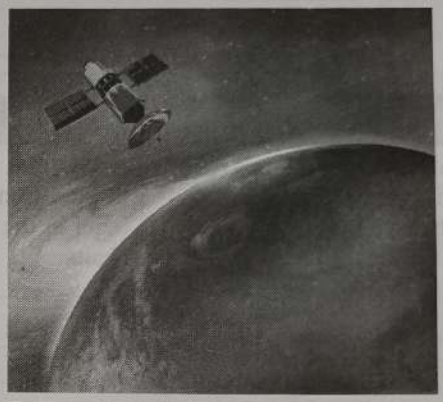
Textbook Chapter No.

15 Hydrocarbons

Subtopics

Methane - an Indicator of Life?

Methane (CH_4) is an organic molecule present in gaseous form in the Earth's atmosphere. More than 90% of methane on our home planet is produced by living organisms. The recent detection of plumes of methane in the northern hemisphere of Mars is of great interest because of its potential biological origin, though other explanations may also be possible. The scientific objective of India's Mars mission, MOM is exploration of martian atmosphere.



Quick Review

➢ **Alkanes:**

Preparations:

- Alkene —(H_2; Pt/Pd (R.T) or Ni (High temperature and pressure))→ **Alkanes**
- Alkyne —($2H_2$; Pt/Pd (R.T) or Ni (High temperature and pressure))→ **Alkanes**
- Alkyl halide —(2[H]; Zn – HCl)→ **Alkanes**
- Alkyl halide —(2Na; Dry ether, Δ)→ **Alkanes**
- Alkyl magnesium halide (Grignard reagent) —(HOH; Dry ether)→ **Alkanes**

Reactions:

Alkanes —(X_2, UV light or Δ)→ Alkyl halide (X_2= Cl_2, Br_2)

Alkanes —(O_2/Δ; (combustion))→ CO_2 + H_2O + Heat (Carbon dioxide, Water)

Alkanes —(Δ; Pyrolysis or cracking)→ Mixture of alkanes, alkenes and hydrogen

Alkanes —(V_2O_5; Aromatization or reforming)→ Benzene or its homologue

Isomerism:

Isomerism in alkenes

Structural Isomerism

Isomerism due to difference in carbon chain length or position of double bond.

- **Chain isomerism**: Arises due to the difference in carbon chain length.
- **Position isomerism**: Arises due to difference in position of double bond in the same carbon chain.

Geometrical Isomerism

Isomerism due to the difference in spatial arrangement of atoms or group of atoms around the doubly bonded carbon atom.

- **Cis-isomer**: Contains identical atoms or groups of atoms on the same side of double bond.
- **Trans-isomer**: Contains identical atoms or groups of atoms on opposite side of double bond.

Alkenes:

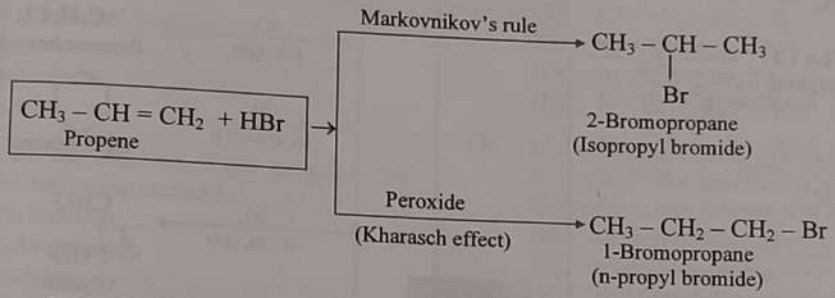
Preparations:

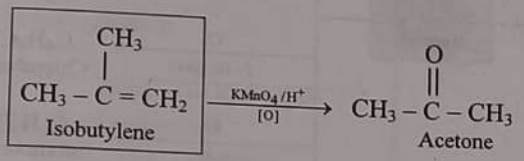
- Alkyl halide —(Alc. KOH, Boil)→ Alkenes
- 1° Alcohol —($75\%\ H_2SO_4$, 413 K)→ Alkenes
- 2° Alcohol —($60\%\ H_2SO_4$, 373 K)→ Alkenes
- 3° Alcohol —($20\%\ H_2SO_4$, 363 K)→ Alkenes
- Vicinal dihalide —(Zn)→ Alkenes
- Alkyne —(Pd – C, Quinoline (Gives cis-isomer))→ Alkenes
- Alkyne —(Na, Liq. NH_3 (Gives trans-isomer))→ Alkenes

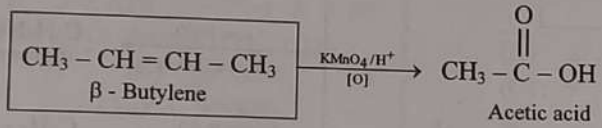
Reactions:

Alkenes →
- (H_2, Pt/Pd (R.T) or Ni (High temperature and pressure)) → Alkane
- (X_2, CCl_4 (R.T)) → Vicinal dihalide (X = Cl, Br)
- (HX) → Alkyl halide
- ($(C_6H_5CO)_2O_2$, Benzoyl peroxide) → Alkyl halide
- (H_2SO_4/H_2O, Δ) → Alcohol
- (O_3, H_2O, Zn dust) → Carbonyl compounds + ZnO
- (Diborane, THF; HO – OH, OH^-) → Alcohol
- (O_2, Heat, pressure, Polymerization) → Polymer
- (H_2O, [O], Alkaline $KMnO_4$ (cold and dil.)) → Alkane diol
- ($KMnO_4$, H^+) → Ketones or acids

