7. Chemical reactions of organic compounds

Let us Assess

1. Question

Given below are two chemical equations.

a) $CH_2 = CH_2 + H_2 \rightarrow A$

b) $A + Cl_2 \xrightarrow{\text{Sunlight}} B + HCl$

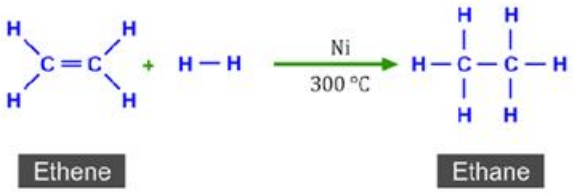
Identify the compounds “A” and “B”. Name these reactions.

Answer

a) “A” is $CH_3—CH_3$ (ethane)

When an unsaturated hydrocarbon reacts with hydrogen, gives a saturated hydrocarbon. This reaction is called addition reaction.

$CH_2 = CH_2 + H_2 \rightarrow CH_3—CH_3$ (A)



(unsaturated) (saturated)

Note: Unsaturated hydrocarbons are those which contain carbon to carbon double bonds C=C or carbon to carbon triple bonds -C≡C- in their molecules.

Saturated hydrocarbons are those organic compounds which contain carbon–carbon single bond.

b) $CH_3—CH_3 + Cl_2 \rightarrow CH_3—CH_2—Cl + HCl$

Ethane Chloroethane

(A) (B)

2. Question

Name the important chemical reactions of hydrocarbons. Give one example for each.

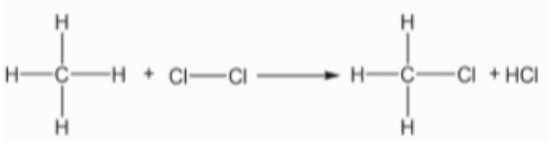
Answer

Important chemical reactions of hydrocarbons are:

i. Substitution reaction:

Reaction in which an atom or a group in a compound is replaced by another atom or group are called substitution reactions.

Example:



Methane Chloromethane

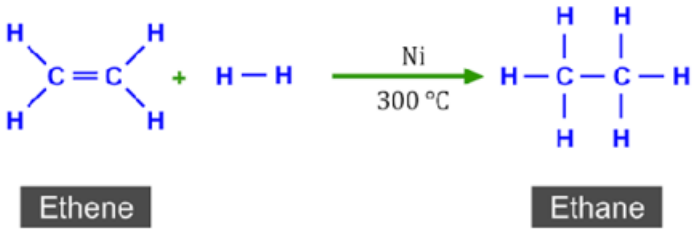
In the above example, one hydrogen atom of methane is replaced by one chlorine atom.

ii. Addition reaction

When an unsaturated hydrocarbon reacts with hydrogen, gives a saturated hydrocarbon. This reaction is called addition reaction.

Example:

$CH_2 = CH_2 + H_2 \rightarrow CH_3—CH_3$

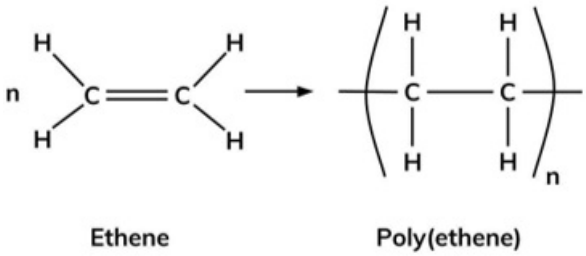


(unsaturated) (saturated)

iii. Polymerization

Polymerization is a process in which a large number of simple molecules combine under suitable conditions to form complex molecules. The molecules formed are called polymers.

Example:



In the above reaction, a large number of ethene molecules combine under higher pressure in the presence of catalyst to form polythene.

3. Question

Write the chemical formula of propane. Write the names and structural formulae of two compounds that may be formed during its substitution reaction with chlorine.

Answer

The chemical formula of propane: $CH_3—CH_2—CH_3$

Substitution reaction of propane with chlorine:

i. $CH_3—CH_2—CH_3 + Cl_2 \rightarrow CH_3—CH_2—CH_2—Cl$propane 1-chloropropane

ii. $CH_3—CH_2—CH_3 + Cl_2 \rightarrow CH_3—\underset{Cl}{CH}—CH_3$

Propane 2-chloropropane

4. Question

Complete the equation for the following chemical reaction. Name this reaction.

$CH_3 – CH_2 – CH_2 – CH_3 + ... O2 \rightarrow$ _____ + _____

Answer

Equation is:

$CH_3—CH_2—CH_2—CH_3 + O_2 \rightarrow CO_2 + H_2O$

Balanced equation:

$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

Butane

The above reaction is a combustion reaction.

