

CHAPTER NO :- 15 POLYMERS

CHAPTER WEIGHTAGE :- 03 MARKS

Q. DEFINITION AND EXAMPLES :-

Q. POLYMER :-

It is defined as Higher molecular weight macromolecule which consist of repeating units of monomers is called as Polymer.

Ex :- Polythene, PVC, Teflon etc.

Q. MONOMER :-

The small and simple molecules which are combine to form polymer is called as Monomer.

Q. POLYMERIZATION :-

The process of synthesising polymer called as Polymerization.

Q. NATURAL POLYMERS :-

The polymers which are obtained from plants and animals is called Natural Polymer.

E.g :- Wool, Silk, Cellulose, Rubber, linene, jute.

Q. SEMI-SYNTHETIC POLYMERS :-

The properties of Natural polymers are modified due to some chemical treatment are called Semi-Synthetic polymers.

Ex :- Acetate Rayon, Viscose Rayon, Cuprammonium Silk.

Q. SYNTHETIC - POLYMERS :-

The polymers obtained from chemical substances are called Synthetic polymers.

Ex :- Nylon, Terylene, Polythene etc.

D LINEAR POLYMERS :-

The polymers made up of long continuous chain without any branches are called linear polymers. Ex :- Polythene, PVC

D BRANCHED CHAIN POLYMERS :-

The polymers made up of main chain with smaller chains as branches of main chain are called Branched chain polymers.

Ex :- Polypropene.

D CROSS - LINKED POLYMERS :-

These polymers consist of linking of chain polymers by strong covalent bonds leads to a three dimensional network structure are called Cross-linked polymers.

Ex :- Bakelite, Melamine-formaldehyde resin.

D ADDITION POLYMER :-

The polymer formed by the repeated addition of a large number of monomers like alkenes or alkynes are called Addition Polymers.

Ex :- Polythene, Teflon.

D CONDENSATION POLYMER :-

The polymers formed by the repeated condensation reaction between two bifunctional or trifunctional monomer units which results in elimination of small molecules like water or alcohol are called Condensation polymers.

Ex :- Nylon-6,6, Terylene.

D ADDITION POLYMERIZATION OR CHAIN GROWTH POLYMERIZATION :-

Addition polymerization involves addition of monomer units at the reactive ends of growing chain across the double bond.

Ex :- Polythene, Teflon.

Q CONDENSATION POLYMERIZATION OR STEP GROWTH POLYMERIZATION :-

The any pair of reacting molecules having functional group, they undergo a series of condensations with elimination of water or alcohol molecule in step wise manner.

Ex :- Nylon-6,6 , Dacron.

Q ELASTOMERS :- The polymers in which the intermolecular forces of attraction between the polymer chains are the Weakest (Vander-Waals forces) are called elastomers.

Ex :- Natural Rubber, Neoprene.

Q FIBRES :- In these polymers, the intermolecular forces of attraction between the polymer chains are the strongest.

Ex :- Terylene, Nylon-6,6

Q THERMOPLASTIC POLYMERS :- In these polymers, the intermolecular forces of attraction in the polymer chains are in between those of elastomers and fibres.

Ex :- Polythene, Polystyrene.

Q THERMOSETTING POLYMERS :- These polymers are cross linked or branched molecules which do not become soft on heating under pressure, hence cannot be remoulded and Recycled.

Ex :- Bakelite.

Q HOMOPOLYMER :-

A polymer made from identical repeating units of one monomer is called Homopolymer.

Ex :- Polythene, PVC.

D HETERO POLYMER OR CO-POLYMER :-

A polymer made from more than one kind of repeating unit of monomers is called Heteropolymer.

E.x :- Nylon-6,6, Terylene, Buna-S, Buna-N.

D NATURAL RUBBER :-

Natural Rubber is a linear polymer of isoprene unit to form cis-1,4-polyisoprene with elastic properties.

D VULCANIZATION :-

It is a process in which, when elasticity of natural rubber can be increased by adding 3 to 5% sulphur and heating at $100-150^{\circ}\text{C}$, resulting in cross linking of cis-1,4 polyisoprene chains through disulphide bonds (-S-S-) is known as VULCANIZATION.

D BIO-DEGRADABLE POLYMERS :-

Polymers which disintegrate by themselves after a certain period of time due to environmental degradation are called Bio-degradable polymers.

