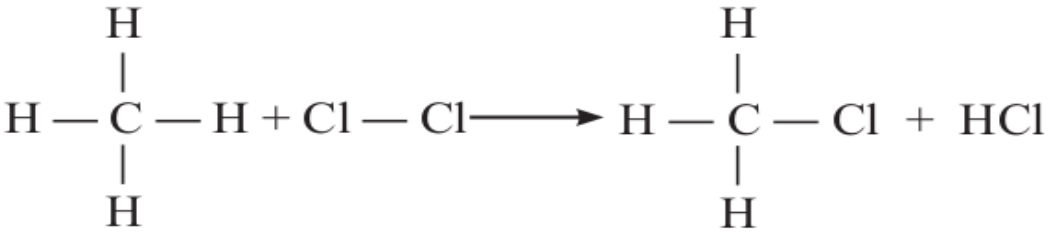
FOR MORE VISIT www.pusthakam360.blogspot.com

CHEMICAL REACTIONS OF ORGANIC COMPOUNDS

Substitution reactions are chemical reactions in which an atom or group of atoms is replaced with another atom or group of atoms in a compound.

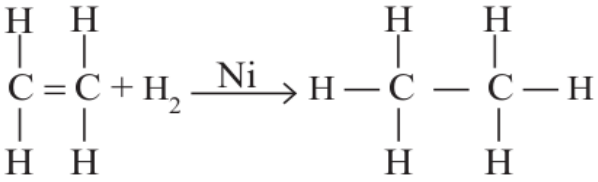


$$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$$

Which hydrocarbon is given here? methane

Which atom replaces hydrogen in the hydrocarbon? chlorine

Write the IUPAC name of the product. chloro methane



$$CH_2 = CH_2 + H_2 \xrightarrow{Ni} CH_3 - CH_3$$

What change takes place to the carbon-carbon double bond in ethene? double bond breaks

What is the product formed? methane

Is this product saturated or unsaturated? saturated

FOR MORE VISIT www.pusthakam360.blogspot.com

Polymerisation

Polymerisation is the process by which simple molecules join together to form large complex molecules.

Addition polymers

$$n CH_2 = CH_2 \rightarrow \left[CH_2 - CH_2 \right]_n$$

ethene — polyethene (polythene)

Condensation polymers

$$n HOOC - (CH_2)_4 - COOH + n NH_2 - (CH_2)_6 - NH_2 \rightarrow$$

Adipic acid — Hexamethylenediamine

$$\left[CO - (CH_2)_4 - CO - NH - (CH_2)_6 - NH \right]_n + n H_2O$$

Nylon 66

Condensation polymerisation is the process in which different monomers combine together to form larger compounds accompanied by the removal of simple molecules.

Monomer	Polymer	Uses
Vinyl chloride	PVC	Manufacture of pipes, plastic furniture, coating of electric conductors etc.
Ethene	Polythene	Manufacture of tarpaulin sheets, carry bags etc.
Isoprene	Natural rubber	Manufacture of tyres.
Tetrafluoroethene	Teflon	Coating of the inner surface of non stick cookware.
Acrylonitrile (Vinyl cyanide)	Orlon	Manufacture of synthetic fibres.

FOR MORE VISIT www.pusthakam360.blogspot.com

Monomer	Polymer	Use
• Adipic acid • Hexamethylenediamine	Nylon 66	Manufacture of fabrics, combs, bristles of brushes etc.
• Phenol • Formaldehyde	Phenol formaldehyde resin (bakelite)	Manufacture of switches, plugs, handles of pressure cookers etc.
• Ethylene glycol • Terephthalic acid	Polyethylene terephthalate (polyester)	Manufacture of tarpaulin, bottles, fabrics etc.

Thermal cracking

When heated in the absence of air, some hydrocarbons with high molecular weight decompose into hydrocarbons with lower molecular weight. This process is called thermal cracking.

When hydrocarbons burn, they combine with oxygen in air to form CO 2 and H 2 O along with heat and light. This process is called combustion.

Methanol ($CH_3 - OH$)

$$CO + 2H_2 \xrightarrow[573\ K]{catalyst} CH_3 - OH$$

Uses of methanol

For manufacturing varnish, paint etc.

For the manufacture of formic acid, formaldehyde etc.

40% solution of formaldehyde is formalin.