When hydrocarbons burn, they combine with the oxygen in the air to form CO_2 along with heat and light. The reaction takes place is called combustion.

5. Question

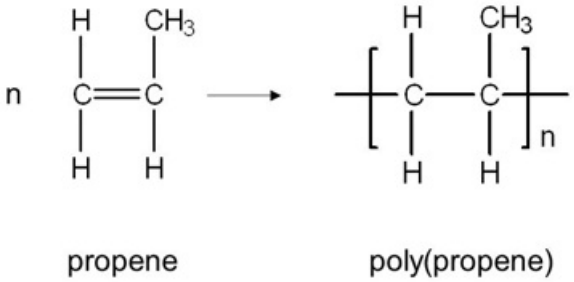
Which of the given molecules can form polymers? Butane, Propane, Propene, Methane, Butene

Answer

Propene and butene

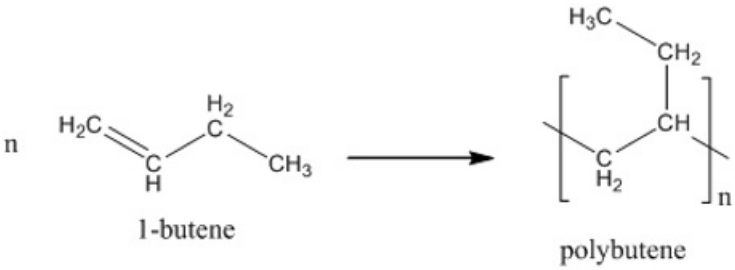
Unsaturated hydrocarbons undergo polymerization reaction to form a large number of saturated hydrocarbons.

Propene undergoes polymerization:



propene poly(propene)

Butene undergoes polymerization:



1-butene polybutene

Extended Activities

1. Question

You are familiar with different chemical reactions of hydrocarbons. Identify the situations in daily life in which these are used.

Answer

i. Manufacture of polymers like polythene.

ii. Production of rubbers.

iii. In lubricants like grease and graphite.

iv. Photosynthesis by plants

v. Burning of matchstick

vi. Burning of coal.

2. Question

List the different uses of ethanol. Prepare an essay on its adverse effects on human body and the related social issues when it is used as a beverage.

Answer

Uses of ethanol:

i. Ethanol is extensively used for industrial purposes.

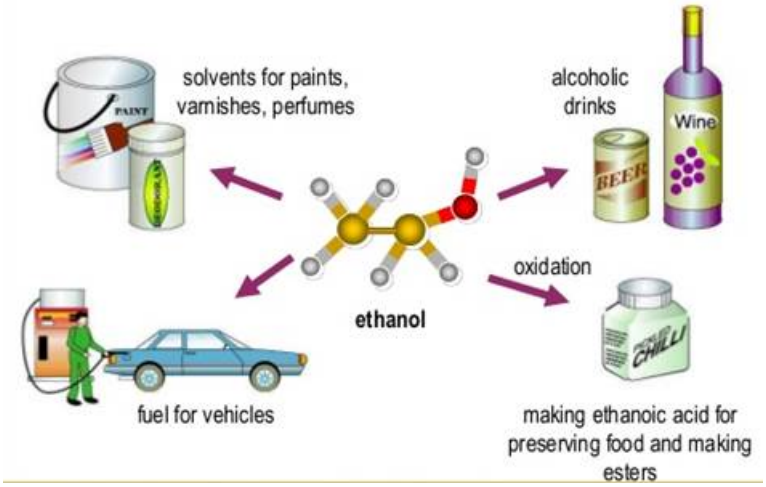
ii. It is used as an organic solvent.

iii. It is used in the manufacture of various organic compounds.

iv. It is used in the manufacture of paints.

v. It can be used as a fuel.

vi. It is used as a preservative.



Adverse effects of ethanol:

i. Ethanol consumption direct effects the nervous system (especially brain) and liver.

ii. The ability of memorization and learning becomes slow.

iii. Due to excess consumption of ethanol, lifespan of a person also decreases.

3. Question

You know how to make soap, don't you? Try to prepare soaps of different colours and fragrance. Prepare a short note on the chemistry of soaps.

Answer

Chemistry of soaps:

i. Soaps are sodium and potassium salts of fatty acids.

ii. They are produced by the process of saponification.

iii. Saponification is a process in which natural oils or fats undergo hydrolysis to produce soaps.

iv. It comes in the form of solid bar or liquid gels.

v. It is an excellent skin cleanser.

vi. It is also used in laundry for cleaning a large number of textiles.