CHEMISTRY

CLASS-XII

SESSION 2020-21

POLYMERS PART-2

StepI: Revise polymers till types of polymerisation reactions.

StepII: Read the chapter from N.C.E.R.T and then revise from the notes.

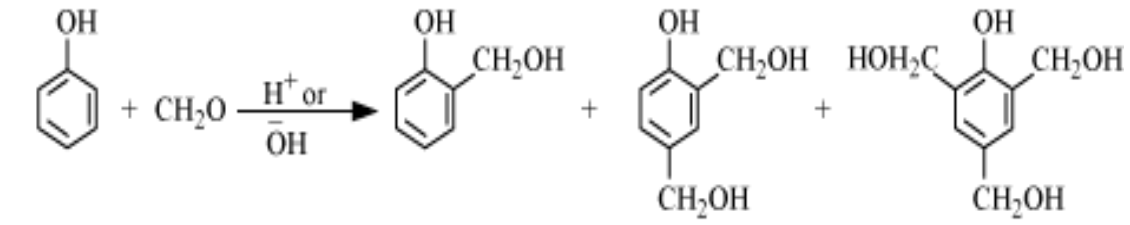
StepIII: You can open the link https://youtu.be/OxdJlS0xZ0Y

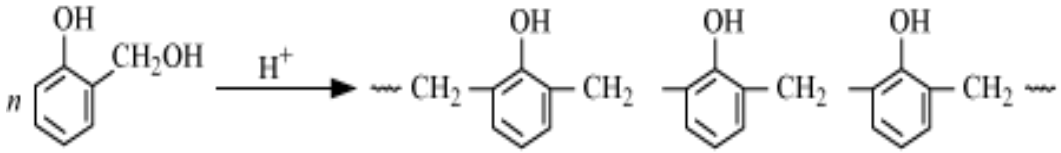
Polymers Shiksha House

StepIV: Attempt the online Quiz after revising the chapter.

https://forms.gle/6X9qtfhLgihkdMa86

Phenol-Formaldehyde Polymer(Bakelite)



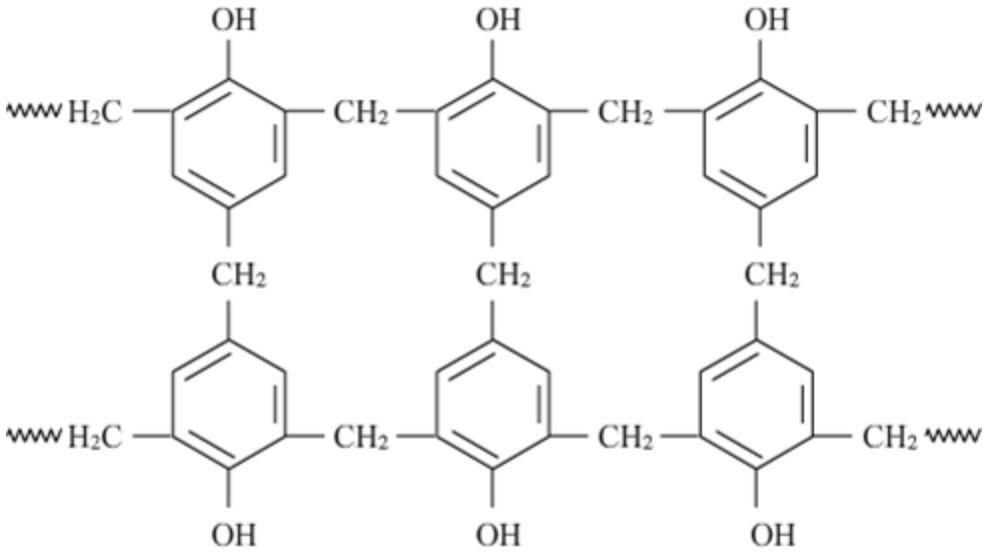


Novolac

They are obtained by the condensation reaction of phenol with formaldehyde in the presence of either an acid or a base.The initial product formed is linear and called **Novolac** which is used in paints.

Novolac on heating with formaldehyde undergoes cross linkages and forms solid mass called **Bakelite.**

Novolac, obtained on heating with formaldehyde, undergoes cross- linking to form an infusible solid mass called bakelite.

