جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم
قسم الادلة الجنائية

المحاضرة الخامسة

Organic chemistry

المادة : عضوية
المرحلة : الثانية
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Alkyne

Nomenclature:

Alkynes are named according to two different systems.

1-In this system, alkynes are considered to be derived from acetylene by replacing one or both hydrogen atoms with alkyl groups.

$H–C\equiv C–C_2H_5$: Ethylacetylene (Common Name) or 1-Butyne (Systematic Name).

$CH_3–C\equiv C–CH_3$: Dimethylacetylene (Common Name) or 2-Butyne (Systematic Name).

$CH_3–C\equiv C–CH(CH_3)_2$: Methylisopropylacetylene (Common Name) or 4-Methyl-2-pentyne (Systematic Name).

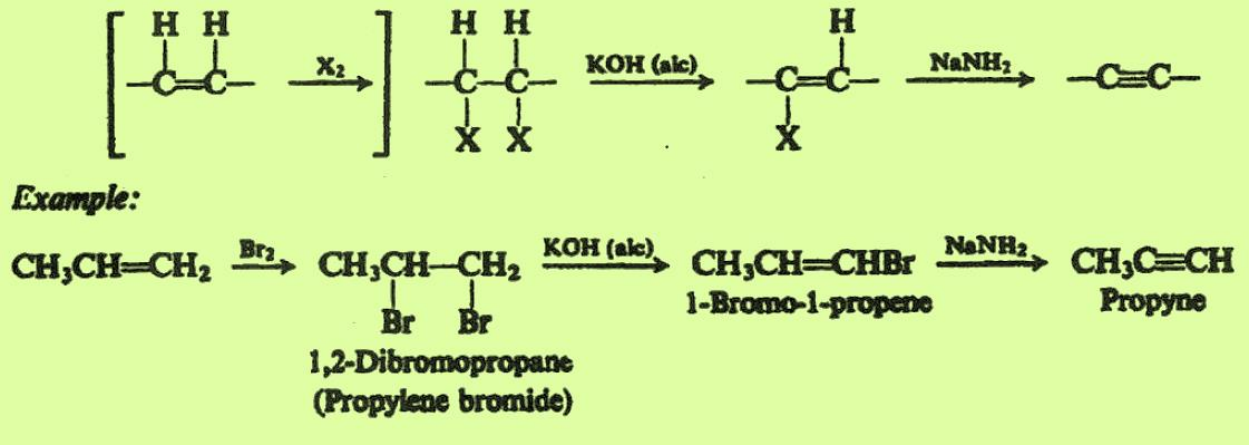
2-For more complicated alkynes, the IUPAC names are used.

- ✓ The rules are the same as for naming alkenes, but the ending **-yne** replaces the **-ene**.
- ✓ The **parent chain** is the longest continuous chain that contains the triple bond.
- ✓ The positions of both substituents and the triple bond are indicated by numbers.
- ✓ The triple bond is given the number of the first triply-bonded carbon atom, starting from the end of the chain nearest to the triple bond.

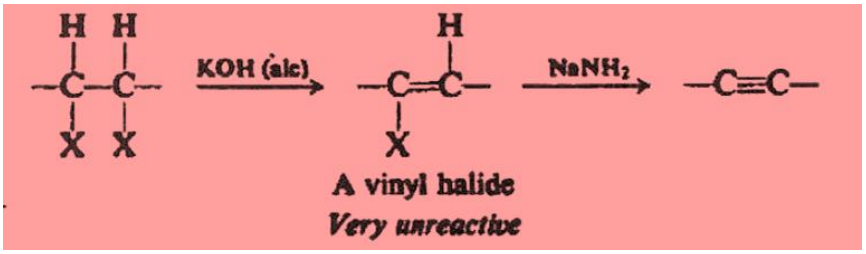
Name	Formula
Acetylene	$HC\equiv CH$
Propyne	$HC\equiv CCH_3$
1-Butyne	$HC\equiv CCH_2CH_3$
1-Pentyne	$HC\equiv C(CH_2)_2CH_3$
2-Butyne	$CH_3C\equiv CCH_3$
2-Pentyne	$CH_3C\equiv CCH_2CH_3$
3-Methyl-1-butyne	$HC\equiv CCH(CH_3)_2$
2-Hexyne	$CH_3C\equiv C(CH_2)_2CH_3$
3-Hexyne	$CH_3CH_2C\equiv CCH_2CH_3$

