The chemistry of Carbon

ORGANIC CHEMISTRY

hydrocarbons

- Hydrocarbons are composed of **C** and **H** atoms *(at least: may contain O, N, etc.)*
- Carbon atoms are uniquely able to bond with other carbon atoms
- May be long carbon chains, branched chains, or multi-carbon rings

Carbon

- 4 valence electrons
- Nearly always covalently bonds
- **Almost always forms 4 covalent bonds**
- Single, double or triple bonds are possible

Hydrogen

- only has 1 valence electron
- Nearly always covalently bonds
- **ONLY forms 1 covalent bond**
- NEVER the central atom
- “one and done” rule

Alkanes

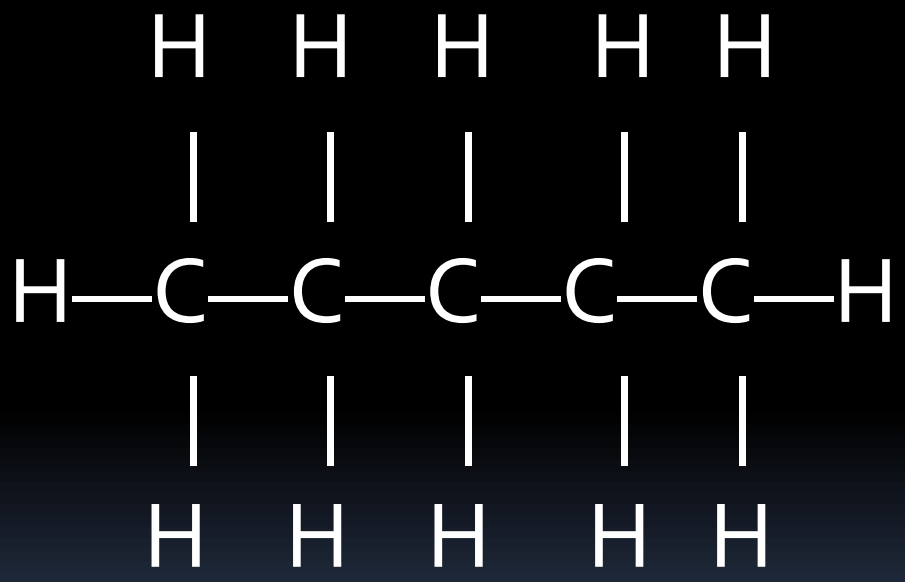
- hydrocarbon chains where carbons have only single bonds
- Each carbon bonds to other carbons or hydrogens
- $C_nH_{(2n+2)}$

Alkanes

- CH_4
  - Methane
- C_2H_6
  - Ethane
- C_3H_8
  - Propane
- C_4H_{10}
  - Butane
- C_5H_{12}
  - Pentane
- C_6H_{14}
  - Hexane
- C_7H_{16}
  - Heptane
- C_8H_{18}
  - Octane
- C_9H_{20}
  - Nonane
- $C_{10}H_{22}$
  - Decane

Structural formulas

Ex: pentane: C_5H_{12}

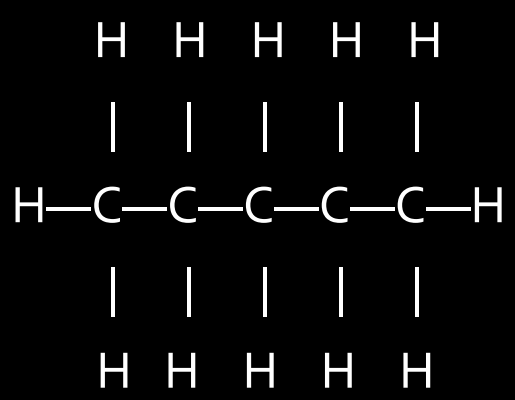


Condensed structural formulas

- Rather than draw out the entire structure, often condensed structural formulas are used
- Each carbon is listed by itself, followed with how many hydrogens are bonded to it

Condensed structural formulas

- Ex: pentane: C_5H_{12}



Condensed structural formula:

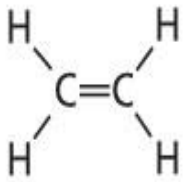
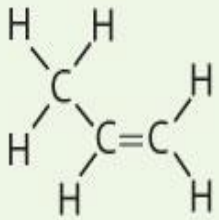
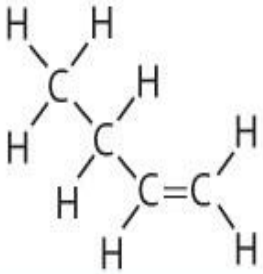
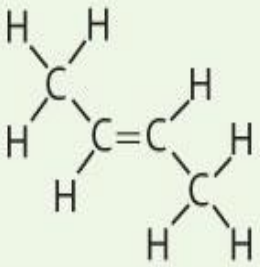
$CH_3CH_2CH_2CH_2CH_3$