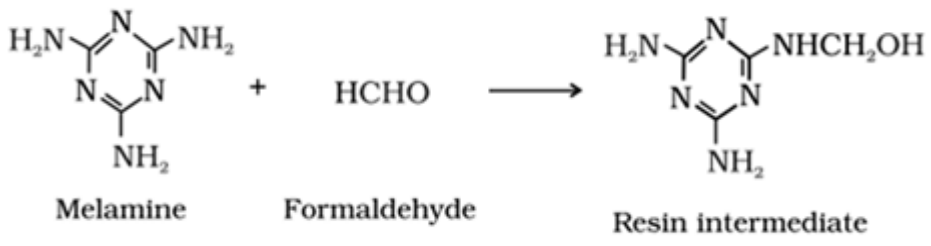


Bakelite

Used for making combs, phonograph records, electrical switches and handles of various utensils.

Melamine – formaldehyde polymer

• It is obtained by the condensation polymerisation of melamine and formaldehyde.



Melamine + Formaldehyde → Resin intermediate

- It is used in the manufacture of unbreakable crockery.

Polymers of Commercial Importance

The key notes of the chapter are as follows:

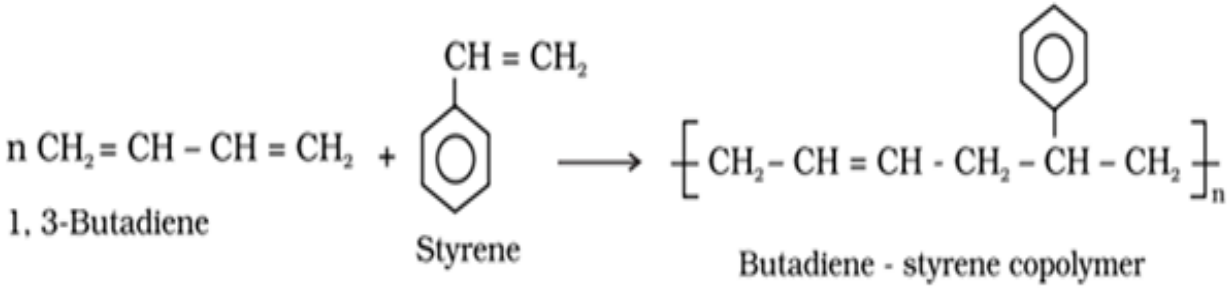
Copolymerisation

It is a type of polymerisation reaction in which a mixture of more than one monomeric species is allowed to polymerise and form a polymer called copolymer.

It is formed by both chain growth and step growth polymerisation.

Copolymer contains multiple units of each monomer used in the same polymeric chain.

For example: 1, 3-Butadiene and styrene can undergo copolymerization to form butadiene –styrene copolymer.



Rubber

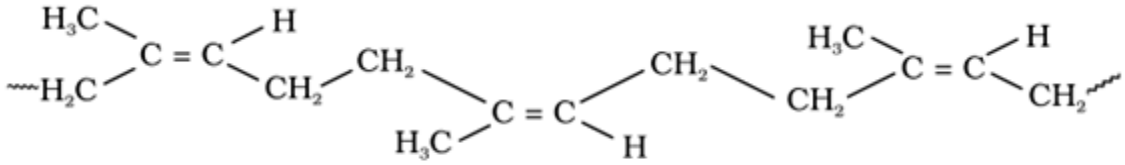
Rubber is of two types: Natural and synthetic

1. Natural Rubber

It is a natural polymer possesessing elastic properties. It is also an elastomer i.e. the varios chains are held by weak vander waal interactions

It is a linear polymer of isoprene (2-methyl buta-1, 3-diene).

It is also called cis-1.4-polyisoprene

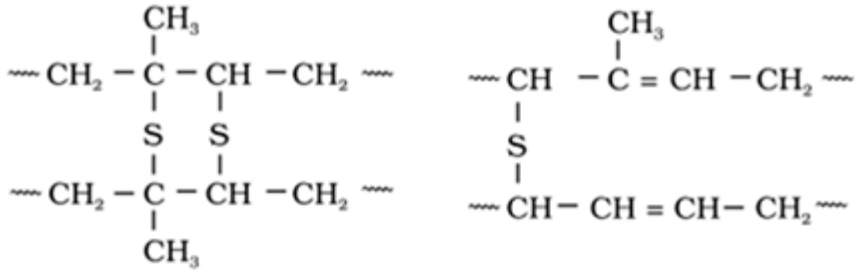


Natural rubber

Drawbacks of Natural Rubber:

- It becomes soft at high temperature and brittle at low temperature.
- It is non-resistant to the attack of oxidizing agents.
- It has high water absorption capacity.