Preparation of Alkynes

1. Dehydrohalogenation of Alkyl Dihalides



The dehydrohalogenation of alkyl dihalides to form alkynes is generally carried out in **two stages**.



2. Reaction of sodium acetylides with primary alkyl halides.

—C≡CH →(NaNH₂ or Na metal) —C≡C⁻Na⁺ + RX → —C≡C–R + NaX

(R must be 1°)

Examples:

$HC{\equiv}C{:}^{-}Na^{+} + CH_3CH_2CH_2CH_2Br \longrightarrow HC{\equiv}CCH_2CH_2CH_2CH_3$

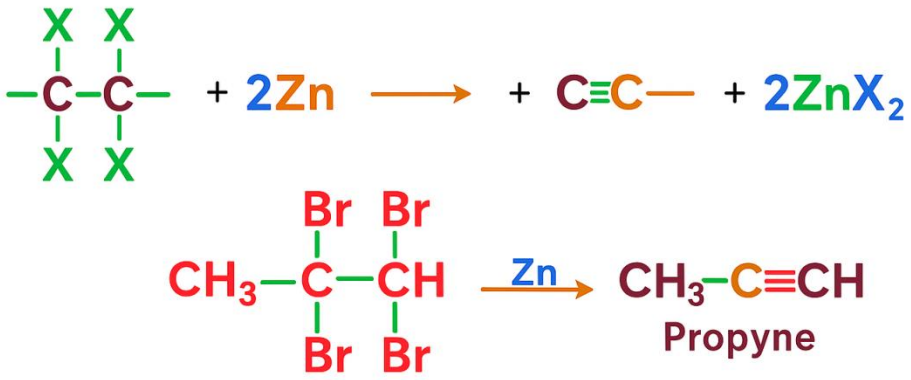
Sodium acetylide — *n*-Butyl bromide — 1-Hexyne (*n*-Butylacetylene)

$CH_3(CH_2)_4C{\equiv}C{:}^{-}Na^{+} + CH_3(CH_2)_3CH_2Cl \longrightarrow CH_3(CH_2)_4C{\equiv}C(CH_2)_4CH_3$

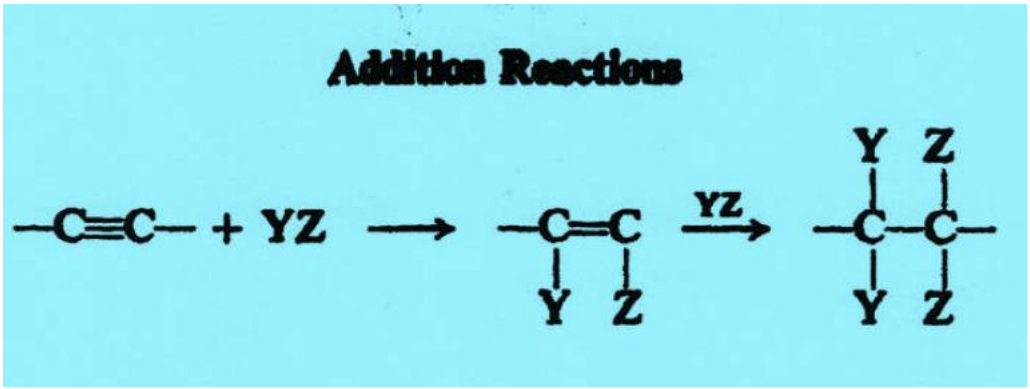
Sodium *n*-pentylacetylide — *n*-Pentyl chloride — 6-Dodecyne