Ethanol ($CH_3 - CH_2 - OH$)

The fermentation is carried out by adding yeast to the dilute molasses.The enzyme invertase present in yeast converts sugar

solution to glucose and fructose. Then another enzyme zymase, converts glucose and fructose into ethanol.

$$\underset{\text{(Sugar solution)}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{Invertase}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$\underset{\text{Glucose / Fructose}}{C_6H_{12}O_6} \xrightarrow{\text{Zymase}} \underset{\text{Ethanol}}{2C_2H_5OH} + 2CO_2$$

8-10% ethanol is known as wash
95.6% of ethanol is known as rectified spirit.
100% of ethanol is known as absolute alcohol.

Uses of ethanol
As a solvent for medicines.
Manufacture of paints.
As preservatives.
Production of organic compounds.

Ethanoic acid
Ethanoic acid can be prepared industrially by treating methanol with carbon monoxide in the presence of a catalyst.

Uses of ethanoic acid
Manufacture of vinegar.
Production of acetic anhydride, acetate ester, synthetic fibres etc.
Solvent of polymers and resins.

Esters
Esters are formed when alcohols react with carboxylic acids. This reaction is called esterification.

FOR MORE VISIT www.pusthakam360.blogspot.com

Name of carboxylic acid	Name of alcohol	Name of ester	Fragrance
Ethanoic acid	Isoamyl alcohol	Isoamyl acetate	Banana
Ethanoic acid	Benzyl alcohol	Benzyl ethanoate	Jasmine
Ethanoic acid	Octyl alcohol	Octyl ethanoate	Orange
Butanoic acid	Ethyl alcohol	Ethyl butanoate	Pineapple

Category	Function	Examples
Analgesics	Relieve pain	Aspirin
Antipyretics	Reduce body temperature	Paracetamol
Antiseptics	Control microorganism	Dettol
Antibiotics	Destroy infectious microorganisms and prevent their growth.	Penicillin

Let us assess

1. a) In which of the following situation is methane converted to chloromethane?

(i) Chlorine + sunlight

(ii) Hydrochloric acid + sunlight

(iii) Oxygen + temperature

(iv) Heating in the absence of oxygen

b) Write the name of such types of reactions.

a) 1 b)substitution reaction

FOR MORE VISIT www.pusthakam360.blogspot.com

2. a) How many hydrogen molecules are required to convert CH ≡ CH (ethyne) into C_2H_6 (ethane)?

   b) Write the chemical equation of the reaction.

   c) To which category does this chemical reaction belong?

a)2 molecules b)CH=CH $+2H_2$ ---> C_2H_6 c) addition

3. a) Complete the chemical equation.

   i) $CH \equiv CH + HCl \rightarrow$ A

   ii) $n\,A \rightarrow$ B

   b) Write the IUPAC names of the molecules A and B.

   c) To which category does each of these chemical reactions belong?

a)CH_2 =CHCl b) $[-CH_2\text{-}CHCl-]_n$ c) polymerisation

4. a) Which of the given polymers is used to coat the inner surface of cookware? (Polythene, polyvinyl chloride, teflon)

   b) What is the monomer of this polymer?

a) teflon b)hexamethylene diamine+adipic acid

6. $C_{12}H_{22}O_{11} + H_2O \xrightarrow{A} C_6H_{12}O_6 +$ B

   $C_6H_{12}O_6 \xrightarrow{C} 2C_2H_5OH +$ D

   a) Identify A, B, C and D in the given chemical reactions.

   b) What is wash?

   c) How is rectified spirit obtained from wash?

   d) What is the purpose of denaturing rectified spirit?

FOR MORE VISIT www.pusthakam360.blogspot.com

a)invertase ,$C_6H_{12}O_6$, zymase, CO_2
b)8% ethanol is called wash
c)fractional distillation
d)in order to prevent its misuse as a beverage

7. a) How is ethanoic acid prepared industrially?
   b) 5 - 8% ethanoic acid is called .....

a)Ethanoic acid can be prepared industrially by treating methanol with carbon monoxide in the presence of a catalyst.
b)vinegar

8. $CH_3 - COOH + CH_3 - OH \xrightarrow{\text{conc. } H_2SO_4} CH_3 - COO - CH_3 + H_2O$

   Analyse the equation and answer the following questions.

   a) What is the name of this chemical reaction?
   b) What is the name of the ester formed?
   c) Write any two uses of esters.

a)esterification
b)methyl ethanoate
c)for making perfumes ,in food material.artificial fruit juices