➢ **Reactions of some alkenes:**

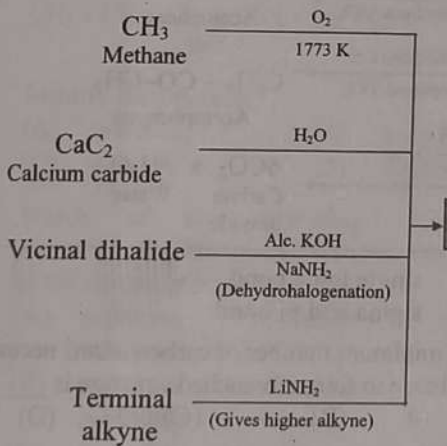




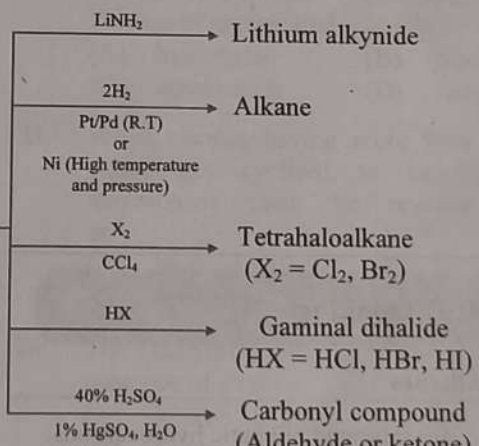


➢ **Alkynes:**

Preparations:

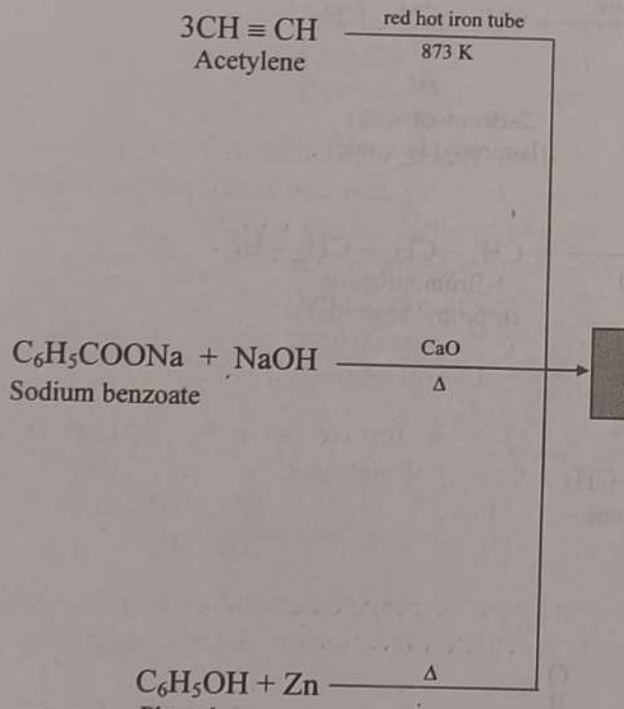


Reactions:

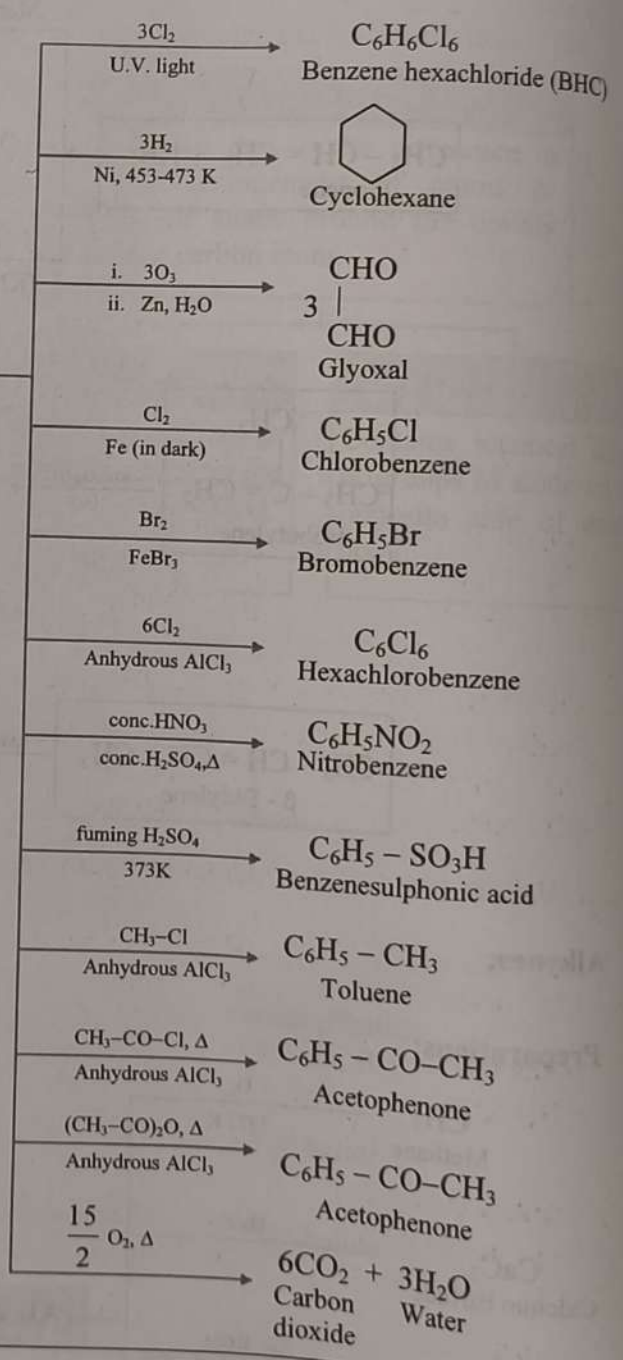


Benzene:

Preparations:



Reactions:



(C) single ionic bond