3-Dehalogenation of tetrahalides

Example:



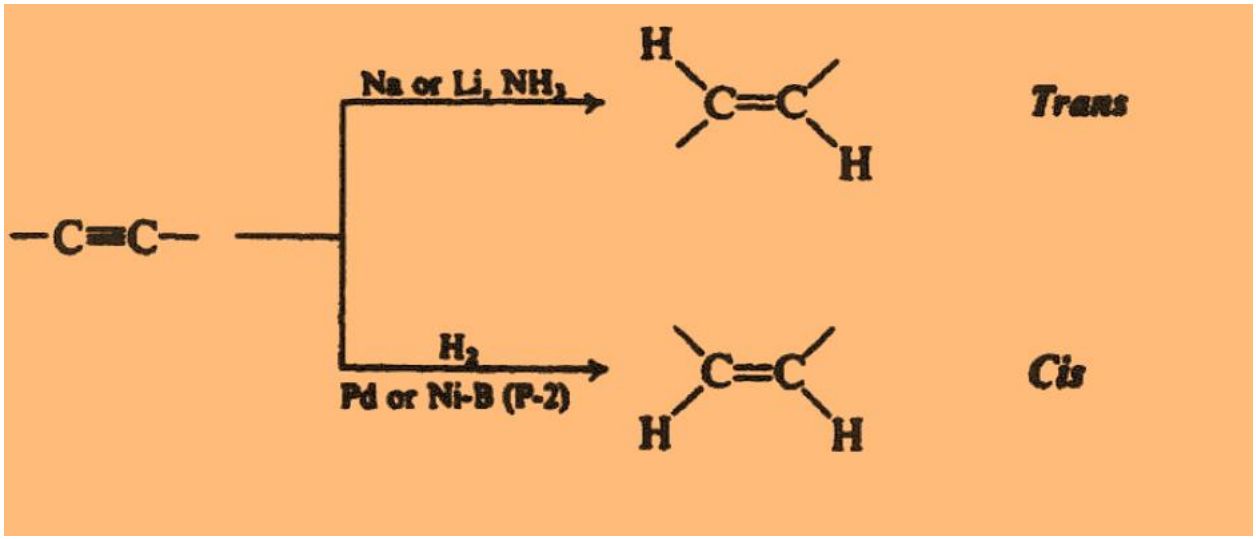
Reaction of Alkyne

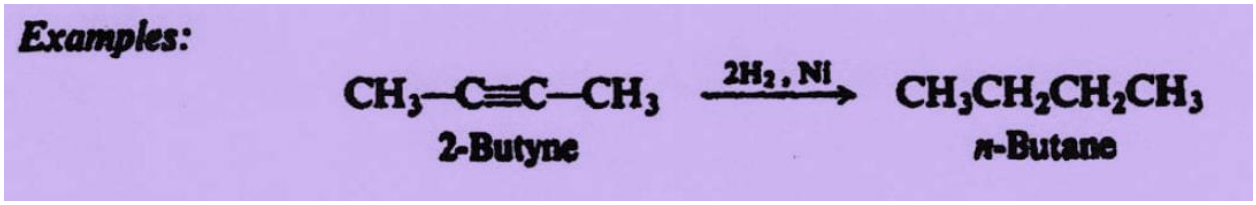


