

Organic Chemistry

CHEM 145

2 Credit hrs

Chemistry Department

College of Science

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By

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Alkynes

➔ These compounds are deficient in hydrogen

Carbon-carbon triple bond.

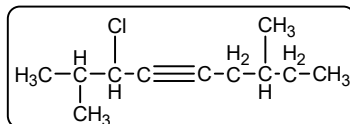
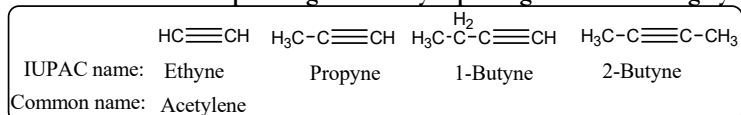
is called the **Alkynes** or **Acetylenes**

General formula is C_nH_{2n-2}

Nomenclature of Alkynes

➔ The simplest members of the **alkynes** series (C_2 & C_3)

derived from the corresponding alkanes by replacing the **-ane** ending by **-yne**.



3-Chloro-2,7-dimethyl-4-nonyne

Geometry of Unsaturated Hydrocarbons

➔ Geometry of the Carbon-Carbon Triple Bond: *sp* Hybridization

➔ Acetylene is a **linear** molecule with a bond angle of 180° .

Physical Properties of Alkynes

➔ The physical properties of alkynes are much the same as those of corresponding alkanes.

C_2 to C_4 alkenes are gases

C_5 to C_{18} alkenes are liquids

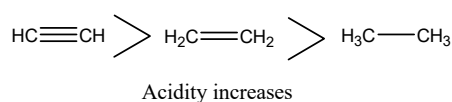
above C_{18} are solids.

➔ Alkynes are insoluble in water and soluble in **nonpolar** organic solvents such as benzene or in carbon tetrachloride.

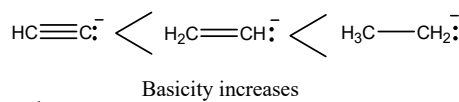
The Acidity of Terminal Alkynes

➔ The hydrogen bonded to the carbon of a terminal alkyne is more acidic than those bonded to carbons of alkene or alkane

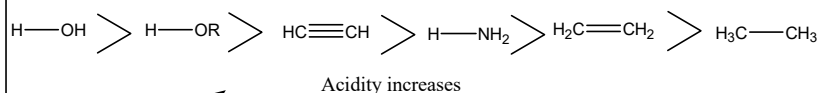
Relative Acidity of the Hydrocarbon



Relative Basicity of the Carbanions



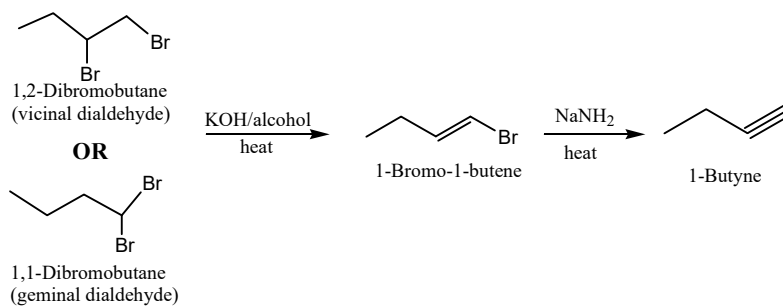
Relative Acidity



Preparation of Alkynes

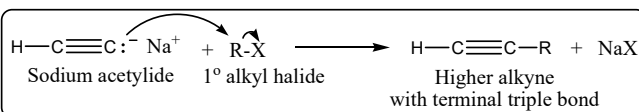
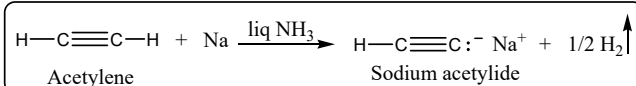
Dehydrohalogenation of Alkyl dihalides

▶ Treatment of vicinal or geminal dihalides with strong base followed by sodium amide.

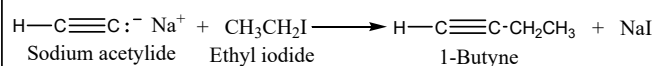
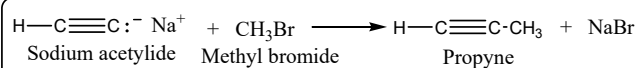


Reaction of Sodium Acetylide with Primary Alkyl Halides

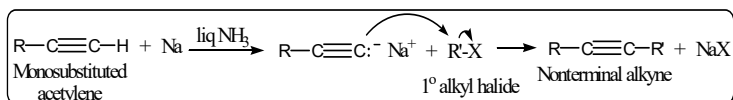
▶ Acetylenes



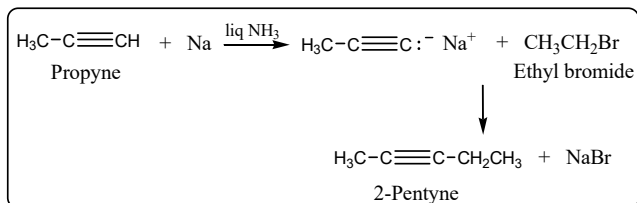
Example



➔ Monosubstituted Acetylenes

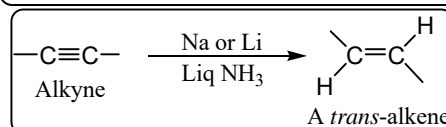
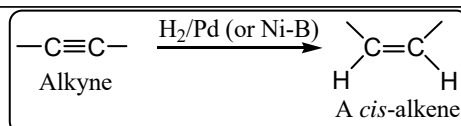
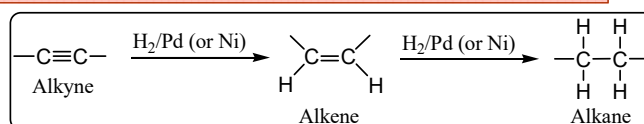


Example

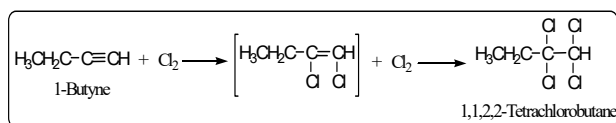


Reactions of Alkynes

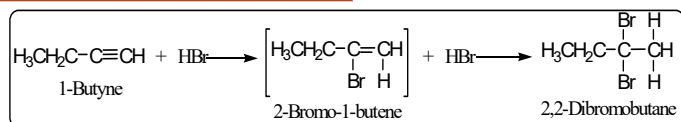
1. Addition of Hydrogen: Catalytic Hydrogenation



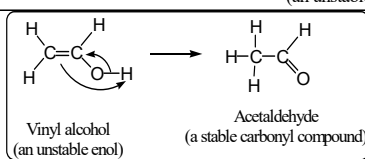
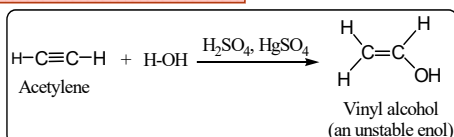
2. Addition of Halogens: Halogenation



3. Addition of Hydrogen Halide



4. Addition of Water: Hydration



Specific example:

