CHM 103: Organic Chemistry I

Presented by:

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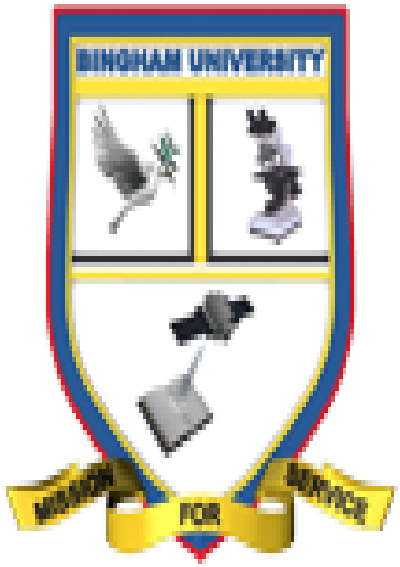
The University with the difference

Course Synopsis



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Alkanes: General formula, nomenclature, natural sources synthesis, uses, physical and chemical properties. **Alkenes:** General formula and nomenclature. Natural sources and synthesis. Physical and chemical properties. Relevant functional group transformations. Brief mention of dienes and cycloalkenes. **Alkynes:** General formula and nomenclature. Synthesis and reactions of alkyne, uses. **Alkyl halides:** General formula and nomenclature. Synthesis and reactions. Brief mention of polyhalides and their uses in the chemical industry. **Alkanols:** General formula and nomenclature. Natural sources and synthesis. Physical and chemical properties and uses. Brief mention of polyhydric alcohols. **Carbonyl compounds:** Alkanals and Alkanones. General formula, nomenclature and chemical properties. Carboxylic acids. Brief introduction to bio-molecules: carbohydrates and proteins. Synthetic polymers.

ALKANES

Alkanes are also introduced as Paraffin compounds. Most fuels such as petrol, diesel, LP gas, kerosene and more contains alkanes.

Physical properties of Alkanes

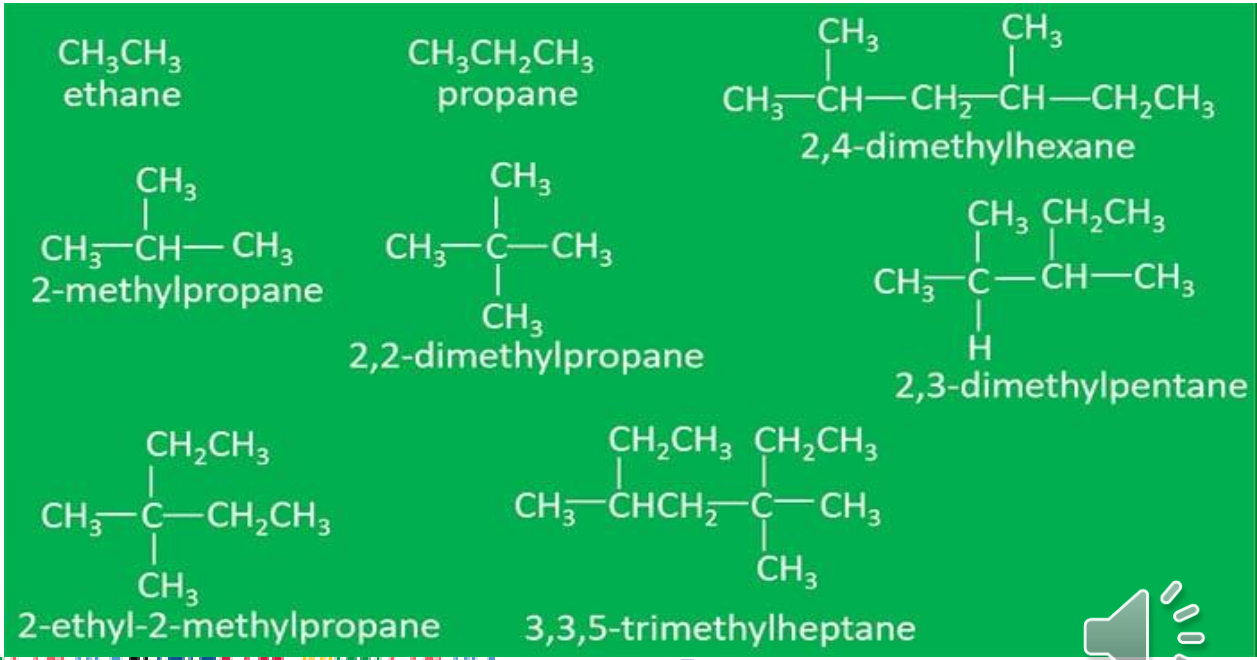
- saturated hydrocarbons
- Common formula of alkane is C_2H_{2n+2} ; n = 1,2,3,4...

Alkanes IUPAC naming | nomenclature

Alkanes IUPAC naming is simple.

- longest carbon chain
- Substituents

Some examples are noted here.

