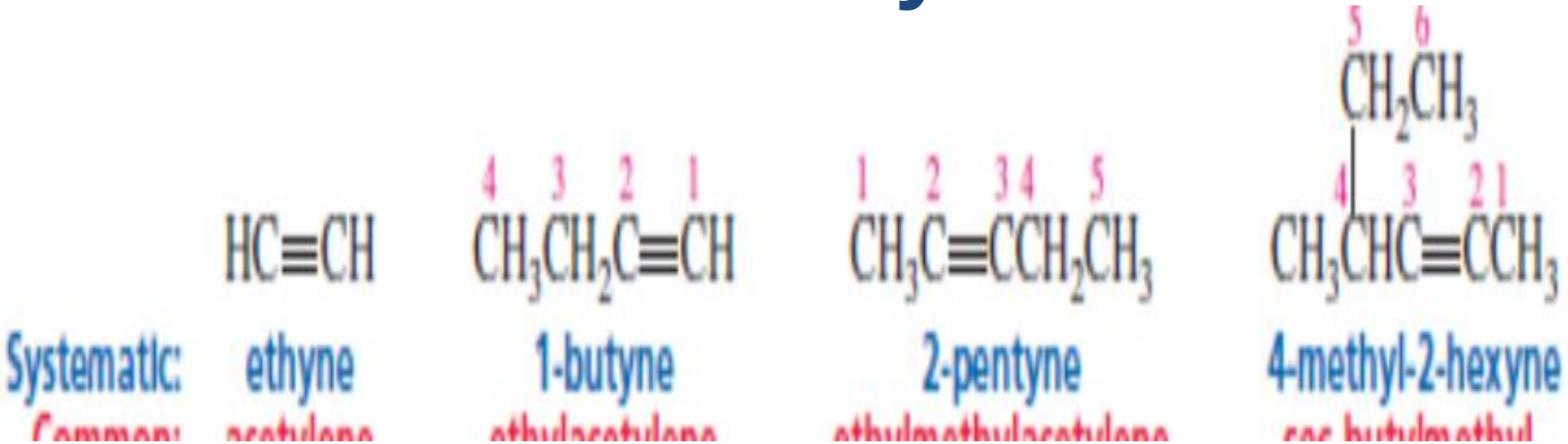
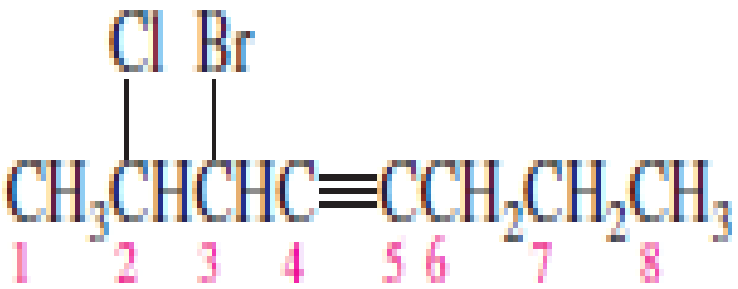
Alkynes

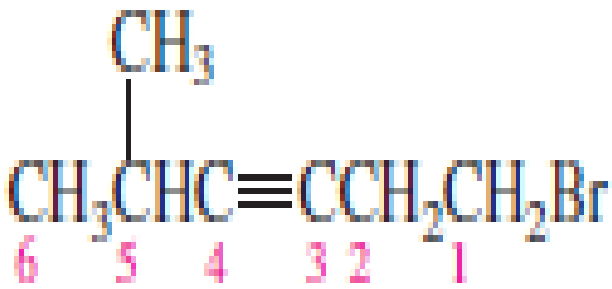
- Are hydrocarbons that contain a carbon–carbon triple bond.
- The general molecular formula for an alkyne is CnH2n-2 .
- There are only a few naturally occurring alkynes. Examples include capelin, which has fungicidal activity

