Alkynes

Def: unsaturated hydrocarbon with

The framework $\rightarrow$ triple bond consists of:

*Like alkenes, pi bonds

**IUPAC naming:** Similar to

- Longest continuous chain with
- Parent compound =
- Number to give

Ex:

4-sec-butyl-2-octyne
**When multiple FG given**
- Highest priority =
- Highest priority also
- Multiple bonds
- Other FG named

Ex:

Common Naming: as derivatives of

H—C≡C—H  R—C≡C—H  R—C≡C—R'

Ex:

CH₂CH₃—C≡C—H  benzene  CH₃—C≡C—CH(CH₂)₃
Properties of alkynes depend on:

\[ \text{R–C≡C–H} \quad \text{R–C≡C–R'} \]

**Physical Properties:**
- Nonpolar →
- Low Mol. Wt. (≤ C4) →
- Boiling pts →
- Density →
- *Acidity → Table 9-2 (pg 388)
  - High
  - Electrons of conj. Base

Ex: Which base can deprotonate acetylene, alkoxides or amide ions?

*Remember in acid-base reactions,

\[ \text{H–C≡C–H} + \text{OR} \quad \rightarrow \]

\[ \text{H–C≡C–H} + \text{NH}_2 \quad \rightarrow \]

*Acetylde ions are
Reactions of Alkynes

1. Nucleophilic substitution

\[
\text{H} - \text{C} = = \text{C}^- + \text{R} - \text{X} \rightarrow \]

2. Synthesis by

*Requires ( )

\[
\text{R} - \text{C} - \text{C} - \text{R} \rightarrow \]

3. Addition reactions “Whatever alkenes can do

1 equivalent reactant →
2 equivalents reactant →

**Ex:** Hydrogenation

\[
\text{R} - \text{C} = \text{C} - \text{R}' \rightarrow \]

*Correct reactant/catalyst can select

Lindlar’s catalyst →
Na/NH₃ →

Other additions: X₂, HX, HOH*
**Ex:** Addition of HOH – Markovnikov orientation

*Catalyzed by

\[
\text{R} = \text{C} = \text{C} = \text{H} + \text{H}_2\text{O} \xrightarrow{\text{HgSO}_4/\text{H}_2\text{SO}_4} \text{R} = \text{C} = \text{C} = \text{H}
\]

Keto-enol tautomerization – rapid equilibrium of

**Ex:** Addition of HOH – Anti-markovnikov orientation

*Called

\[
\text{R} = \text{C} = \text{C} = \text{H} + (1) \text{Si}_2\text{BH}^*\text{THF} \\
(2) \text{H}_2\text{O}_2, \text{NaOH}
\]

Suggested problems: 27(a, b, c, h, k), 28a, 29(a, b, c, d), 30a, 33 (a, b, c, d, e, f, l, m)