E.x :- PHBV, DEXTRON, Nylon-2-Nylon-6

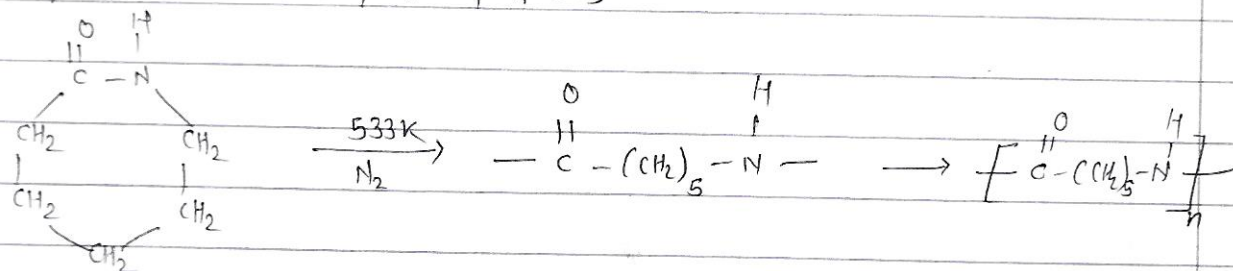
D NON-BIO-DEGRADABLE POLYMERS :- (Synthetic polymer)

Polymers do not disintegrate themselves after a certain period of time due to environmental degradation^{are} called Non-biodegradable polymer.

E.x :- Bakelite, Polythene, PVC etc.

Q SOME - IMPORTANT METHODS OF PREPARATION OF POLYMER:-

① Nylon - 6 :- [Polyamide polymer]

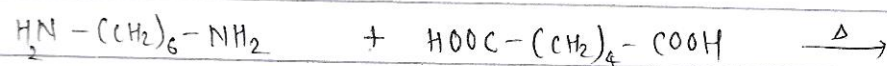


ε-Caprolactam

Repeating unit

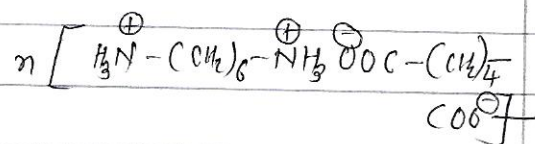
Nylon-6

② Nylon - 6, 6 :- [Polyamide Polymer]

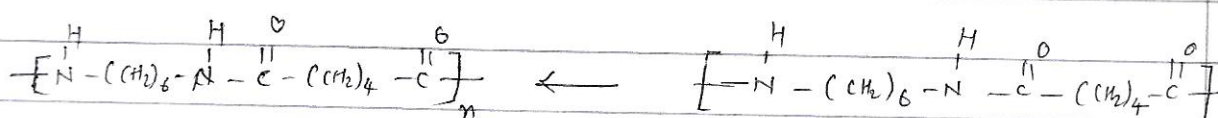
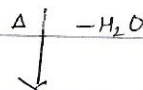


Hexamethylene diamine

Adipic acid



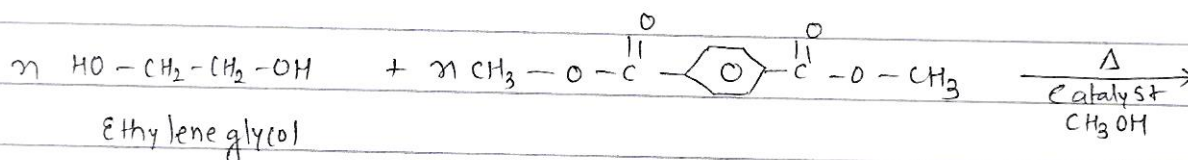
Nylon Salt.



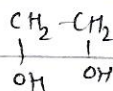
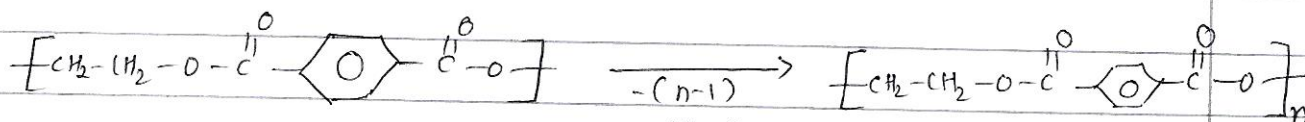
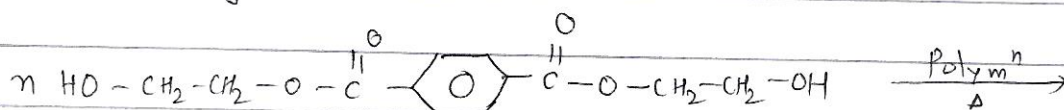
Nylon-6,6

