

# CHEMISTRY DAILY PLAN

**Class:**

**Date:**

**Subject:** Preparations of Alkanes

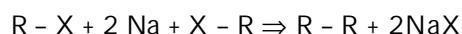
**Time:**

The two most important natural sources of alkanes are **petroleum** and **natural gas**. Petroleum is a complex liquid mixture of organic compounds. Many of these compounds are alkanes or cycloalkanes. All of the alkanes up to and including  $C_{33}H_{68}$  have been isolated from petroleum. Natural gas consists mainly of methane (about 80%) and ethane (5-10%), with lesser amounts of some higher alkanes.

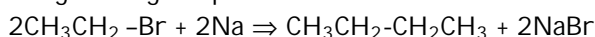
Since the main source of alkanes is petroleum, they may be obtained by fractional distillation of petroleum. In addition, several laboratory methods have been developed to obtain alkanes.

## a) The Wurtz Reaction

When alkyl halides (RX) are heated with sodium in dry ether solution, alkanes of double the carbon content are produced. The reaction can be summarized by the general equation

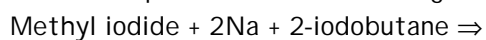


**For example:** Ethyl bromide gives a good product of n-butane



**Example:** Write the equation for the preparation of 2,3-dimethylhexane by the Wurtz reaction?

**Example:** Write an equation for the following reaction, using structural formulas



## b) Reduction of Alkenes (Hydrogenation)

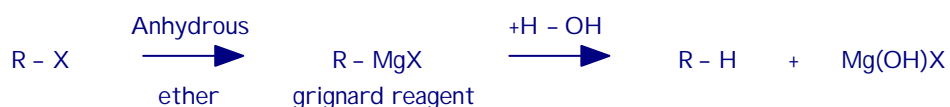
Unsaturated hydrocarbons, whether involving double or triple bonds, may be converted to alkanes by the addition of hydrogen in the presence of a metal catalyst under high temperature (250-300 °C) and pressure.

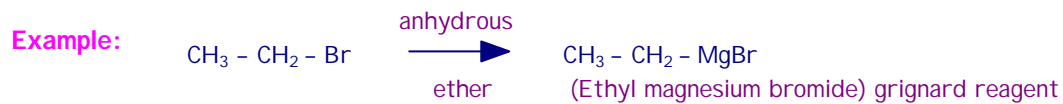


## c) Reduction of Alkyl Halide (Grignard Reagent)

Halogen compounds can be converted to hydrocarbons with the same number of carbon atoms by a reducing agent, which replace the halogen by hydrogen.

If the metal, such as Zn and Mg, is allowed to react with alkyl halide in a dry solvent such as ether, a solution of organometallic reagent is obtained. This can then be hydrolyzed in a separate step.





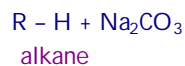
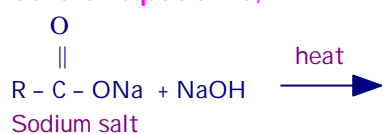
An acid can be used for reducing agent



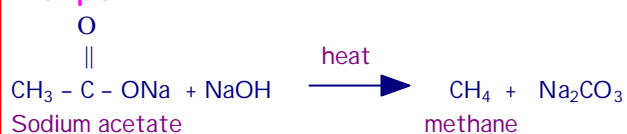
#### d) From Alkali Metal Salts of Carboxylic Acids

Alkali metal salts of carboxylic acids may be fused with alkali hydroxides. Here a hydrocarbon is obtained containing one carbon atom less than the original acid salt.

**General equation is;**



**Example:**



**Exercise:** Write equations for the following reactions

- 2-butyne + H<sub>2</sub> (excess) ⇒
- Production of 2-methylbutane by the Wurtz reaction.
- Production of butane by Grignard reaction.

**Exercise:** How many grams of carbon dioxide are obtained from the combustion of an alkane which is produced by the reaction of 66 g sample of sodium propionate?