Vulcanisation of Rubber: The process of heating a mixture of raw rubber with sulphur in order to improves its physical properties is called vulcanisation of rubber.



Vulcanised rubber

Vulcanisatlon is carried out by adding sulphur (3-5%) and zinc oxide to the rubber, and then heating at a temperature range 373K to 415K for 20-30 minutes.

Zinc oxide accelerates the rate of vulcanisation

Sulphur forms cross links at the reactive sites of double bonds and thus the rubber gets stiffened.

Thus about 5% sulphur is used for making tyre rubber and 30% of it for making battery case rubber.

The improved properties of vulcanised rubber are:

(i) High elasticity.
(ii) Low water-absorption tendency
(iii) Resistance to oxidation.

2. Synthetic Rubber

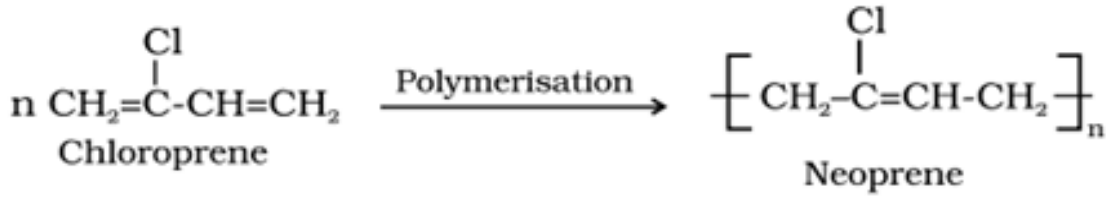
Synthetic rubbers are polymers derived from buta-1.3-diene or buta-1.3-diene derivatives.

It is like vulcanised rubber and is capable of stretching to twice its length.

The synthetic rubber is of two types:

- ***Neoprene***

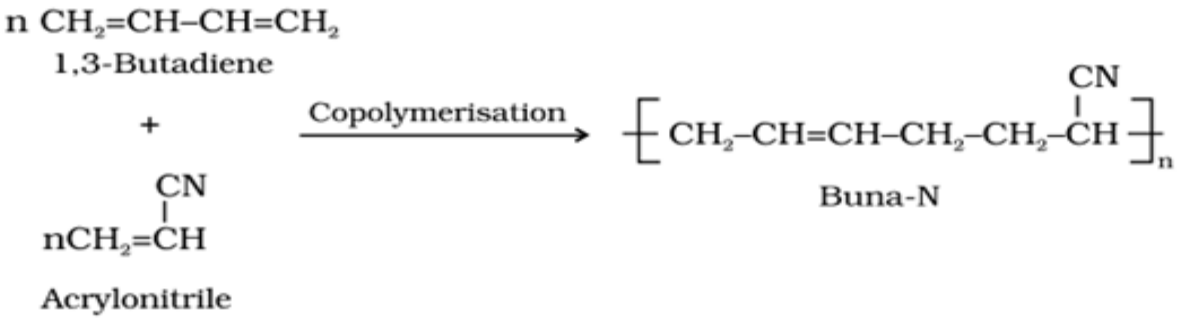
It is a homopolymers of chloroprene (2-Chloro-buta-1,3-diene).



Uses: It is used for manufacturing conveyor belts, gaskets and hoses.

- ***Buna-N***

It is a copolymer of Buta-1, 3-diene with acrylonitrile in the presence of a peroxide catalyst.



Uses: It is used in making conveyor belts and printing rollers.

Biodegradable Polymers

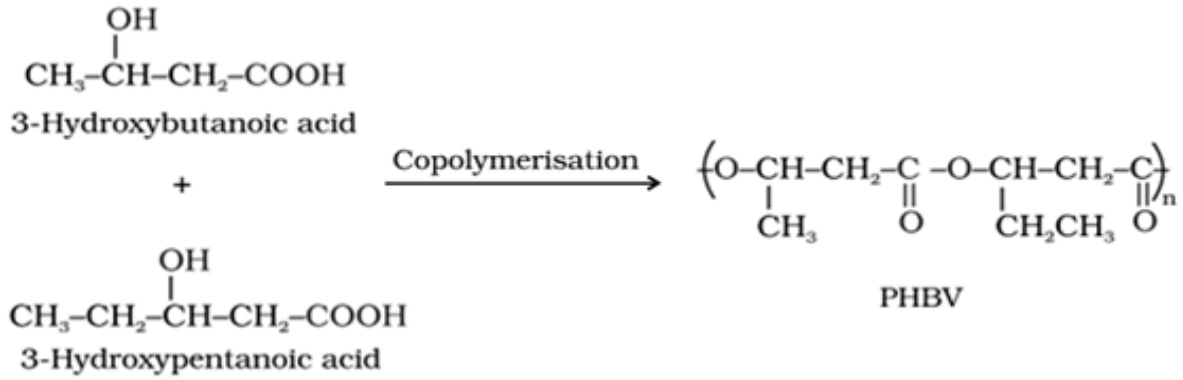
These are the synthetic polymers that are hydrolysed by enzymes and to some extent degrade by oxidation.