Repeating unit

③ Terylene or Dacron :-

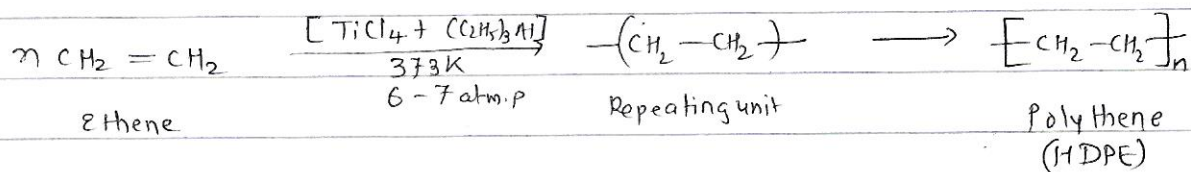


Ethylene glycol




Polyester
[Terylene]

④ HDPE :- HIGH DENSITY POLYTHENE

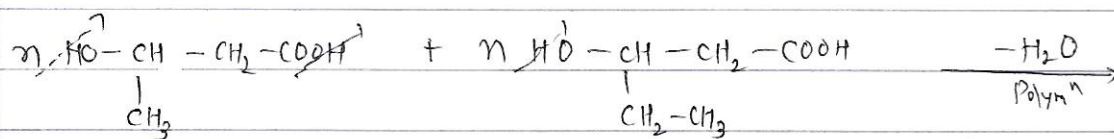


SOME IMPORTANT NAME OF POLYMER AND ITS MONOMER :-

- | POLYMER | NAME OF MONOMER |
|--------------------|--|
| 1) Buna - S :- | Buta-1,3-diene + Styrene
$\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$ $\text{CH} = \text{CH}_2$
 |
| 2) Buna - N :- | Buta - 1,3-diene + Acrylonitrile
$\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$ $\text{CH}_2 = \text{CH}$
<div style="text-align: center;">
CN</div> |
| 3) Neoprene :- | $\text{CH}_2 = \overset{\text{Cl}}{\underset{ }{\text{C}}} - \text{CH} = \text{CH}_2$
Chloroprene |
| 4) Butyl Rubber :- | Iso butylene + Isoprene
$\text{CH}_2 = \overset{\text{CH}_3}{\underset{ }{\text{C}}} \text{---} \overset{\text{CH}_3}{\underset{ }{\text{C}}} - \text{CH} = \text{CH}_2$ |
| 5) Teflon :- | Tetrafluoroethene
$\text{CF}_2 = \text{CF}_2$
Acrylonitrile
$\text{CH}_2 = \text{CH}$
<div style="text-align: center;">
CN</div> |
| 6) Orlon / PAN :- | $\text{CH}_2 = \text{CH}$
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CN</div> |
| 7) PVC :- | $\text{CH}_2 = \underset{\text{Cl}}{\text{CH}}$ (Vinyl chloride) |

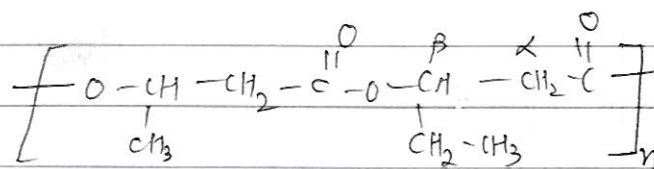
SOME IMPORTANT METHOD TO PREPARE BIO-DEGRADABLE POLYMER

1) PHBV Polymer : [Polyhydroxy butyrate - co - β -hydroxy valerate]



3-Hydroxy butanoic acid

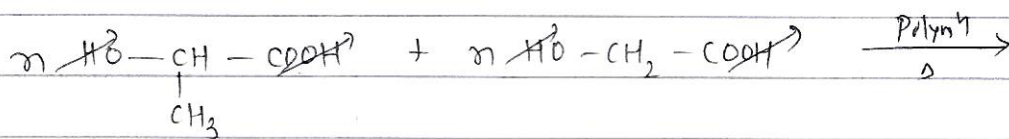
3-Hydroxy pentanoic acid



PHBV

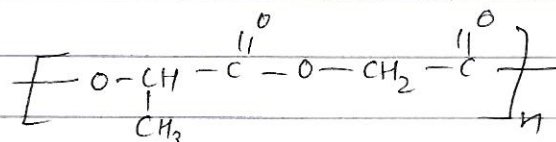
(Polyester)