Nomenclature of Alkynes





3-bromo-2-chloro-4-octyne



1-bromo-5-methyl-3-hexyne

Preparation of Alkynes

- They considered as important industrial sources. They can be produced industrially from the effect of water on calcium carbide which is prepared from calcium monoxide and coal at high temperature using electrical ovens:
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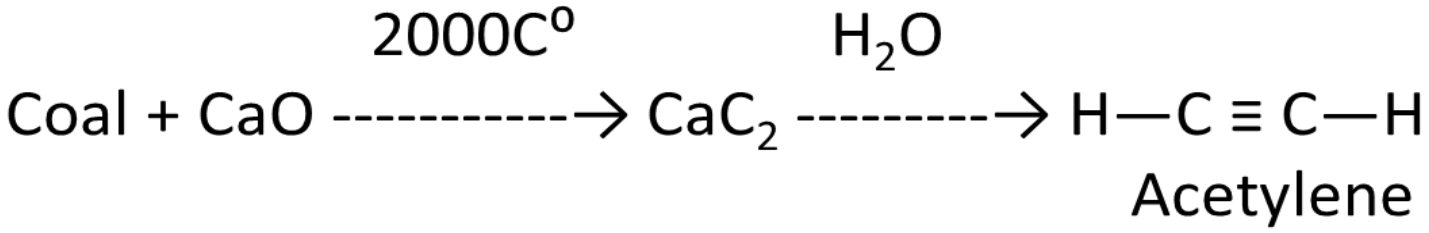
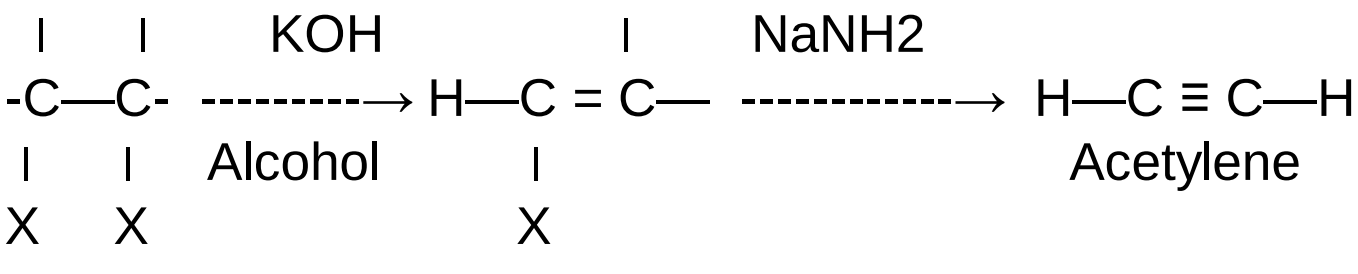


There is an other industrial method for production of acetylene by controlled partial oxidation of methane:

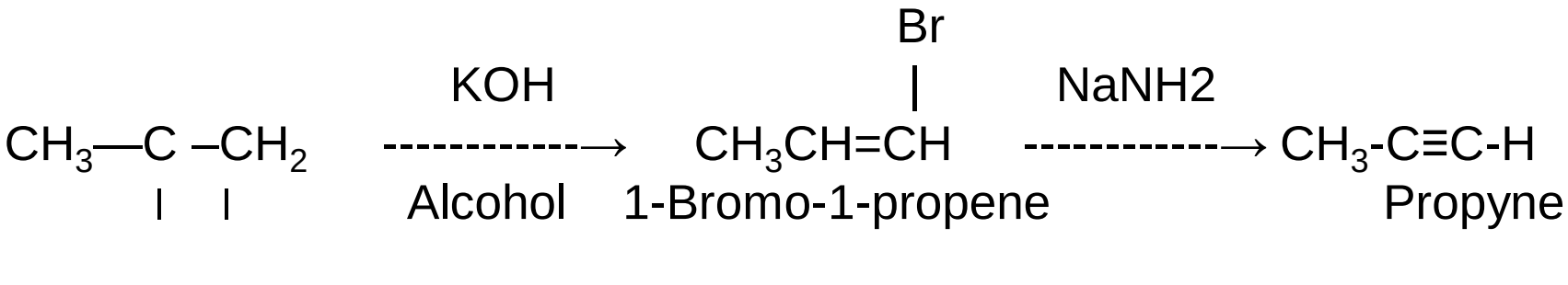
$$6CH_4 + O_2 \xrightarrow{1500\ C^{o}} 2\ H{-}C \equiv C{-}H + CO + 10\ H_2$$

Preparation of acetylenes: (in laboratory)

