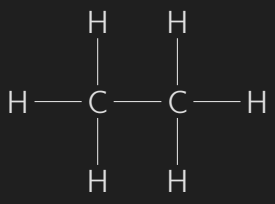
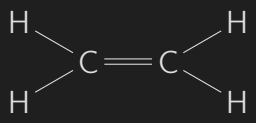
Organic Chemistry II

Chapter 14: Alkenes

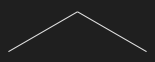
Nomenclature of Alkenes



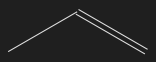
Saturated
alkanes ethane



Unsaturateed
alkenes ethene



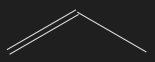
propane



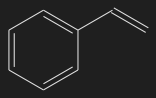
propene

- Generally prepared through beta elimination, which results in the formation of alkenes (series of unsaturated hydrocarbons contain that a π bond).
- Alkenes are named using the same four steps in the previously used nomenclature, though the suffix of "ane" is replaced with "ene."
- When choosing the parent chain, choose the parent chain that includes the π bond.
- When numbering the parent chain, the π bond should receive the lowest number possible.
- The locant of the π bond should be place right before the suffix of "ene," though, it was previously recommended before the parent (both are acceptable).
- Commonly recognized alternative names:

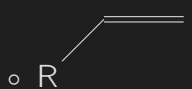
Ethylene



Propylene



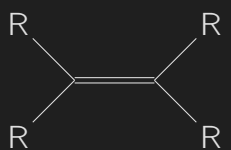
Styrene

- **Degree of substitution**: not a substitution reaction, but the number of groups connected to the double bond.
  - 

Monosubstituted

Disubstituted

Trisubstituted

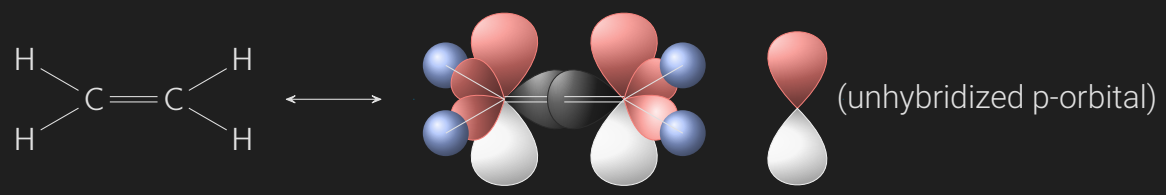


Tetrasubstituted

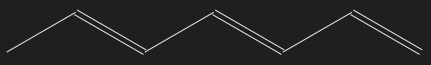
Practice and Review

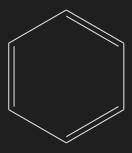
- **Electronegativity**: negative charges on atoms with lower hybridization result in greater stability due to proximity (overlap) to positive nucleus. More s character results in greater stability.

- I.e., sp (50% s) > sp^2 (33% s) > sp^3 (25% s)
- E.g., ethene has two carbons that are both sp^2 due to one unhybridized p-orbital. This gives ethene a trigonal planar geometry.



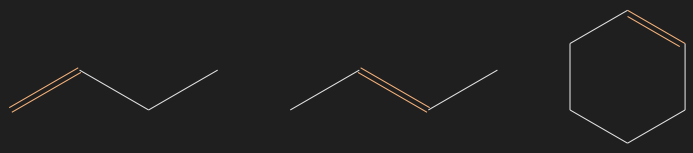
- **Hydrogen deficiency index (HDI)**: the measure of degrees of unsaturation.
  - E.g., two degrees of unsaturation results in a HDI of 2.
  - Degrees of freedom help represent possible structures, indicating possible double bounds, triple bounds, rings, or various combinations of each.
  - Only helpful when molecular formula is known for certainty.
  - Formula: $\text{HDI} = \frac{1}{2}(2C + 2 + N - H - X)$
    - X: halogen atoms.
- What is the HDI for the following molecules?

i 

ii 

Types of Alkenes

- Basic types of alkenes:



Terminal Alkene Internal Alkene Cyloalkene

- Types of terminal alkenes:

Methylene Vinyl Allyl

  - "R" always tells you it's a carbon containing functional group, or hydrogen.
  - "A" can be used to represent any functional group.