2) DEXTRON :-



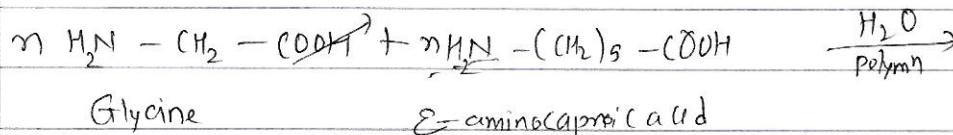
Lactic acid

Glycolic acid



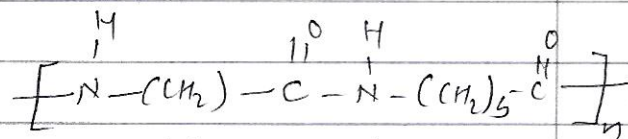
Dextron

3) NYLON-2 - NYLON-6 :-



Glycine

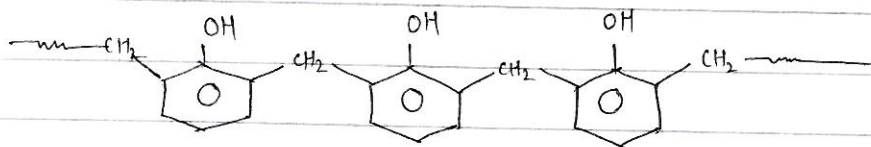
ϵ -aminocaproic acid



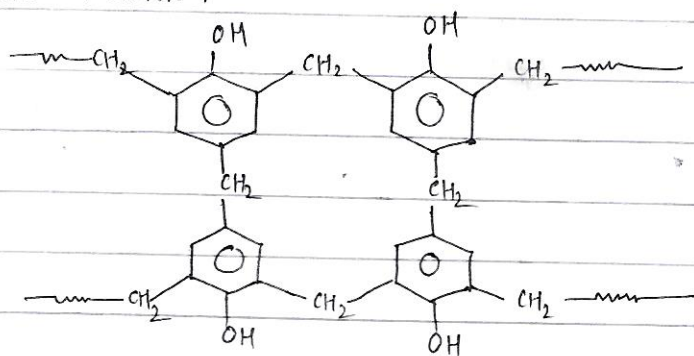
Nylon-2 - Nylon-6

SOME IMPORTANT STRUCTURE OF POLYMER

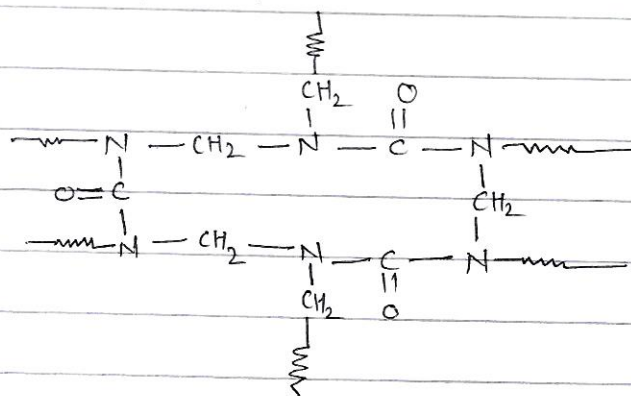
① NOVOLAC POLYMER :-



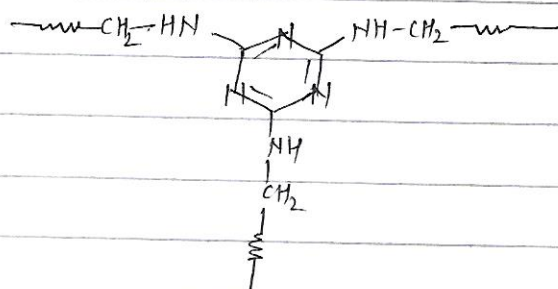
② BAKELITE POLYMER :-



③ UREA - FORMALDEHYDE POLYMER :-



④ MELAMINE - FORMALDEHYDE POLYMER :-



USES OF POLYMER :- Refer government text book,