- ***1. By elimination of two molecules of hydrogen halide*:**



- **Example:**



2. *Reaction of sodium acetylide with primary alky halide:*

- NaNH2

H—C ≡C—H ----------→ H—C^{-} ≡ C—Na^{+}

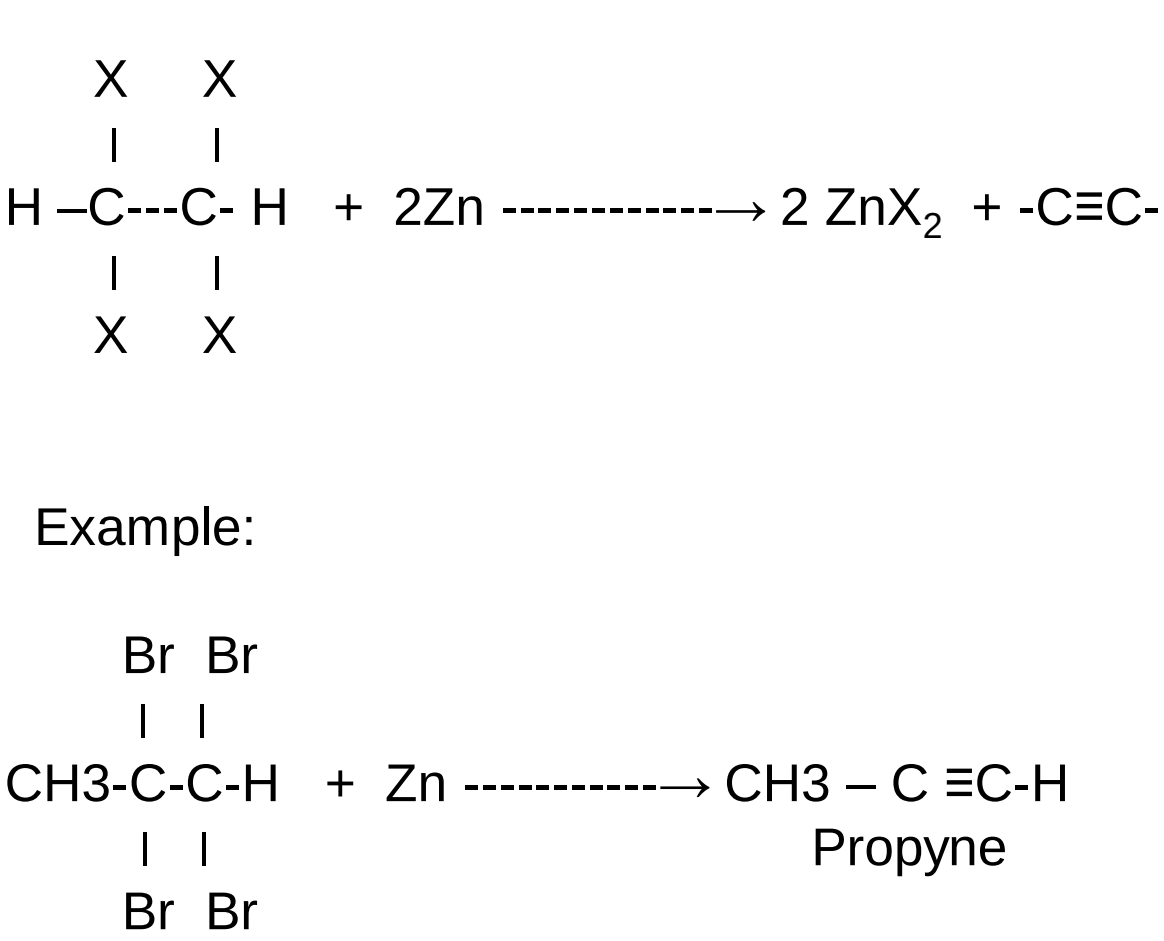
- Or/ Na Sod. acetylide

- H—C ≡ C^{-}—Na^{+} + RX → H—C ≡ C—R + NaX
- Sod. acetylide R=1º
-
- H—C ≡ C^{-}—Na^{+} +$CH_3CH_2CH_2CH_2Br$ → H—C ≡$CCH_2CH_2CH_2CH_3$

- Sod. Acetylide n-ButylBromide 1- Hexyne

- $CH_3(CH_2)_4C{\equiv}C^{-}$—$Na^{+}$+$CH_3(CH_2)_3CH_2Cl$ → $CH_3(CH_2)_4C{\equiv}C(CH_2)_4CH_3$
-
- Sod. n-pentylacetylide n- Pentylchloride 6-Dodecyne

3. Removal of halogen from tetra halide molecules:



Alkyne Reactions:

- **Addition of H2**
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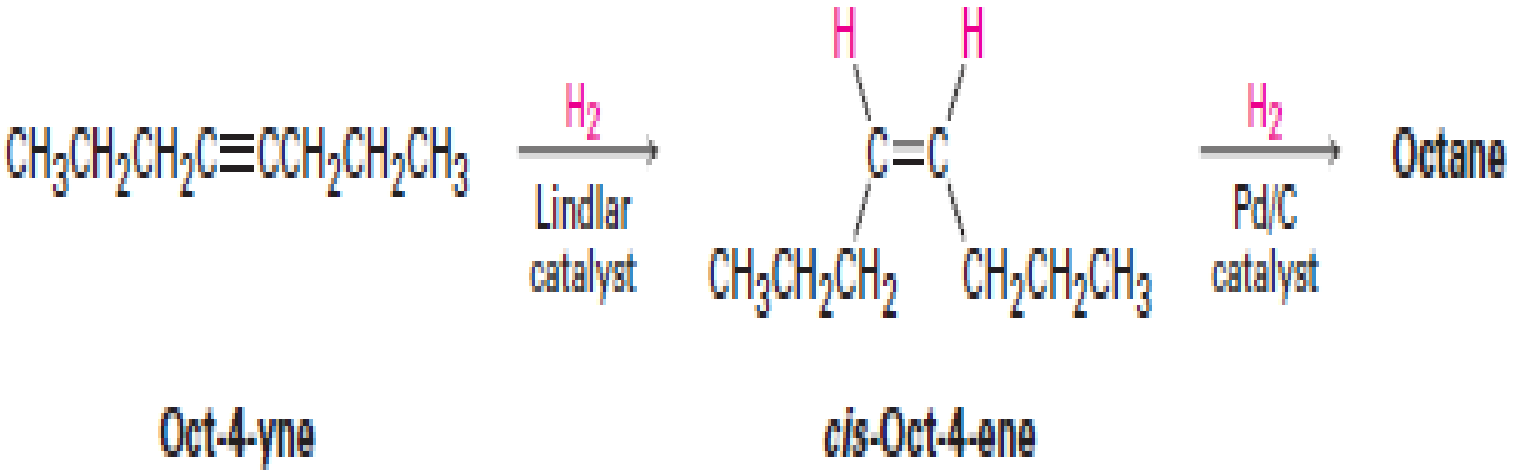
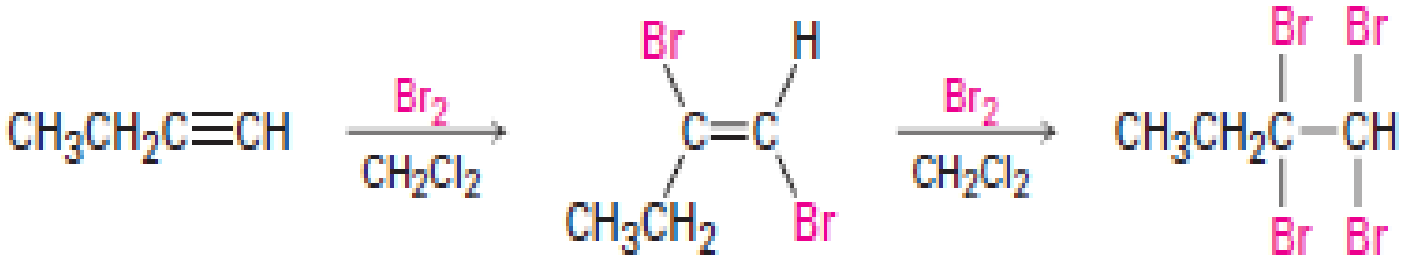


Alkyne Reactions:

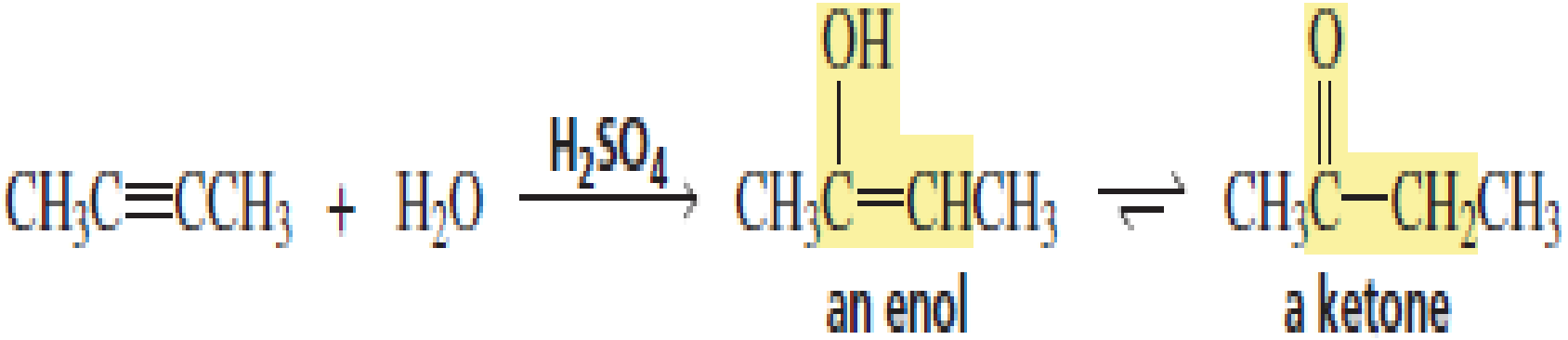
Addition of X2

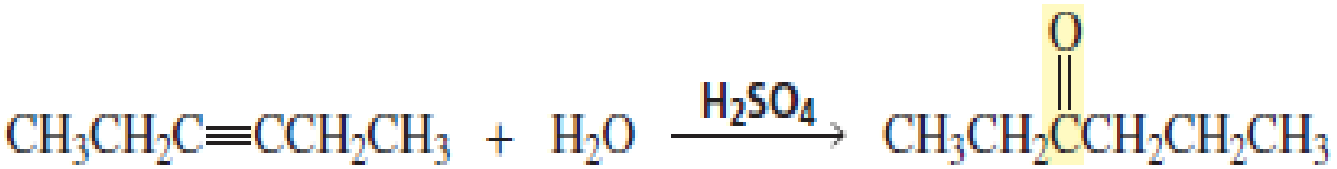


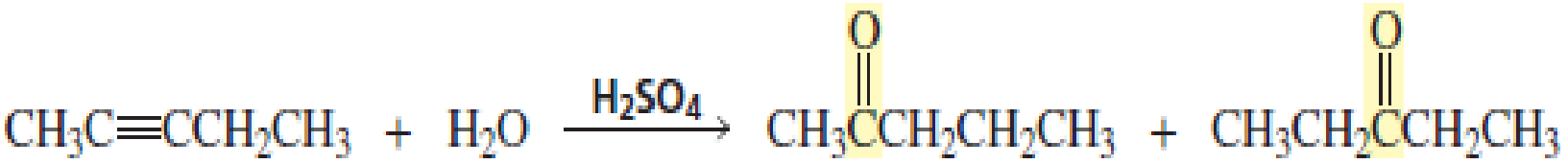
But-1-yne (*E*)-1,2-Dibromobut-1-ene 1,1,2,2-Tetrabromobutane