These polymers contain functional groups similar to the functional groups present in biopolymers.

Some important examples of biodegradable polymers are given below:

1. Poly β- hydroxybutyrate- co-β-hydroxy valerate (PHBV):

- **Preparation:** It is a copolymer of 3-hydroxy butanoic acid and 3-hydroxy pentanoic acid in which the monomeric units are connected by ester linkages.



- **Uses:** It is used in packaging, orthopaedic devices and even in controlled release of drugs

2. Suture Polymer:

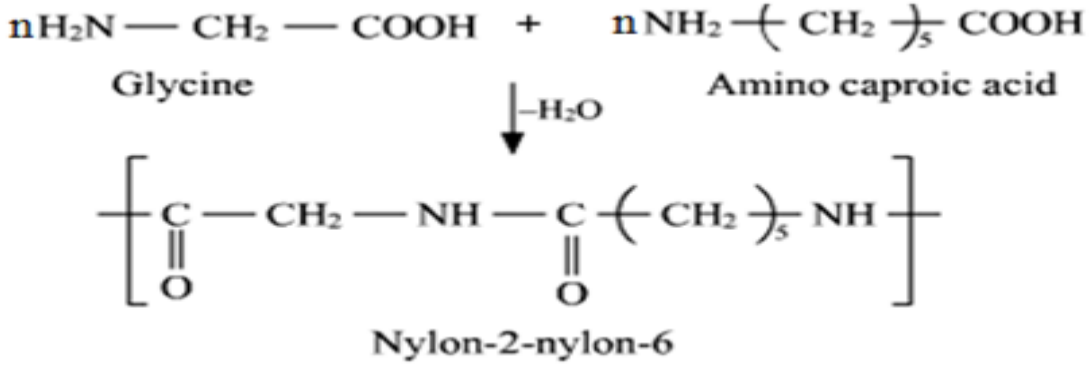
- It is a copolymer of glycolic acid and lactic acid.

- Sutures help the healing process by closing and sealing a wound.

- Dextron was the first biodegradable suture made from biodegradable polyesters for post-operation sticher.

3. Nylon-2-Nylon-6:

It is a copolymer of glycine ($H_2N–CH_2–COOH$) and amino caproic acid [$H_2N\ (CH_2)_5\ COOH$] and is biodegradable.

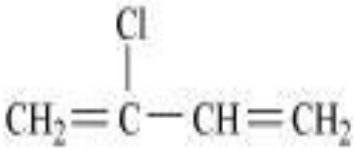


Polymers of Commercial Importance

Some Commercially Important Polymers, their monomers and uses are given below:

Polymer	Monomer	Uses
Polyvinyl chloride (PVC)	CH_2=CHCl Vinyl Chloride	Manufacture of rain coats, hand bags, vinyl flooring, and water pipes.
Bakelite	Phenol and formaldehyde	For making combs,electrical switches,handles of utensils and computer discs.
Polystyrene	CH_2=CH–C_6H_5 Vinylbenzene (Styrene)	As insulator, wrapping material, manufacture of toys, radio and television cabinets
Polypropene	Propene	Manufacture of ropes,toys,pipes,fibres etc.
Glyptal	Ethylene glycol and phthalic acid	Manufacture of paints and lacquers

Polymer		Monomer	Uses
I	Buna-S	1, 3-butadiene **CH_2 = CH – CH=CH2**	Manufacture of Autotyres,floortyres

		Styrene **$C_6H_5CH = CH_2$**	Cable insulation
Ii	Buna-N	1, 3-butadiene **$CH_2 = CH – CH = CH2$**	For making oil seals,tank lining
		Acrylonitrile **$CH_2 = CH – CN$**	
Iii	Neoprene	 Chloroprene	Manufacture of Hoses,gaskets and Conveyer belts
Iv	Dacron OR Terylene	Ethylene glycol **$HOH_2C –CH_2OH$**	Used in blending With cotton and Wool fibres
		Terephthalic acid