Alkenes

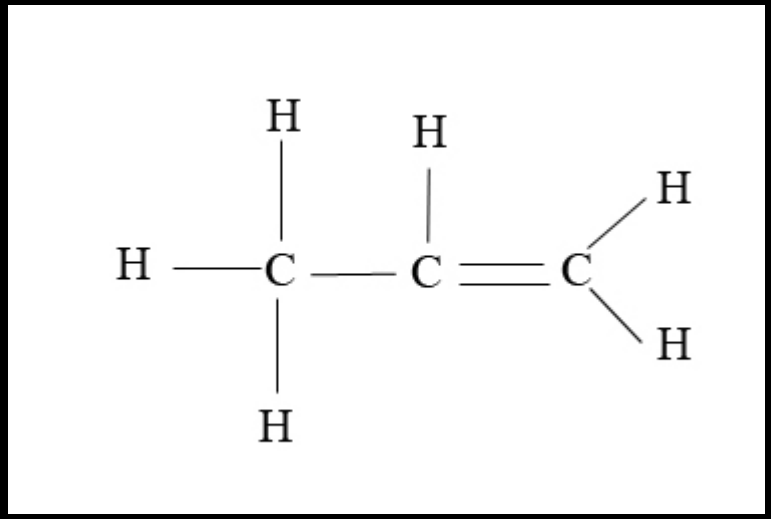
- hydrocarbon chains where carbons have double bonds
- Considered to be "unsaturated" because there isn't the maximum number of hydrogens.
- C_nH_{2n}

Alkenes

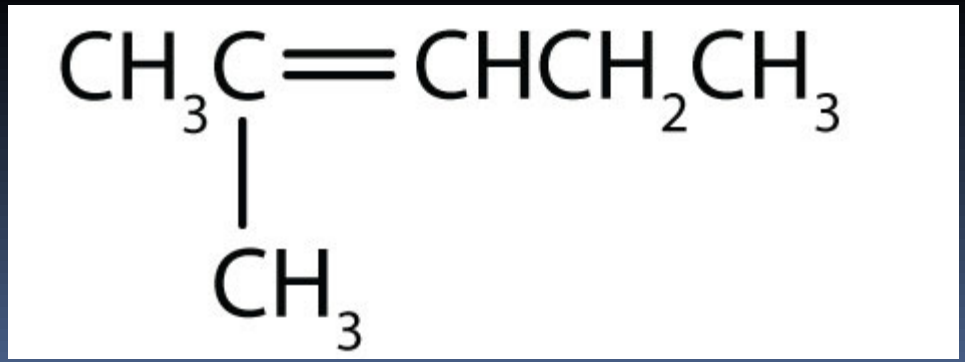
Table 21.5 Examples of Alkenes

Name	Ethene	Propene	1-Butene	2-Butene
Molecular formula	C_2H_4	C_3H_6	C_4H_8	C_4H_8
Structural formula				
Condensed structural formula	$CH_2=CH_2$	$CH_3CH=CH_2$	$CH_3CH_2CH=CH_2$	$CH_3CH=CHCH_3$

propene



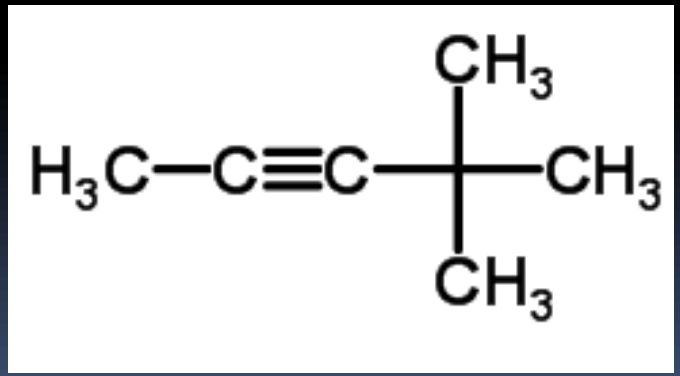
2-methyl-2-pentene



Alkynes

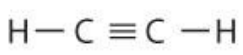
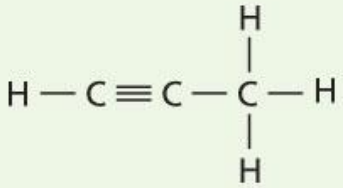
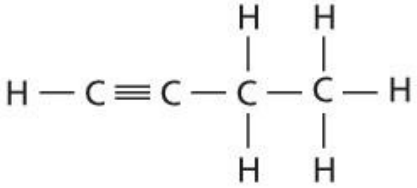
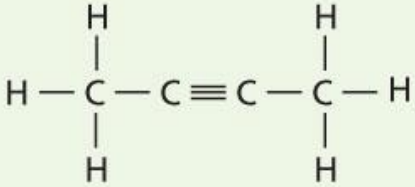
- hydrocarbon chains where carbons have one or more triple bonds
- Often very reactive.
- $C_nH_{(2n-2)}$

4,4-dimethyl-2-pentyne



Alkynes

Table 21.6 Examples of Alkynes

Name	Molecular Formula	Structural Formula	Condensed Structural Formula
Ethyne	C_2H_2		$CH \equiv CH$
Propyne	C_3H_4		$CH \equiv CCH_3$
1-Butyne	C_4H_6		$CH \equiv CCH_2CH_3$
2-Butyne	C_4H_6		$CH_3C \equiv CCH_3$

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