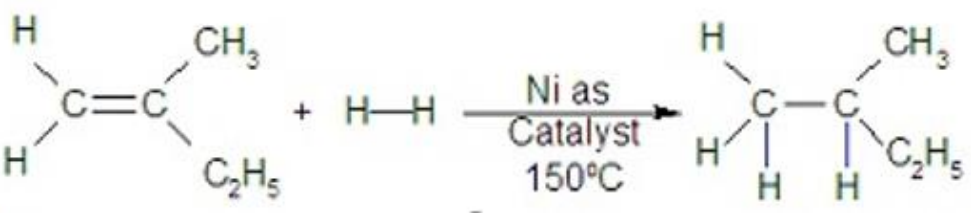


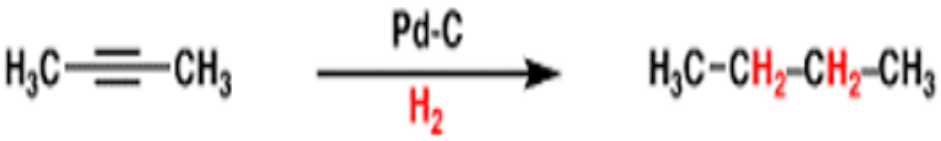
Preparation of Alkane

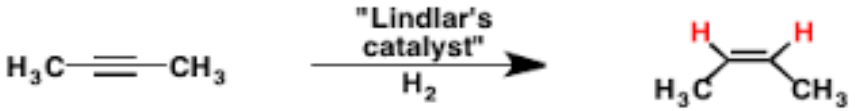
Alkanes are prepared from different organic compounds as follows:

- **Catalytic hydrogenation**
- **Wurtz reaction**
- **Reduction of alkyl halides**

1. Catalytic hydrogenation: Alkenes and Alkynes can be converted into alkanes at high temperature and catalyst such Raney Nickle (Ni), Platinum (Pt), or Palladium (Pd) are used as catalysts

(i) 

(ii) 

(iii) 

Lindlar's catalyst: a mixture of Pd, $CaCO_3$, Pb salts, and quinoline

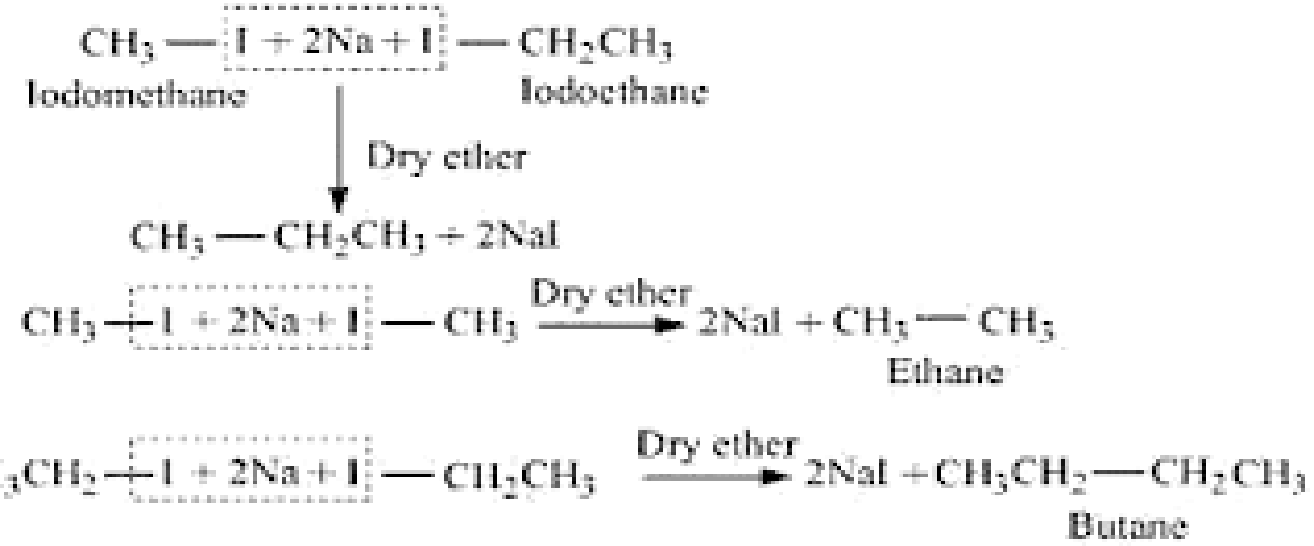
2. Wurtz reaction: The Wurtz Coupling produces the simple dimer derived from two equivalents of alkyl halide. Then a symmetrical alkane containing **twice** the number of carbon atoms of alkyl halide is obtained

$$CH_3Br + 2Na + BrCH_3 \xrightarrow{\text{dry ether}} CH_3 - CH_3 + 2NaBr$$

Bromomethane — Ethane

$$C_2H_5Br + 2Na + BrC_2H_5 \xrightarrow{\text{dry ether}} C_2H_5 - C_2H_5$$

Bromoethane — n-Butane



3. Reduction of alkyl halides

Alkyl halides on reduction with nascent hydrogen form alkanes. The nascent hydrogen may be obtained by any one of the following;

I. Zn + HCl,

II. Zn + CH_3COOH,

III. Zn-Cu couple in ethanol,

IV. Red P + HI, and

V. Al-Hg + ethanol.

VI. H_2/Pd or $LiAlH_4$ or by H_2/Ni.