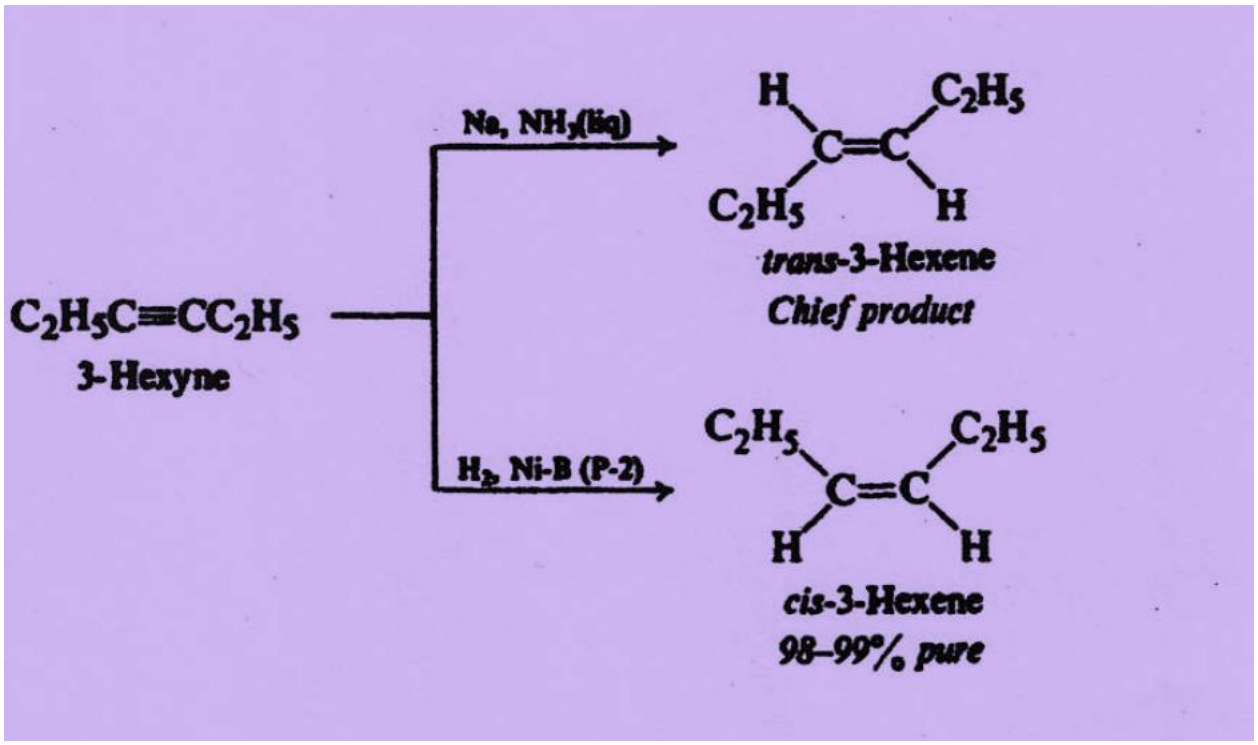
1- Addition of hydrogen

Ni catalyst

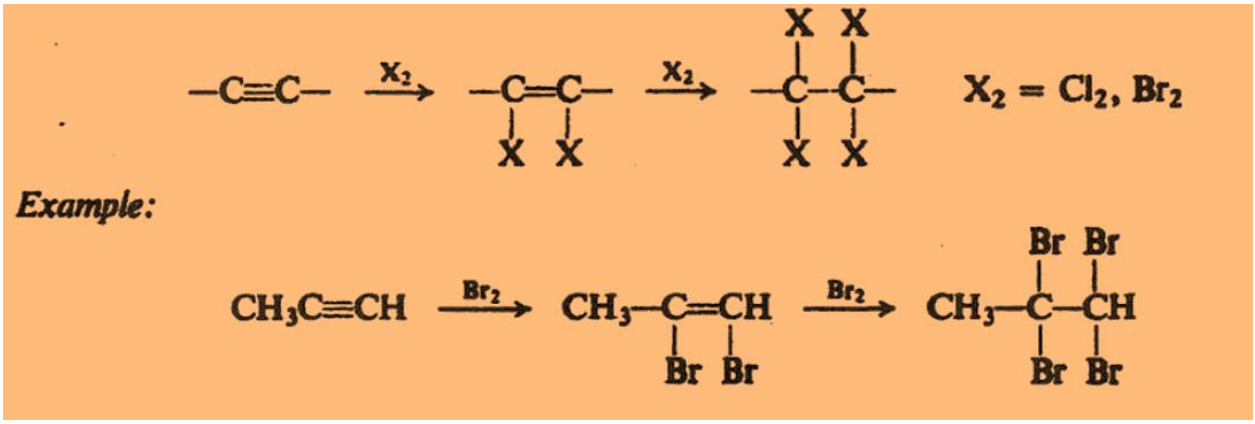
$$HC{\equiv}CH + 2H_2 \longrightarrow CH_3CH_3$$


