

# Topic: Organic Chemistry

## STUDY LIST

### Hydrocarbons – An Introduction To Chemistry

- Give examples of hydrocarbons.
- Give examples of molecular formulas and structural formulas.
- List prefixes 1 – 10 (meth-, eth-, prop-, but-, etc.)
- Build models of molecules.
- State the # of atoms and # of elements in a molecule.
- Draw isomers of molecules and recognize isomers.
- Know the bond angle of H-C-H bond.
- State the bonding capacity of C, H, O, Cl, Br, and I.
- Given the name of a hydrocarbon, write its formula and vice versa.
- Know the names and symbols of the elements used.
- Know that hydrocarbons are good fuels and give household examples.

### Branched and Substituted Hydrocarbons

- Looking at a structural formula, identify the “parent chain.”
- Remember that the parent chain can be bent.
- Know that trichloromethane is “chloroform.”
- Give examples of substituted hydrocarbons.
- Know the names of side groups: methyl –CH<sub>3</sub> ethyl –C<sub>2</sub>H<sub>5</sub> bromo –Br iodo –I chloro –Cl
- Start numbering carbons of a parent chain where there are more side groups.
- Know that “n” means “normal” (straight chain.) For example, n-pentane C-C-C-C-C
- Draw and name isomers of substituted hydrocarbons.
- State that tetramethyl means 4 methyl groups, trimethyl means 3 groups, dimethyl means 2 groups.

### Double Bonds, Triple Bonds, and Rings

- Build a model of a double bond using two carbon atoms connected by two springs.
- Demonstrate that double bonds cannot rotate like a single bond.
- Demonstrate cis- and trans- isomerism using dichloroethene, C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>.
- State that hydrocarbons with:

all single bonds are called alkanes	end with “-ane”	follow the formula C <sub>n</sub> H <sub>2n+2</sub>
one double bond are called alkenes	end with “-ene”	follow the formula C <sub>n</sub> H <sub>2n</sub>
one triple bond are called alkynes	end with “-yne”	follow the formula C <sub>n</sub> H <sub>2n-2</sub>

- Given a formula, recognize whether the molecule is an alkane, alkene, or alkyne.
- Given a formula, name the molecule. Given a name, write the correct formula.

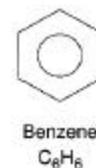
- Build a model of a triple bond using two carbon atoms connected by three springs.
- Know that “cyclo-“ means the molecule contains a ring. Draw and build cyclopentane.
- Know that “saturated” means “saturated with hydrogens” and describes alkanes.
- Know that alkenes, alkynes, and cyclic hydrocarbons are all “unsaturated.”
- State why unsaturated fats are better for you (the double bond makes them easier to digest and less likely to coat the inside of your arteries.)

## Functional Groups

- Know the “big idea” that various types of compounds (alcohols, ethers, etc.) have atoms in common (called functional groups).
- Given the structural formula of a molecule, circle the atoms that make up the functional group.

alcohol  $\text{R} - \text{OH}$	aldehyde  $\begin{array}{c} \text{O} \\    \\ \text{R} - \text{C} - \text{H} \end{array}$	ketone  $\begin{array}{c} \text{O} \\    \\ \text{R} - \text{C} - \text{R} \end{array}$	ether (bunny)  $\text{R} - \text{O} - \text{R}$
carboxylic acid  $\begin{array}{c} \text{O} \\    \\ \text{R} - \text{C} - \text{OH} \end{array}$	ester  $\begin{array}{c} \text{O} \\    \\ \text{R} - \text{C} - \text{O} - \text{R} \end{array}$	amine  $\text{R} - \text{NH}_2$	amide  $\begin{array}{c} \text{O} \\    \\ \text{R} - \text{C} - \text{NH}_2 \end{array}$

- Know that “R” stands for the “Rest of the molecule” (methyl, ethyl, etc.) [Officially, “R” = “Residue”.]
- State examples of these molecule in daily life. (methyl alcohol, ethyl alcohol, denatured alcohol, rubbing alcohol, formaldehyde, acetone, diethylether, acetic acid, maleic acid, citric acid, salicylic acid, methylsalicylate, vitamins)
- Draw the structural formula and the shortcut picture of a benzene ring.
- Name the three positions of a disubstituted benzene ring (ortho-, meta-, and para-).



## Reactions – Condensation Reactions and Addition Reactions

- Acid + Alcohol → Ester + H<sub>2</sub>O
- Amino Acid + Amino Acid → Protein + H<sub>2</sub>O
- State one way molecules can join: a reaction where H<sub>2</sub>O is formed is called a “condensation reaction.”
- Know that a polymer (“poly” means many, “mer” means parts) consists of many repeating parts.
- State natural examples of polymers such as proteins (many amino acids), carbohydrates (many sugar units), and DNA (many nucleotide bases).
- State man-made polymers like polyester (many ester linkages), and polyethylene, polystyrene, and Teflon.
- State a second way molecules can join: a double bond opens to form two new bonds. Know that this is called an “addition reaction.”
- Given a monomer (like ethane, aka. ethylene), draw the “repeat unit” with the double bond open, copy the repeat unit to draw the polymer.
- Give examples of common substances made from addition polymers.