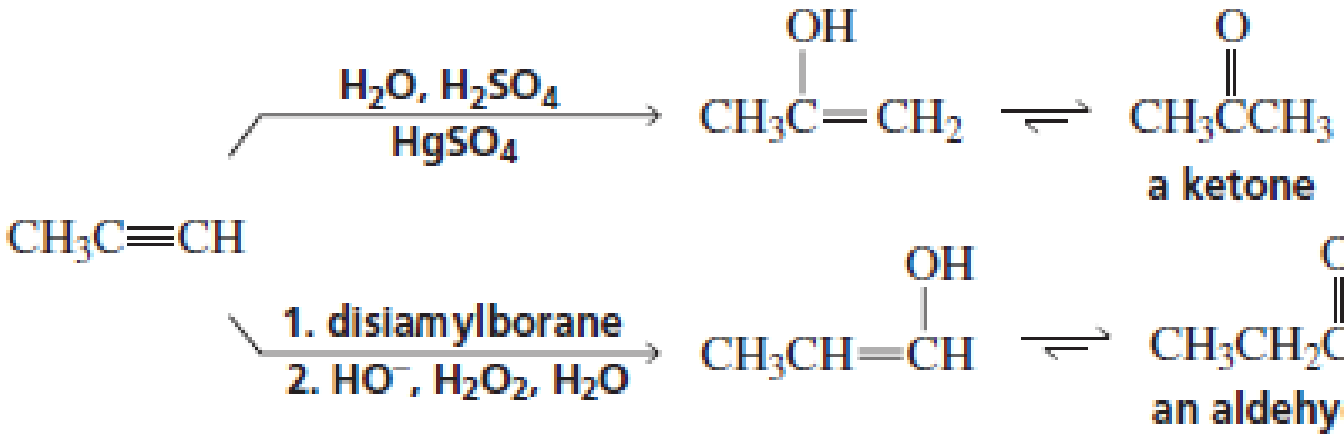
Alkyne Reactions:

- **Addition of H2O**



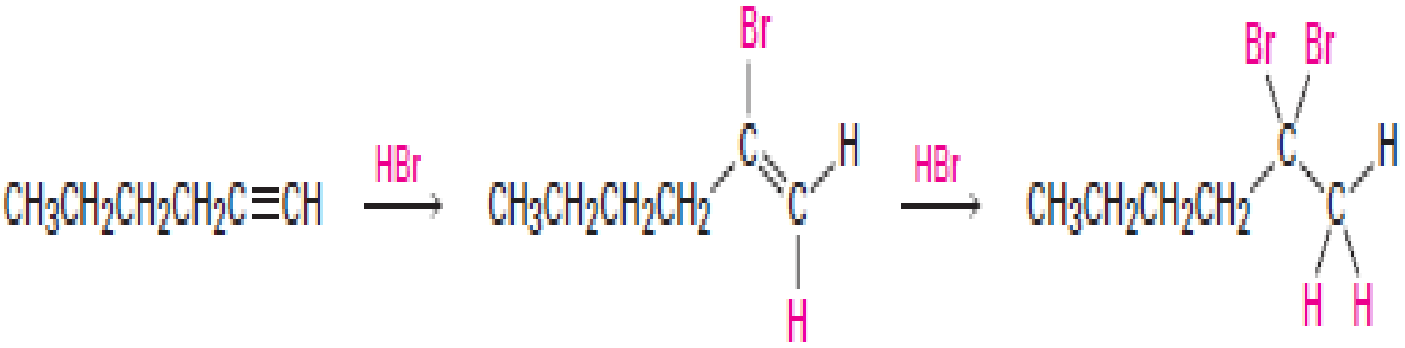

CH3CH2C≡CCH2CH3 + H2O
H2SO4
O
CH3CH2CCH2CH2CH3


CH3C≡CCH2CH3 + H2O
H2SO4
O
CH3CCH2CH2CH3 + CH3CH2CCH2CH3

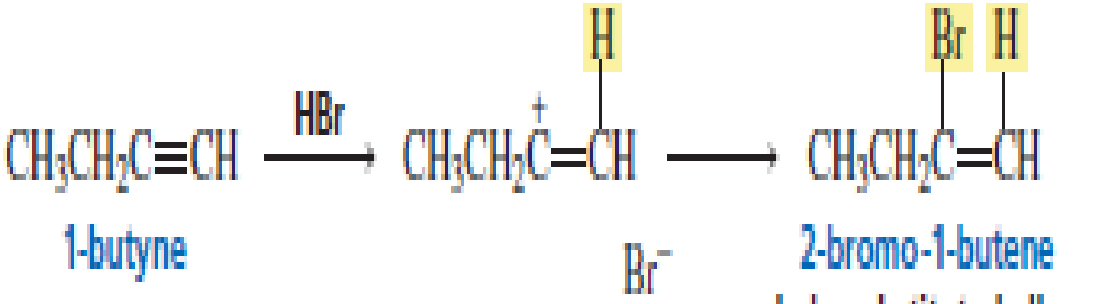

H2O, H2SO4
HgSO4
OH
CH3C=CH2
O
CH3CCH3
a ketone
CH3C≡CH
1. disiamylborane
2. HO⁻, H2O2, H2O
OH
CH3CH=CH
O
CH3CH2CH
an aldehyde