Na or Li, NH3
Trans
H2
Pd or Ni-B (P-2)
Cis

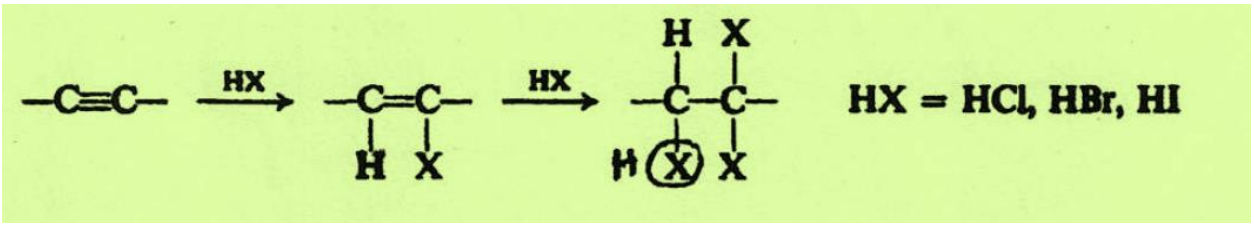

Examples:
2H2 , Ni
2-Butyne
n-Butane

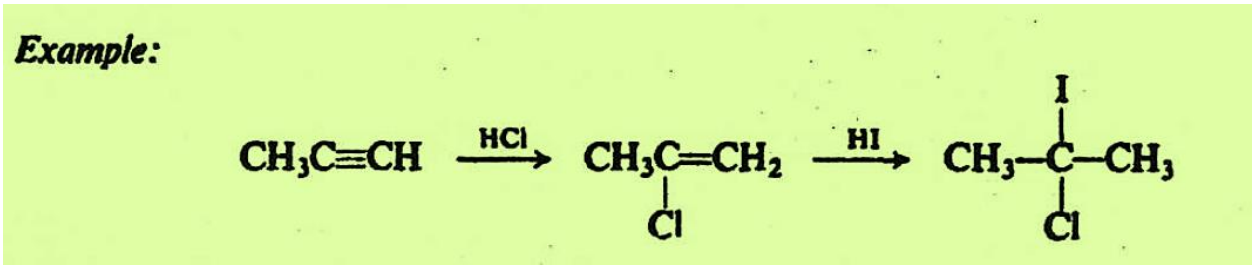

Na, NH3(liq)
3-Hexyne
trans-3-Hexene
Chief product
H2, Ni-B (P-2)
cis-3-Hexene
98–99% pure

