

**SEM-II General: Organic Chemistry**  
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**CC2/GE 2: Syllabus**

**Aliphatic Hydrocarbons**

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structures.

*Alkanes:* (up to 5 Carbons). *Preparation:* catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis.

*Alkenes:* (up to 5 Carbons). *Preparation:* elimination reactions: dehydration of alcohols and dehydrohalogenation of alkyl halides; *cis* alkenes (partial catalytic hydrogenation) and *trans* alkenes (Birch reduction). *Reactions:* addition of bromine, addition of HX [Markownikoff's (with mechanism) and anti-Markownikoff's addition], hydration, ozonolysis.

*Alkynes:* (up to 5 Carbons). *Preparation:* acetylene from  $\text{CaC}_2$ ; by dehalogenation of tetra halides and dehydrohalogenation of vicinal dihalides.

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**Aliphatic Hydrocarbon: Alkanes**

**Introduction:**

Open chain binary compounds of C and H containing C-C and C-H  $\sigma$ -bonds only, are called alkanes. Since there is no C-C multiple bond, alkanes are saturated hydrocarbons. Alkanes are represented as R-H or R-R' or R-CH<sub>3</sub> etc. where R, R' are alkyl groups. For examples, propane may be represented as R-H (R = -CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>) or R-CH<sub>3</sub> (R = -CH<sub>2</sub>-CH<sub>3</sub>). The main sources of alkanes are natural gas and petroleum oil.

**Chemical Reaction of Alkanes:**

As the C—C and C—H bonds are quite strong: alkanes are generally inert to many chemical reagents. The C—H bonds of alkanes are only **slightly polarized**, so alkanes are generally unaffected by most bases. Alkane molecules have **no unshared electrons** to offer sites for attack by acids. That is why alkanes are known as *Paraffins* (Latin: *parum affinis*, little affinity).

**General Reactivity of Alkanes:**

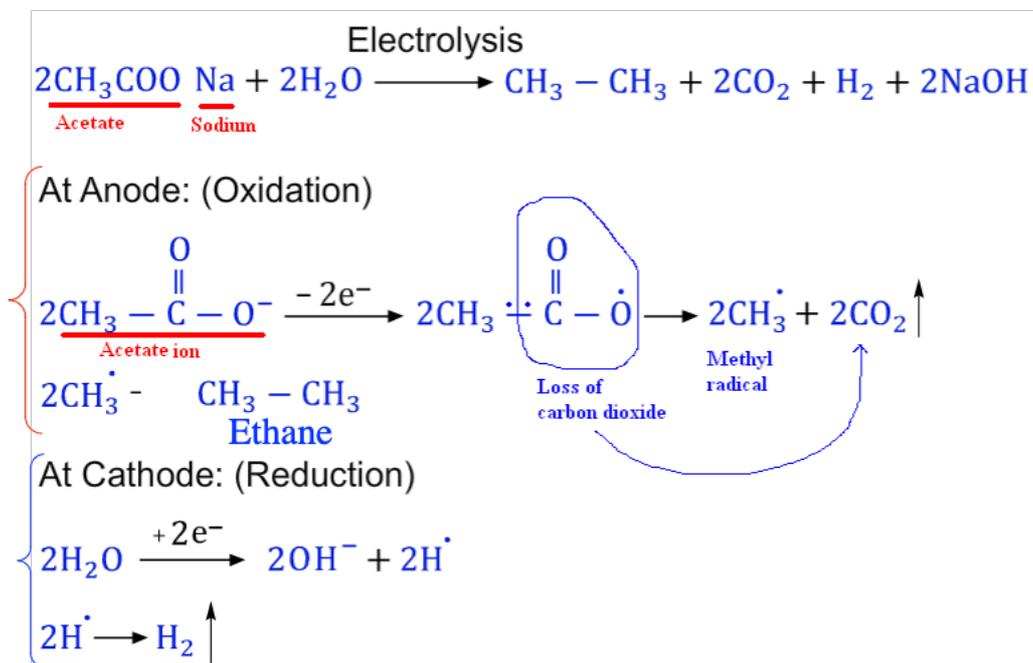
- 1) Alkanes react vigorously with oxygen when an appropriate mixture is ignited. It is known as **combustion**.
- 2) Alkanes react with **chlorine** and **bromine** when **heated**, and they react explosively with **fluorine**.





### 3. Kolbe's Synthesis.

Kolbe's electrolysis is basically a decarboxylative dimerization reaction which proceeds with radical reaction mechanism with the evolution of CO<sub>2</sub>. It is an electrolysis reaction i.e the reaction occurs at anodic and cathodic compartment. By this method, alkane can be prepared from the sodium or potassium salt of the corresponding carboxylic acid. The plausible mechanism is as follows-



Examples of Kolbe Reaction:

