

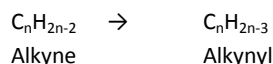
ALKYNES

Introduction

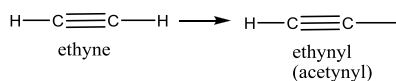
- Unsaturated hydrocarbons containing $C\equiv C$ bond are called alkynes.
- Carbon atoms having triple bond make sp hybridization.
- They are also known as acetylenes.
- General formula is $C_n H_{2n-2}$.
- Simplest member is ethyne, or acetylene, C_2H_2 .
- Change -ane ending with -yne to name alkenes.

1. Alkynyl Groups

- When one hydrogen is removed from an alkyne an alkynyl group is formed.
- General formula of alkynyl group is $C_n H_{2n-3}$.



Example 1



Example 2

10% of the molecular weight of an alkyne is hydrogen. What is the molecular formula of the alkyne? (C:12, H:1)

Example 3

A 2.7 g of an alkyne is burned and produces 8.8 g of carbon dioxide. What is the molecular formula of the alkyne? (C:12, H:1)

Example 4

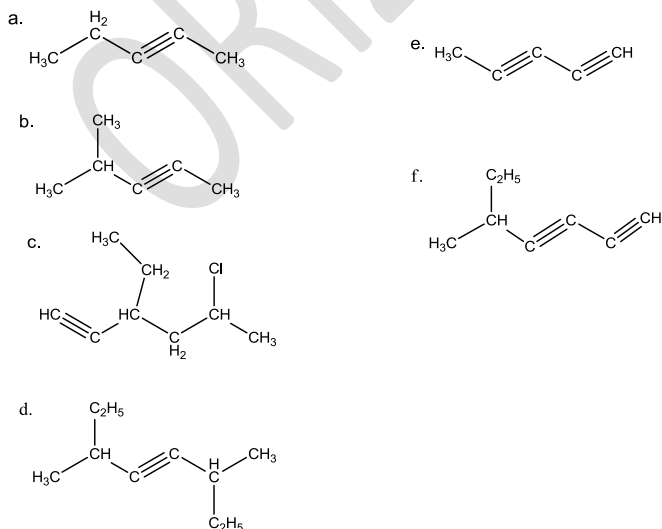
When an alkyne is burned, the mass of water produced is the same as the mass of alkyne used up. What is the molecular formula of the alkyne? (C:12, H:1)

2. Nomenclature of Alkynes

- Select longest carbon atom chain containing a triple bond.
- Number the carbon atoms in the chain so that the triple bond would be between the carbons with lowest designated number.

Example 5

Name the following alkynes.



- 2-pentyne
- 4-methyl-2-pentyne
- 5-chloro-3-ethyl-1-hexyne
- 3,6-dimethyl-4-octyne
- 1,3-pentadiyne
- 5-methyl-1,3-heptadiyne

Example 6

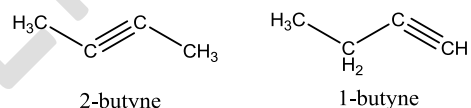
Draw the structures of the following alkynes.

- 2-butyne
- 3-methyl-1-butyne
- 4-chloro-2-pentyne
- 2,5-dimethyl-3-hexyne
- 3-methyl-2-hexene-5-yne

3. Isomerism in Alkynes

- In alkynes only structural isomerism is possible, according to position of triple bond. For the first and second members there is only one possible structure.

Structural isomers of alkynes have different physical properties



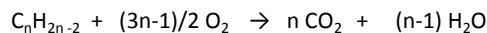
4. Physical Properties of Alkynes

- The physical properties of alkynes are similar to those of alkenes and alkanes.
- Acetylene, propyne and butyne are gases at room temperature, others are liquids.
- Boiling points increase as the number of carbon atom increases.
- They are quite soluble in organic solvents, but insoluble in water.
- Branching as it is other hydrocarbons decreases the boiling point.

5. Chemical Properties of Alkynes

- Alkynes are unsaturated compounds therefore their chemical properties are similar to those of alkenes.

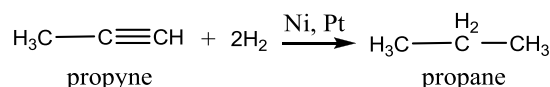
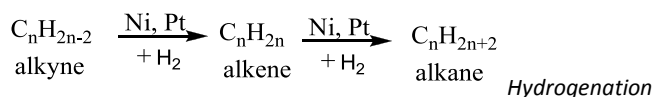
1. Combustion Reactions



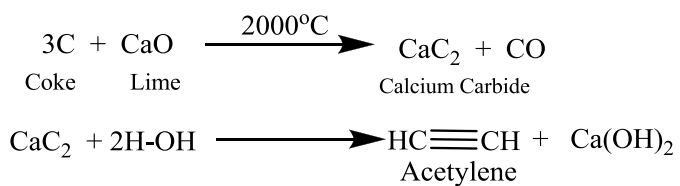
Example 7

A 2.7 g of sample of an alkyne, when burned, produces 8.8 g of CO_2 . What is the molecular formula of the alkyne? (C:12, H:1)

2. Addition Reactions



Preparation



Example 10

When a 10 g sample of the mixture of methane and acetylene reacts with aqueous ammonical cuprous chloride, a 30.2 g precipitate is formed. What is the percentage by mass of methane in the mixture? (Cu: 63.5, Cl: 35.5, C:12, H:1)

Example 11

How many liters of oxygen gas at STP are needed to burn a sample of acetylene which is obtained from 6.4 g of calcium carbide?

(Ca: 40, C:12, H:1)

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