2-Additon of halogens

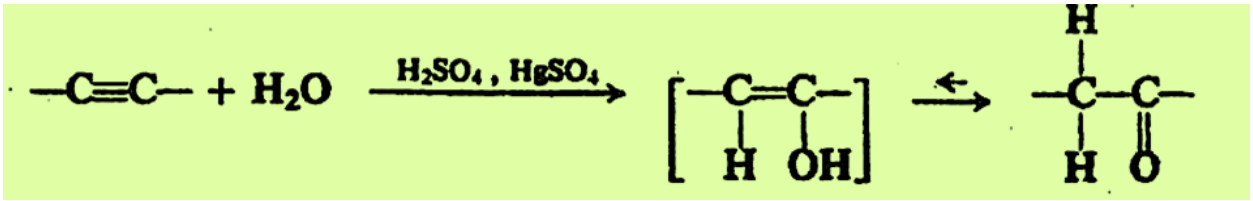


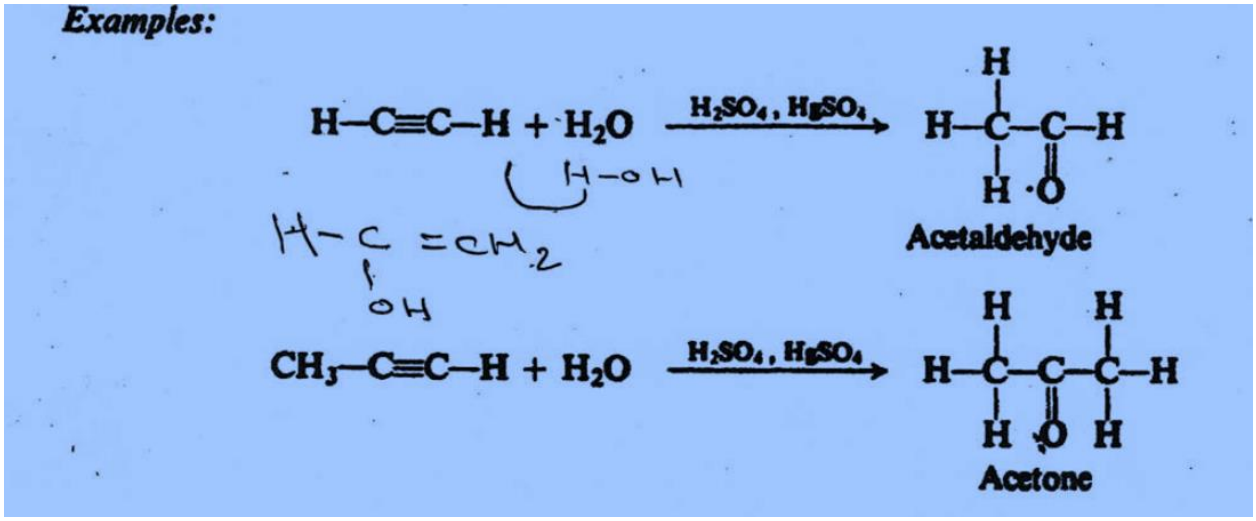
3-Addition of hydrogen halide

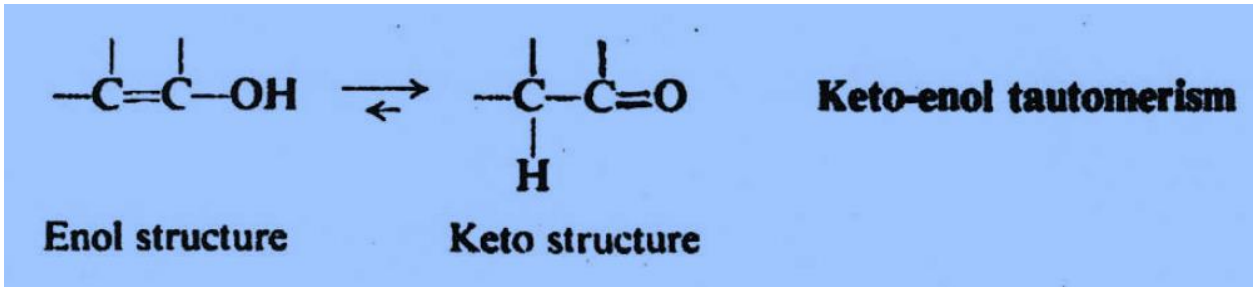




4-Addition of water, Hydration




Examples:
H–C≡C–H + H2O
H2SO4, HgSO4
Acetaldehyde
CH3–C≡C–H + H2O
H2SO4, HgSO4
Acetone


Keto-enol tautomerism
Enol structure
Keto structure