; forms 4 bonds ($\sigma + \pi$), no lone pairs
 - N; forms 3 bonds ($\sigma + \pi$), one lone pair
 - O; forms 2 bonds ($\sigma + \pi$), two lone pairs
 - Halogen; forms one σ bond, three lone pairs
 - H; forms one σ bond, no lone pairs

Organic

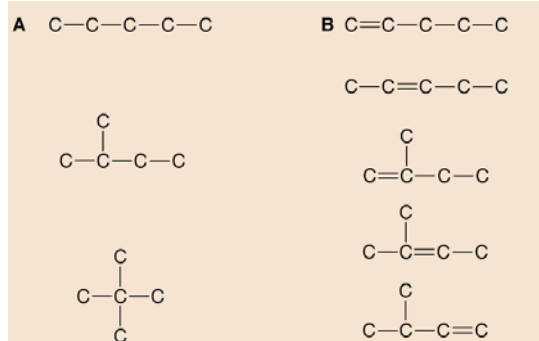
1.4 Normal Bonding Tendencies

- Complete the molecules by adding hydrogen atoms where required



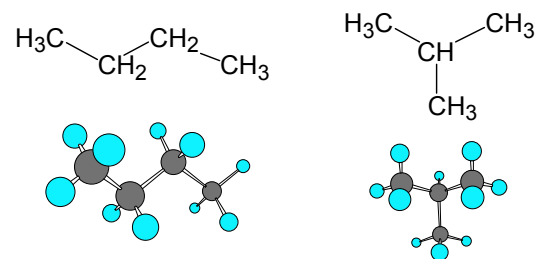
1.5 Diverse Structures

- A: 5 C, all single bonds
- B: 5 C, one double bond



2.1 Isomers

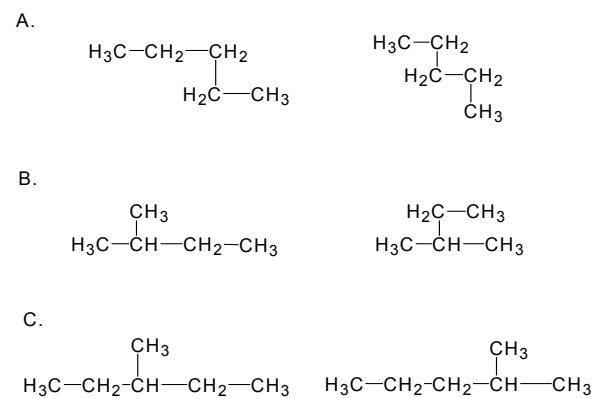
- Molecules with the same chemical formula but with different arrangement of atoms in space
- Isomers possess different chemical and physical properties



2.2 Isomers

- Molecules with the same chemical formula but with different arrangement of atoms in space
- Isomers possess different chemical and physical properties
- C₂H₆O

2.3 Isomers?



Organic

2.4 Isomers

- Draw all possible isomers for C_6H_{14} assuming there are no rings and no multiple bonds

Organic

2.5 Isomers

- Draw the five possible isomers for C_5H_{10} assuming there is one ring

Organic

2.6 Molecule Representations

- Expanded formulas

- Condensed formulas

- Carbon skeleton formulas (stick drawings)

Organic

2.7 Molecule Representations

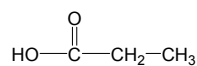
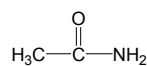
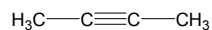
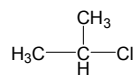
- Carbon skeleton formulas (stick drawings) for butane and 2-methylpropane

- C_2H_6O

Organic

2.8 Molecule Representations

- Draw carbon skeleton structures for the following:



Organic

2.9 Molecule Representations

- Draw carbon skeleton structures for all possible isomers for C_6H_{14}

Organic

2.10 Molecule Representations

- Draw carbon skeleton structures for the five possible isomers for C_5H_{10} assuming there is one ring

Organic

3.1 Naming Hydrocarbons

PREFIX + ROOT + SUFFIX

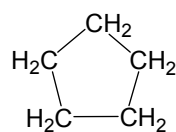
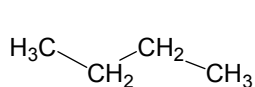
Roots	Number of C atoms
meth-	1
eth-	2
prop-	3
but-	4
pent-	5
hex-	6
hept-	7
oct-	8
non-	9
dec-	10

Organic

3.2 Naming Organic Compounds

Table 15.2 Rules for Naming an Organic Compound

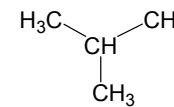
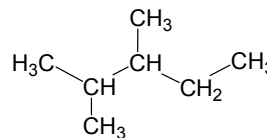
1. Naming the longest chain (root)
 - (a) Find the longest *continuous* chain of C atoms.
 - (b) Select the root that corresponds to the number of C atoms in this chain.
2. Naming the compound type (suffix)
 - (a) For alkanes, add the suffix *-ane* to the chain root. (Other suffixes appear in Table 15.5 with their functional group and compound type.)
 - (b) If the chain forms a ring, the name is preceded by *cyclo-*.



Organic

3.3 Naming Organic Compounds

3. Naming the branches (prefixes) (If the compound has no branches, the name consists of the root and suffix.)
 - (a) Each branch name consists of a subroot (number of C atoms) and the ending *-yl* to signify that it is not part of the main chain.
 - (b) Branch names precede the chain name. When two or more branches are present, their names appear in *alphabetical* order.
 - (c) To specify where the branch occurs along the chain, number the main-chain C atoms consecutively, starting at the end *closer* to a branch, to achieve the *lowest* numbers for the branches. Precede each branch name with the number of the main-chain C to which that branch is attached.



Organic

3.4 Naming Organic Compounds

- Name all possible isomers for C_6H_{14}

Organic

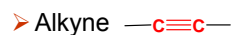
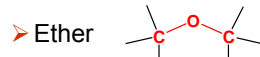
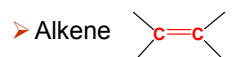
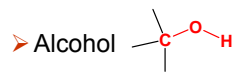
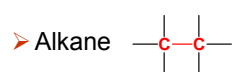
3.5 Naming Organic Compounds

- Name the five possible isomers for C_5H_{10} assuming there is one ring

Organic

4.1 Functional Groups

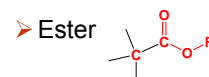
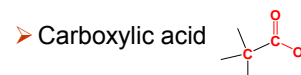
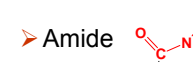
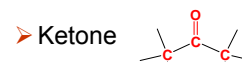
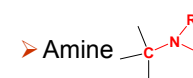
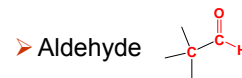
➤ Functional group – group of atoms with specific structure and reactivity



Organic

4.2 Functional Groups

➤ Functional group – group of atoms with specific structure and reactivity



Organic

4.3 Naming Functional Groups

PREFIX + ROOT + SUFFIX

Functional group	Suffix
alkane	-ane
alkene	-ene
alkyne	-yne
alcohol	-ol
ether	ether
aldehyde	-al
ketone	-one
carboxylic acid	-oic acid
ester	-oate
amine	-amine
amide	-amide
nitrile	-nitrile

Organic

4.4 Naming Organic Compounds

