- Classification of Organic Compounds

# Classification of Organic Compounds



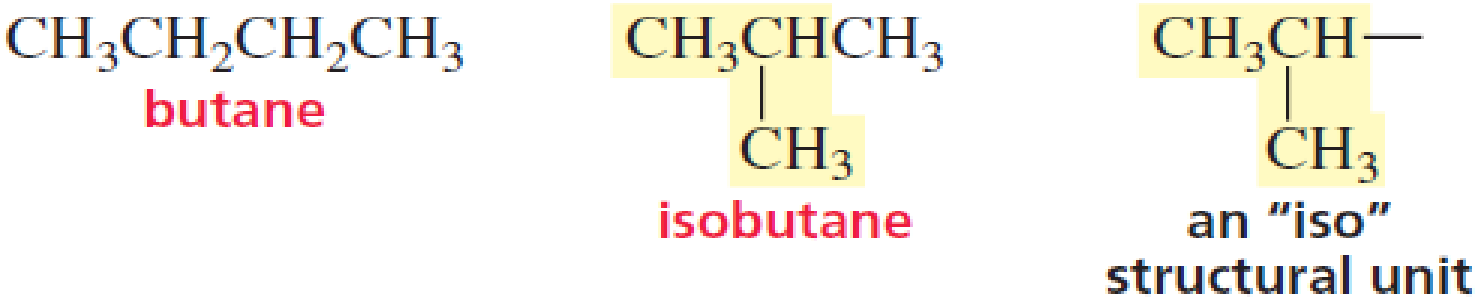
- At the end of this lecture you should be able to:
  - Identify the various classes of organic compounds
    - Hydrocarboons
      - i.e. Aromatic
      - Aliphatic
      - Alicyclic
      - Heterocyclic
    - Etc.
  - Other type of organic compounds

Nomenclature of Organic compounds

Homologous series of Organic Compounds_Alkanes



- As the number of carbons in an alkane increases beyond three, the number of possible structures increases.
- There are two possible structures for an alkane with molecular formula $C_4H_{10}$ In addition to butane—a straight-chain alkane—there is a branched butane called isobutane.
- Both of these structures fulfill the requirement that each carbon forms four bonds and each hydrogen forms only one bond.



# Nomenclature of Organic compounds
## Homologous series of Organic Compounds_Alkanes



- Compounds such as butane and isobutane that have the same molecular formula but differ in the order in which the atoms are connected are called **constitutional**
- **isomers**—their molecules have different constitutions.
- In fact, isobutane got its name because it is an "iso"mer of butane. The structural unit—a carbon bonded to a hydrogen and two groups—that occurs in isobutane has come to be called "iso."
- Thus, the name isobutane tells you that the compound is a four-carbon alkane with an iso structural unit.

$CH_3CH_2CH_2CH_3$
butane

$CH_3CHCH_3$
$|$
$CH_3$
isobutane

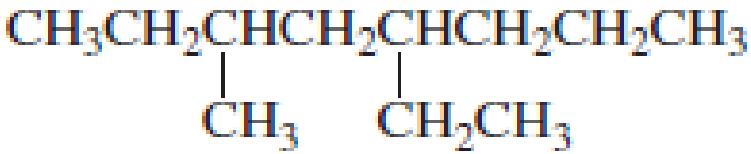
$CH_3CH-$
$|$
$CH_3$
an "iso" structural unit

# Nomenclature of Organic compounds

## Homologous series of Organic Compounds_Alkanes



- If more than one substituent is attached to the parent hydrocarbon, the chain is numbered in the direction that will result in the lowest possible number in the name of the compound.
- The substituents are listed in alphabetical (not numerical) order, with each substituent getting the appropriate number.
- In the following example, the correct name (5-ethyl-3-methyloctane) contains a 3 as its lowest number,
- while the incorrect name (4-ethyl-6-methyloctane) contains a 4 as its lowest number:



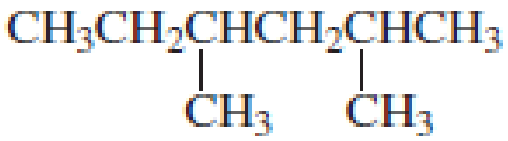
**5-ethyl-3-methyloctane**
**not**
**4-ethyl-6-methyloctane**
**because 3 < 4**

# Nomenclature of Organic compounds

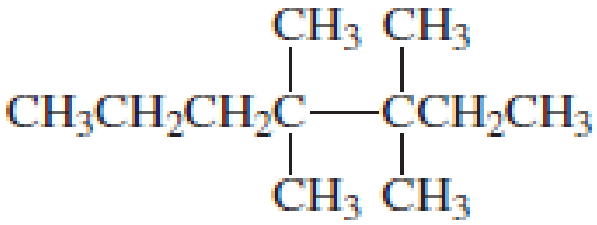
## Homologous series of Organic Compounds_Alkanes



If two or more substituents are the same, the prefixes "di," "tri," and "tetra" are used to indicate how many identical substituents the compound has. The numbers indicating the locations of the identical substituents are listed together, separated by commas. Notice that there must be as many numbers in a name as there are substituents.

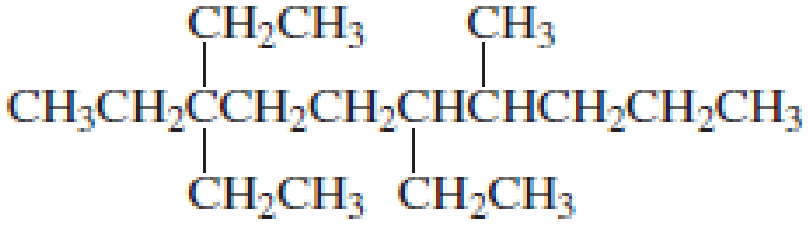


2,4-dimethylhexane

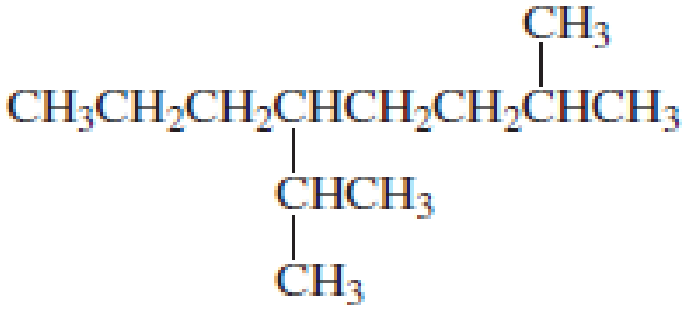


3,3,4,4-tetramethylheptane

The prefixes di, tri, tetra, *sec*, and *tert* are ignored in alphabetizing substituent groups, but the prefixes iso, neo, and cyclo are not ignored.



3,3,6-triethyl-7-methyldecane



5-isopropyl-2-methyloctane

- Alkanes are normally referred to as "*Paraffin*" because of their inert nature
- Latin: *Parum affinis*, not enough affinity
- Halogenation: Alkanes do react with chlorine or bromine to form alkyl chlorides or alkyl
- bromides.
- These **halogenation reactions** take place only at high temperatures or in the presence of light (symbolized by *hν*).

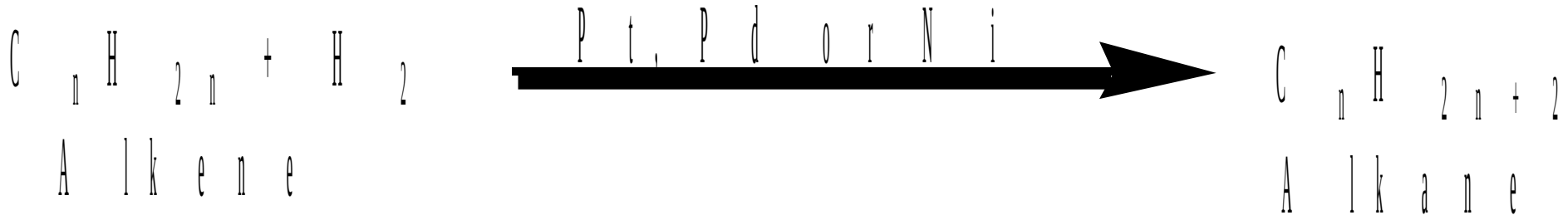
$$CH_4 + Cl_2 \xrightarrow[\text{or } h\nu]{\Delta} CH_3Cl + HCl$$

