Name: KEY Official Class: _____ Date: _____
Teacher: _____ Period: _____ Class: _____

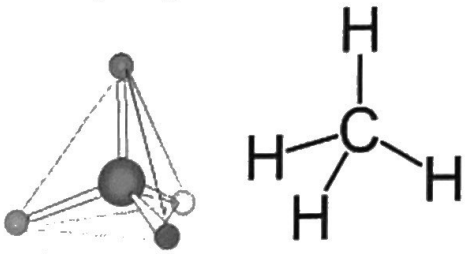
Introduction to Organic Chemistry

What is Organic Chemistry?

- Organic Chemistry: the study of compounds that contain carbon and hydrogen

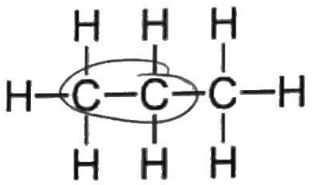
Why is carbon so special?

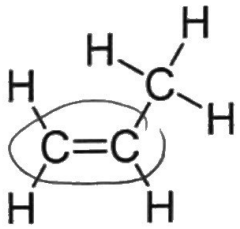
- Carbon has 4 valence electrons
- These four single bonds spread out evenly to create a tetrahedral molecule (like a tripod)
- Carbon atoms bond with other carbon atoms, forming covalent chains, rings, and networks
- Two adjacent carbon atoms can share up to 3 pair e⁻ (C≡C)
- Each shared pair of electrons is represented by a dash line

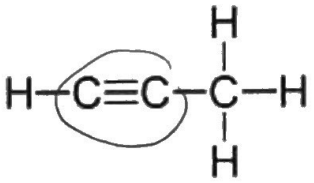


What are hydrocarbons?

- Hydrocarbons – organic molecules that contain only carbon & hydrogen
- Saturated Hydrocarbons - all single bonds between carbons
  - maximum number of hydrogens attached (the same way a saturated solution holds the maximum amount of solute)
  - Single dash line (C-C) → single bond
    1 shared pair e⁻ / 2e⁻ total make up bonds (C:C)
- Unsaturated Hydrocarbons - at least one multiple bond in carbon chain
  - Two dash lines (C=C) → double bond
    - 2 shared pairs / 4 e⁻ total make up bonds (C::C)
      - Example:
  - Three dash lines (C≡C) → triple bond
    - 3 shared pairs e⁻ / 6e⁻ total make up bonds (C:::C)







Properties of Organic Compounds

- Bonding: covalent → nonmetal + nonmetal
- Solubility: most are insoluble in water (generally nonpolar)
  * like dissolves like
- Conductivity: mostly nonconductors (s), (l), & (aq) states *Only organic acids ionize in solution = poor conductors
- Melting/boiling points: weak IMF → low MP's & BP's
- Reactivity Rate: react slowly; more bonds to break

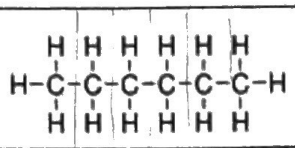
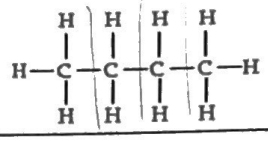
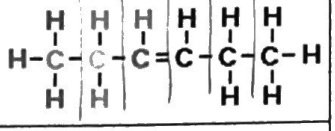
Types Of Chemical Formulas

- Molecular Formula: shows the # of atoms of each element in a compound; least informative formula
- Structural Formula: shows the # of atoms of each element AND the arrangement of the atoms; most informative formula
- Condensed Formula = each carbon is written with its constituent hydrogens followed by the proper subscript

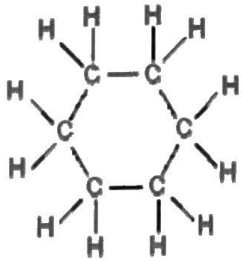
Name: KEY Official Class: _____ Date: _____

Teacher: _____ Period: _____ Class: _____

Open-Chained (Aliphatic)

Structural Formula			
Condensed Formula	$CH_3CH_2CH_2CH_2CH_2CH_3$	$CH_3CH_2CH_2CH_3$	$CH_3CH_2CHCHCH_2CH_3$
Molecular Formula	C_6H_{14}	C_4H_{10}	C_6H_{12}

Closed-Chained (Aromatic)



- When drawing organic compounds you MUST always have 8e- around each atom! ** EXCEPTION: Hydrogen (H) achieves its "octet" with only 2e- around it.

Table Q: Homologous Series of Hydrocarbons

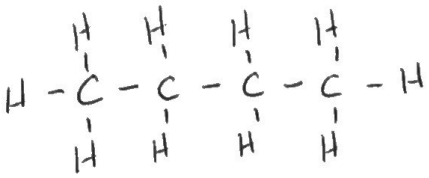
- Homologous series: a group of related compounds in which each member differs from the one before it by one carbon unit
- Note (above): there are always 4 bonds (8 electrons) around carbon & H can only have one bond around it (2 electrons)

Drawing Alk*anes*

- An organic compound ending in "-ane" represents a simple hydrocarbon chain with single bonds
- Use Table P to correctly match the number of carbons and the proper prefix

Drawing Practice: Determine the molecular formula, condensed formula, and structural formula

Structural Formula:

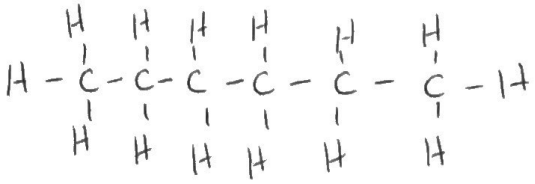


Compound Name: butane

Condensed Formula: $CH_3CH_2CH_2CH_3$

Molecular Formula: C_4H_{10}

Structural Formula:

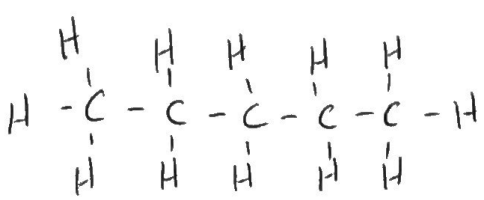


Compound Name: Hexane

Condensed Formula: $CH_3CH_2CH_2CH_2CH_2CH_3$

Molecular Formula: C_6H_{14}

Structural Formula:

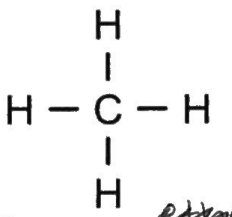


Compound Name: pentane

Condensed Formula: $CH_3CH_2CH_2CH_2CH_3$

Molecular Formula: ~~C6~~ C_5H_{12}

Structural Formula:



Compound Name: ~~ethane~~ methane

Condensed Formula: CH_4

Molecular Formula: CH_4