Alkyne Reactions:

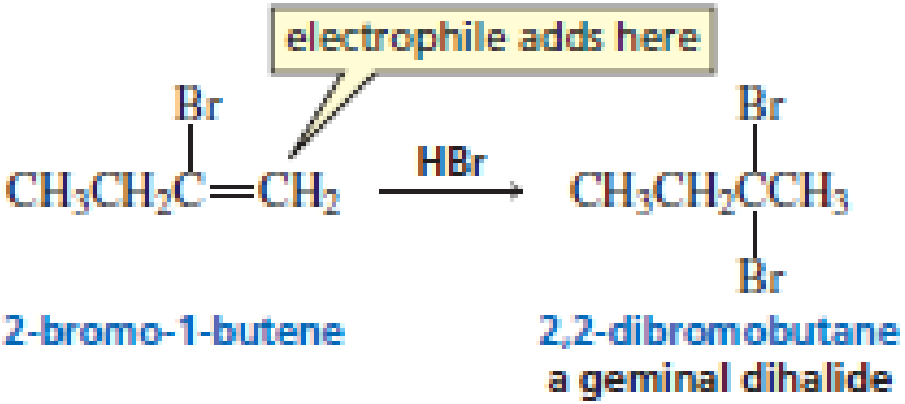
- **Addition of HX**

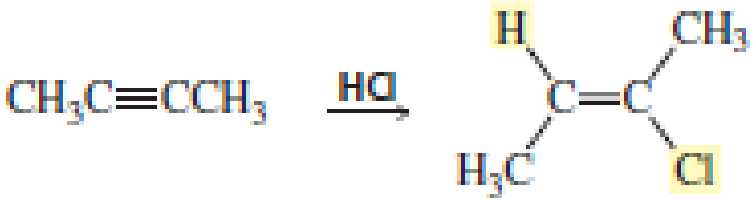


Hex-1-yne 2-Bromohex-1-ene 2,2-Dibromohexane



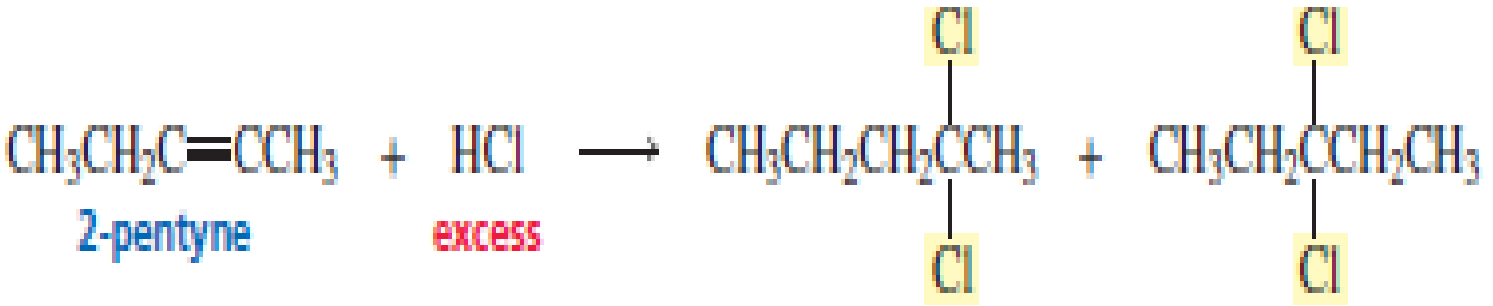
The electrophile adds to the *sp* carbon of a terminal alkyne that is bonded to the hydrogen.





2-butyne

(*Z*)-2-chloro-2-butene



2-pentyne

2,2-dichloropentane

3,3-dichloropentane