MERS
MARKS

DIFFRENCES BETWEEN

1. Thermoplastic and thermosetting plastics :

THERMOPLASTICS	THERMOSETTING PLASTICS
→ It can be repetedly softened on heating and hardened on cooling. → can be used again → eg:- Polythene, PVC	→ It is a permanent setting polymer which become hard and infusible on heating. → can not be softened again → eg:- Bakelite and melamine formaldehyde resin

2.

HOMO POLYMERS	COPOLYMERS
→ Addition polymers formed by polymerisation of single monomeric species → $n\,CH_2=CH_2 \longrightarrow \text{-}(CH_2-CH_2)\text{-}_n$ Polythene → $n\,CH_2=\underset{Cl}{CH} \longrightarrow \text{-}(CH_2-\underset{Cl}{CH})\text{-}_n$ PVC	→ Addition polymers formed by polymerisation of more than one monomeric species → $n\,CH_2=CH-CH=CH_2 + n\,C_6H_5-CH=CH_2$ 1,3-Butadiene ↓ Styrene $\text{-}(CH_2-CH=CH-CH_2-CH_2-\underset{C_6H_5}{CH})\text{-}_n$

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3.

FIBRES	ELASTOMERS
→ Thread forming solids which possess high tensile strength & high modulus. → Strong intermolecular forces like H-bonding → eg → Polyamides (nylon 6,6), terylene	→ Rubber like solids with elastic properties → Polymers chains are held together by weakest intermolecular forces. → Buna-S, Buna-S, neoprene

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4.

ADDITION POLYMERS	CONDENSATION POLYMERS
→ Formed by repeated addition of monomer molecules possessing multiple bonds. → No elimination of any by-product molecule. → Molecular mass of polymer is integral multiple of the monomer units. → eg → $n\,CH_2=CH_2 \longrightarrow \text{-}(CH_2-CH_2)\text{-}_n$ Polythene $n\,CH_2=\underset{CH_3}{CH} \longrightarrow \text{-}(CH_2-\underset{CH_3}{CH})\text{-}_n$ Polypropylene	→ Formed by repeated condensation reaction between two different bifunctional or trifunctional monomeric units. → occurs with the elimination of small molecules such as water, alcohol, HCl etc. → not the integral multiple → $n\,H_2N-(CH_2)_6-NH_2 + n\,HOOC-(CH_2)_4-COOH$ Hexamethylene diamine ↓ Adipic acid $\text{-}NH-(CH_2)_6-NH-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}\text{-}_n + 2n\,H_2O$ Nylon-6,6

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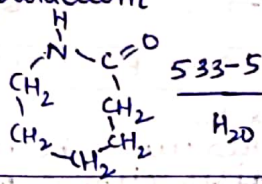
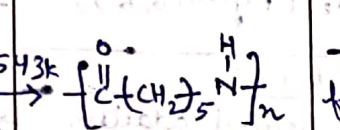
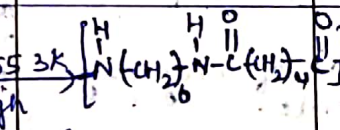
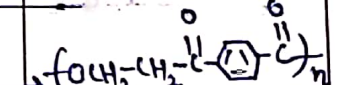
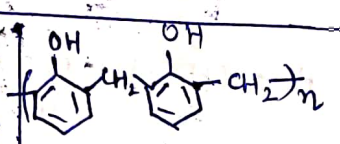
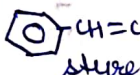
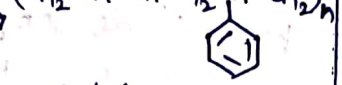
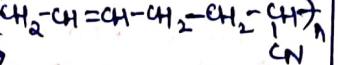
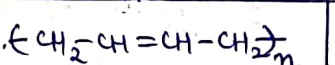
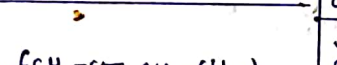
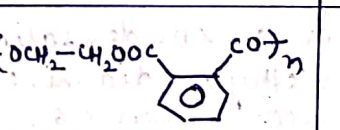
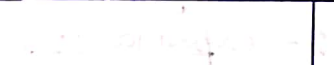
5.

CHAIN GROUTH POLYMERISATION	STEP GROUTH POLYMERISATION
→ Also called as addition polymerisation. → Process involves the addition of monomer units of the growing chain by a chain mechanism	→ called as condensation polymerisation → The type of polymerisation involves a repetitive condensation reaction between two bifunctional monomers.

6. Low density Polyethene (LDPE)	High density polyethene (HDPE)
→ $n\,CH_2=CH_2 \xrightarrow[1000-1500\ atm]{350-570K} -(CH_2-CH_2)_n-$ Traces of O_2	$n\,CH_2=CH_2 \xrightarrow[6\rightarrow 7\ atm]{333-343K} -(CH_2-CH_2)_n-$ Ziegler Natta catalyst
→ consist of branched chain str. of molecules	→ consist of linear chain polymer molecules.
→ chemically inert	→ Also chemically inert
→ moderate tensile strength	→ high tensile strength
→ uses: as packing material	→ Pipes, bottles, toys, bags.