methyl chloride

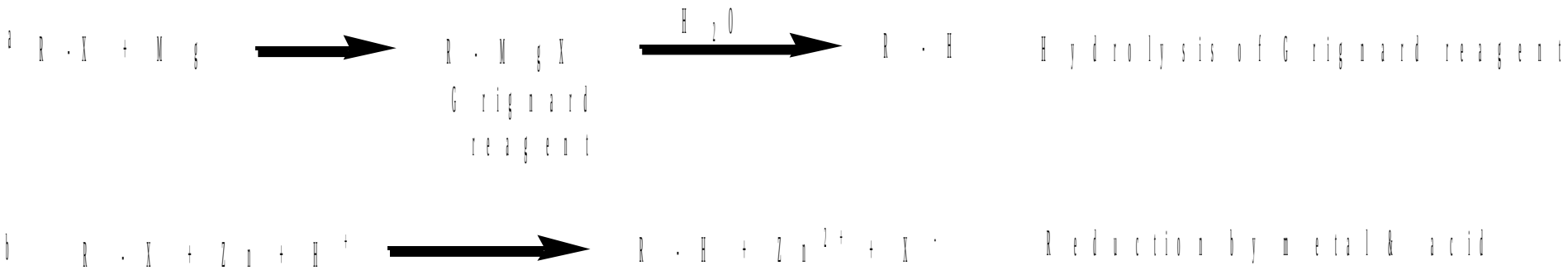
$$CH_3CH_3 + Br_2 \xrightarrow[\text{or } h\nu]{\Delta} CH_3CH_2Br + HBr$$

ethyl bromide

- The main souces of Alkanes industrially is *Petroleum* and *Natural Gas*
- Alkanes can be prepared by any of the following methods
  - Hydrogenation of alkenes



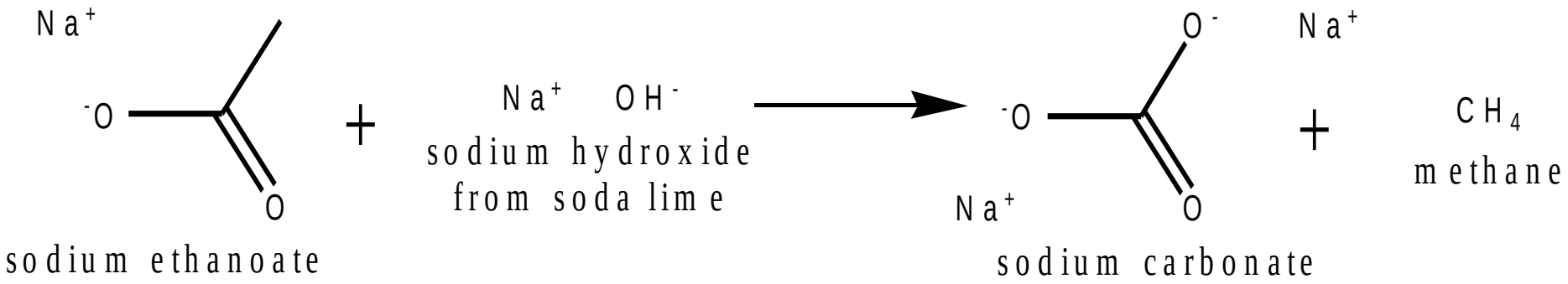
– Reduction of alkyl halides



# Methane

- The simplest member of alkanes
- Obtained mainly from petroleum and natural gas
- It can be prepared by heating anhydrous sodium ethanoate with an alkali





# Methane



- A colourless and odourless gas
- Slightly soluble in water
- Less dense than water
- Neutral to litmus
- Nonpolar