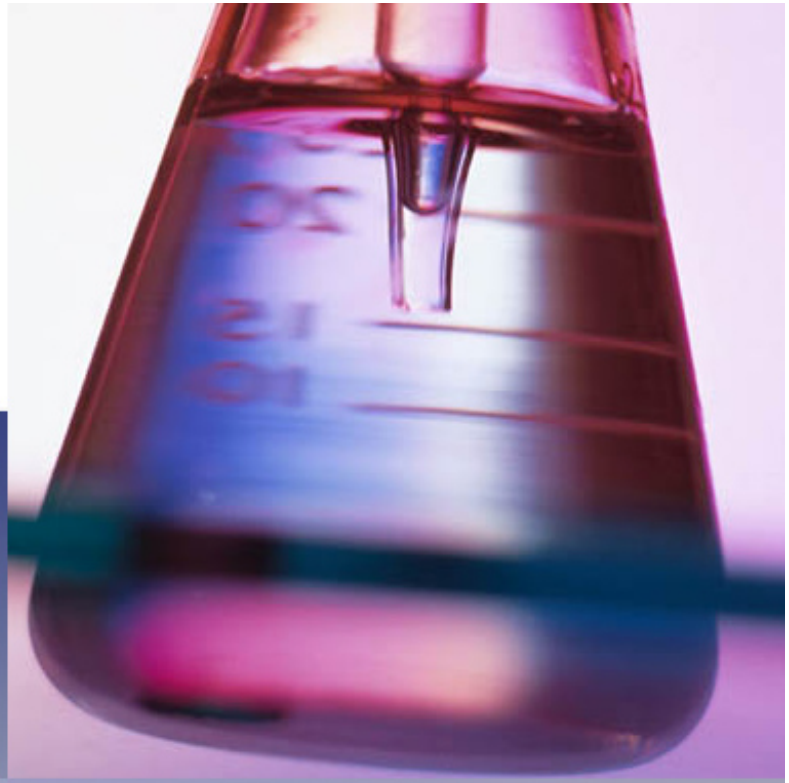


Organic Chemistry

Unit 13

Objectives

- Define, describe and provide examples of polymers
- Explain what makes carbon such a versatile atom when forming bonds
- Name and draw simple linear hydrocarbons and benzene rings

Organic Chemistry

- Includes, but is not limited to, the study of *biological chemicals*
- Primarily involves *carbon compounds*
  - Carbon is rather unique due to its bonding structure
- Includes a class of compounds called *polymers*

Polymers & Monomers

- Polymers are large molecules that are made up of repeating smaller subunits called monomers

- From biology you learned:

  Proteins : amino acids

  Nucleic Acids (DNA) : nucleotides / nucleosides

  Starch (carbohydrate) : glucose (monosaccharide)

Importance of Carbon

These major molecules of life are possible due to the *special bonding structure of carbon*

- Carbon can bond to other carbon atoms to form long chains (and still bond to other things!!)
- Carbon can form single, double, or triple bonds (and still form long chains!!)

Different bonding patterns lead to 16 million different organic carbon compounds!!!

Proteins:
A rather stunning example

- There are thousands of different proteins that life depends upon
- Each protein has a different function based on its sequence of amino acids and its shape
- The ability to link amino acids together is due to the special bonding properties of carbon

Carbon Polymers

- Hydrocarbons – made of just carbon and hydrogen
- Other carbon-based polymers – might include atoms like O, P, N, Cl, F, Br, S, etc.

Components of Carbon Polymers

- Parent Chain (longest chain of carbons)
- Functional groups (there are many…we will only discuss 1)
- Remaining “bonding sites” are filled in with hydrogen atoms *(each carbon atom must have 4 bonds!!)*

Naming Carbon Polymers

Example:

2,2-diphenyl-4-pentyne

Location and name of functional group(s)	Location and name of parent chain

1. name the parent chain
2. “locate” any multiple bonds
3. name any functional groups
4. “locate” any functional groups

Naming Parent Chain

Each parent chain name has a prefix and a suffix

Prefix

Tells the number of carbon atoms in the longest continuous sequence

Suffix

Indicates the kind of bond between carbon atoms

Organic Prefixes

Prefix tells the number of carbon atoms in longest chain:

one	six
two	seven
three	eight
four	nine
five	ten

Mnemonic for First Four Prefixes

First four prefixes

- Meth- Monkeys
- Eth- Eat
- Prop- Peeled
- But- Bananas

Other Prefixes

- Pent-
- Oct-
- Dec-
- Hex-, Hept-, Non-

Organic Suffixes

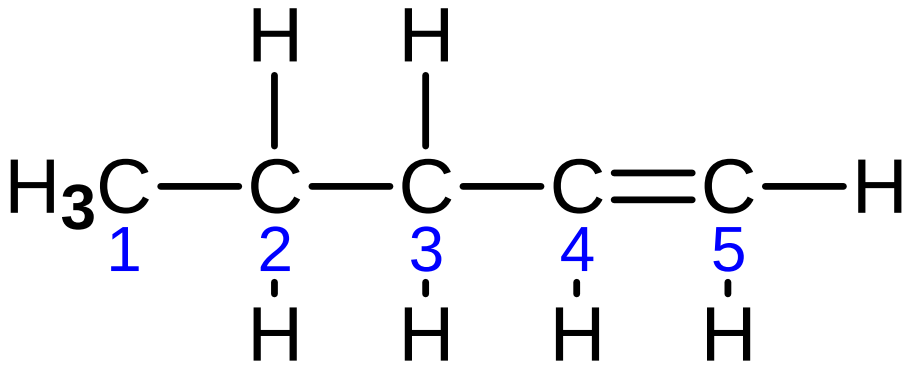
Indicates the kind of bond between carbon atoms

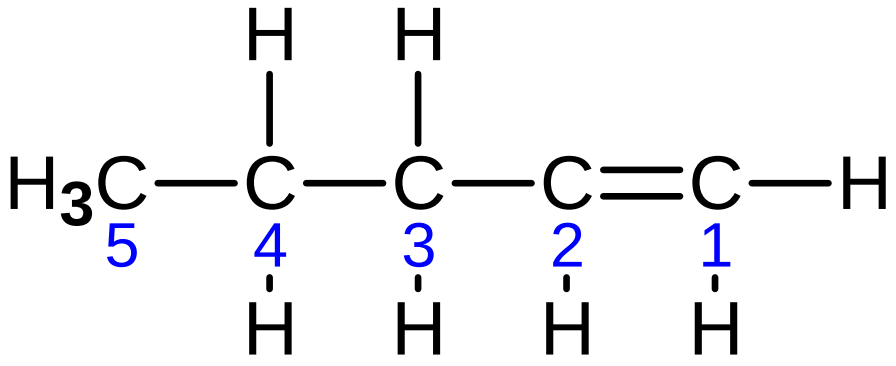
-*ane* – only **single bonds** between carbon atoms

-*ene* – contains one or more **double bonds** between carbon atoms

-*yne* – contains one or more **triple bonds** between carbon atoms

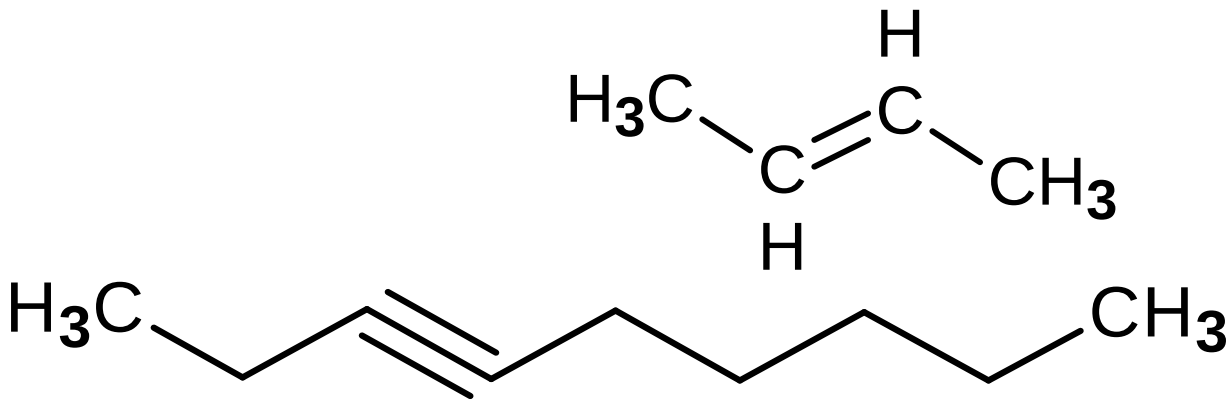
Numbering Carbons





Practice

- Name the following parent chains
  - 7C alkane
  - 5C alkyne
  - 9C alkane



C_2H_4

Functional Groups

There are MANY…see page 684

Benzene Rings

- A molecule of hexene (with three double bonds) that is joined in a ring shape.

- If a benzene ring loses a hydrogen, and instead is attached to a hydrocarbon chain, we call it a ***phenyl*** group

Naming Rules

1. Determine the ending of the compound
   - *-ane* for single bonds only; *-ene* for one or more double bonds; *-yne* for one or more triple bonds
2. Number the carbons
   - For alkenes and alkynes the first carbon of the multiple bond should have the smallest number. For alkanes the first branch should have the lowest #.
3. Add a prefix for the number of carbons
4. Add numbers to locate double and triple bonds
   - Separate numbers from letters with hyphens (e.g. 4-ethyl-2-methyldecane).

Naming Rules cont.

5. Determine the name of any branched groups (phenyl)
6. Attach names of branches alphabetically along with their carbon position.
   - separate numbers with commas (e.g. 2,4-diphenylhexane)
7. When identical groups are on the same carbon, repeat the number of this carbon in the name. (e.g. 2,2-dimethylhexane)

More Practice