II SOME IMPORTANT POLYMERS

S.No	Name of Polymer	Monomer	Structure	Uses
1.	POLYPROPENE	Propene $CH_2=CH(CH_3)$	$-(CH_2-CH(CH_3))_n-$	Manufacture of ropes, toys, pipes etc.
2.	POLYSTYRENE	Styrene $CH_2=CH(C_6H_5)$	$-(CH_2-CH(C_6H_5))_n-$	insulator, wrapping material toys, radio & television devices
3.	POLYVINYL CHLORIDE (PVC)	vinyl chloride $CH_2=CH(Cl)$	$-(CH_2-CH(Cl))_n-$	rain coats, hand bags
4.	NYLON-6	caprolactum  $\xrightarrow[H_2O]{533-543K}$		Tyre cords, fabrics, ropes
5.	NYLON 6,6 -	$n\,HOOC-(CH_2)_4-COOH$ + adipic acid $H_2N-(CH_2)_6-NH_2$ hexamethylene diamine $\xrightarrow[\text{High pressure}]{553K}$		sheets, bristles, brushes & textile industry
6.	Polyethene	ethene $CH_2=CH_2$	$-(CH_2-CH_2)_n-$	Bottles, toys, packing material
7.	Teflon/PTFE	Tetrafluoroethene $n\,CF_2=CF_2$	$-(CF_2-CF_2)_n-$	used in non-stick surface coated utensils
8.	Terelene or Dacron	$HOCH_2-CH_2OH$ + ethylene glycol $n\,HOOC-C_6H_4-COOH$ Terephthalic acid		Crease resistant so used in blending with cotton & wool fibres

	Bakelite	C_6H_5OH + HCHO (Phenol, Formaldehyde) →		For making combs, electrical switches, handles of utensils.
10.	Buna-S	$CH_2=CH-CH=CH_2$ 1,3-Butadiene +  styrene →	 copolymer	used in floor tiles, footwears components
11.	Buna-N	$CH_2=CH-CH=CH_2$ 1,3-Butadiene + $CH_2=CH-CN$ acrylonitrile →	 copolymer	oil seals and tank lining
12.	Polybutadiene	Butadiene $CH_2=CH-CH=CH_2$		manufacture of golf balls & various elastic objects, automobile tyres
13.	Neoprene	2-Chloro-1,3-Butadiene $CH_2=C(Cl)-CH=CH_2$ → chloroprene		manufacture of conveyer belts, gaskets, hoses
14.	Natural Rubber	2-methyl-1,3 Butadiene (isoprene) $CH_2=C(CH_3)-CH=CH_2$ →		Automobile tyres & tubes & foot wears.
15.	Glyptal	a) Ethylene glycol b) phthalic acid		manufacture of pains & lacquers
16.	urea-formaldehyde resin	a) urea b) Formaldehyde		For making unbreakable cups & laminated sheets

III SHORT NOTES :

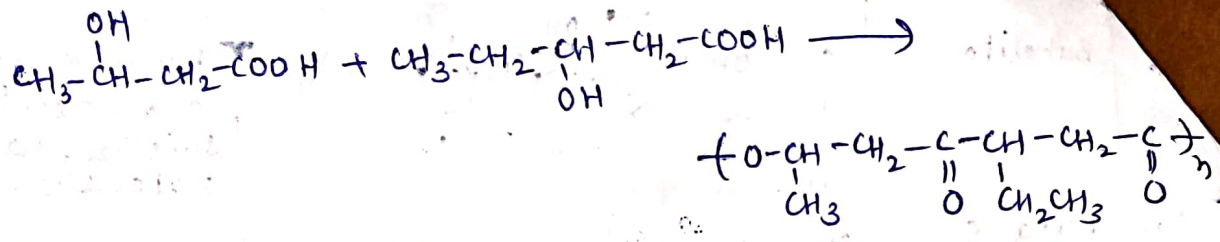
1. **BIODEGRADABLE POLYMERS** : Due to potential environmental hazards of synthetic polymeric wastes certain biodegradable polymers such as PHBV and Nylon-2-Nylon-6 are developed as alternatives. These polymers of not resistant to environmental degradation process.

eg:-

a) **Poly β-hydroxybutyrate-co-β-hydroxy valerate (PHBV)**

→ obtained by copolymerisation of 3-hydroxybutanoic acid and 3-hydroxypentanoic acid.

uses:- speciality packaging, orthopaedic devices



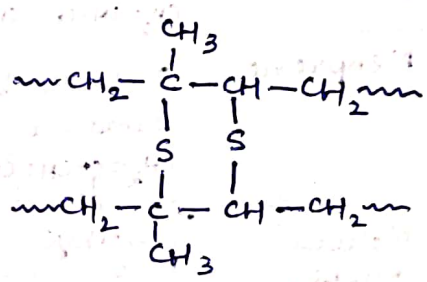
b) Nylon-2-Nylon-6:
Alternating polyamide copolymer of glycine (NH_2-CH_2-COOH) and aminocaproic acid ($NH_2(CH_2)_5COOH$)

2. VULCANIZATION

→ This process involves heating a mixture of raw rubber with sulphur and an appropriate additive at a temperature range between 373 to 415 K. On vulcanisation Sulphur forms cross links through disulphide bonds at the reactive sites of double bonds and thus rubber gets stiffened.

Q1 What is the role of Sulphur in Vulcanisation?

Ans 5% of Sulphur is used as a crosslinking agent in Vulcanisation.



Q2 What does the designation '66' mean in the name of nylon 66?

Ans Nylon 66, is a condensation polymer of adipic acid and hexamethylenediamine, each of which has 6 atoms hence nylon 66.

Q3 Nylon 6 :- Caprolactum a monomer of nylon-6 has 6, C atoms thus the name nylon-6.

Q4 What is the role of benzoyl peroxide in preperation of polyethene?

Ans It is used as a free-radical generating initiator.

NOTE: Any peroxide such as acetyl peroxide, tert-butyl peroxide etc has the same use.