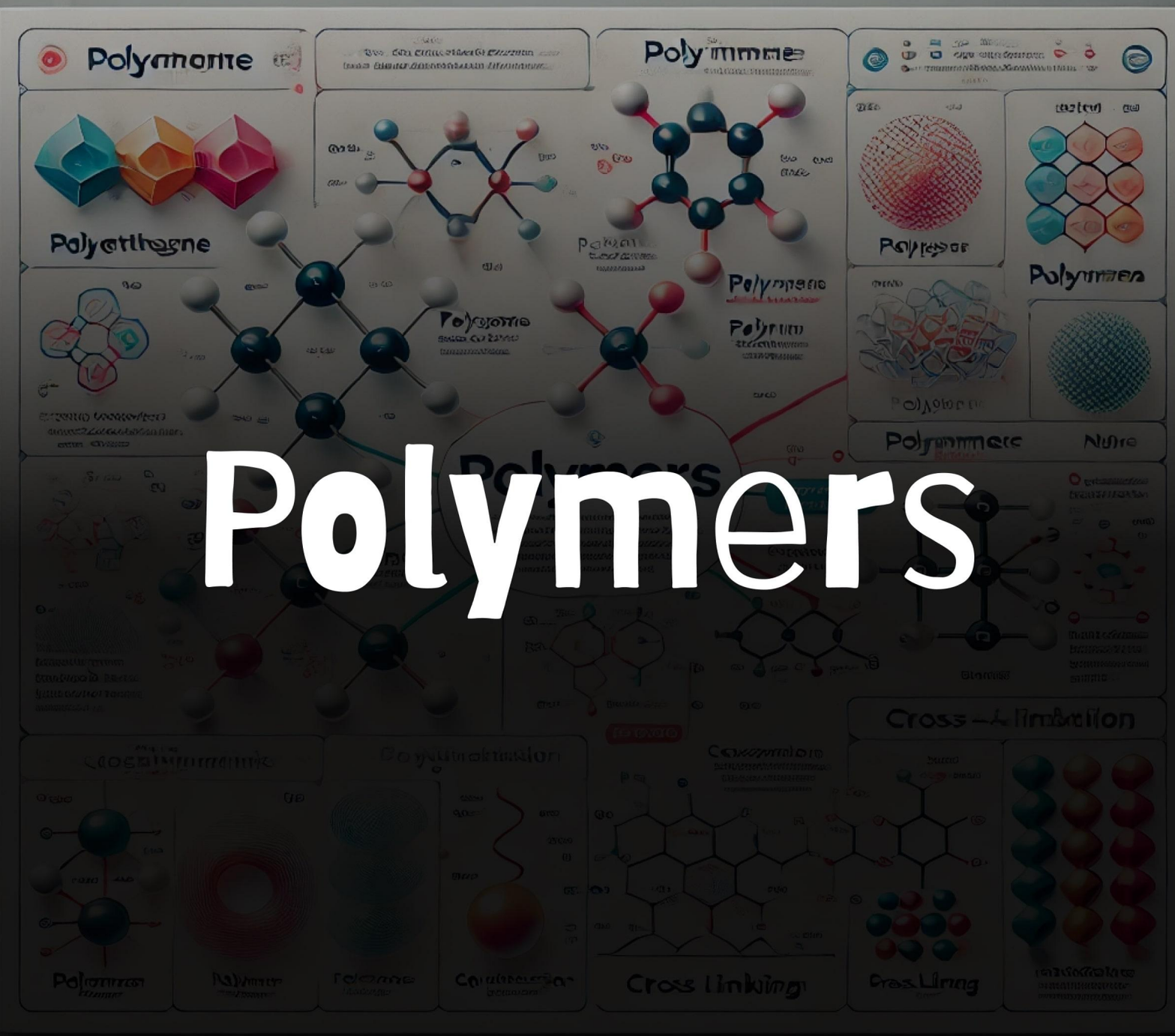

- Monomers and Polymers :

Poly means many and mer means unit or part. The term polymer is defined as very large molecules, having high molecular mass (10^3-10^7 u). These are also referred to as macromolecules

- Classification of Polymers :

A) Classification Based on source : On the Basis of their origin.

① Natural Polymers : Found in plants and animals.
→ Biodegradable : – starch – Cellulose
– Protien – Glycogen.
→ Non Biodegradable : – Rubber – Resins.

② Semi-synthetic polymers : obtained From natural Polymers.
→ cellulose Derivatives : – Cellulose Acetate (Rayon)
– Cellulose Nitrate
– Cellulose Xanthate.
→ Vulcanised Rubber.

③ Synthetic polymers : These are mainly man-made polymers used in daily and industry life.
→ – Polythene – Nylon-66
– Buna-S – Neoprene.

B) Classification Based on Structure of Polymers :

① Linear polymers : Long and straight chains.
– High Density Polythene (HDP) – Polyesters.
– Polyvinyl Chloride (PVC)

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(a) Branched chain polymers : linear chains having some branches. (2D)
- Low Density polythene (LDP)

(3) Cross linked or network polymers : These are found in strong covalent Bonds between various linear polymer chains.
- Bakelite
- Melamine - Formaldehyde.
- Urea - Formaldehyde.

c) Classification Based on Mode of Polymerisation :

(i) Addition Polymers : molecules possessing double or triple bonds.

(1) Homopolymer : polymer of a single monomeric species.
- Polythene
- Polystyrene
- Teflon
- Poly vinyl Chloride (PVC)
- Poly Acro nitrile (PAN, Orlon, Acrilan)
- Natural Rubber (poly-cis-isoprene)
- Synthetic Rubber (Neoprene)

(2) Co-polymers : addition polymer from two different monomers.
- Buna-S
- Buna-N

(ii) Condensation polymers : Repeated condensation reaction b/w two diff monomers through elimination of small molecules such as water, alcohol, HCl etc.

(1) Homopolymer : condensation formed by single monomeric species.
- Nylon-6

(c) Co-polymers : polymer condensation formed by two diff. molecules
- Nylon - 66
- Terylene (Dacron)
- Glyptal.
- Bakelite
- Melamine Formaldehyde.

D) Classification Based on Molecular Forces :

① Elastomers - Rubber like solids with weakest vanderwaal interactio
- Natural Rubber
- Vulcanised Rubber
- Buna - N
- Buna - S
- Neoprene (synthetic Rubber)

② Fibres : H - Bonding
strong interaction
- Polyamides
- Polyesters

③ Thermoplastic polymers : In - Between Elastomers and Fibres.
no cross-links between the chains.
- Polystyrene.
- Polyvinyl
- Polythene.

④ Thermosetting polymers : cross linked or heavily branched molecules.
- Bakelite
- Melamine
- Urea - Formaldehyde
- Resins.

• Strength - Thermosetting > Fibres > Thermoplastic > Elastomer

- Examples of Addition Polymers:

	Monomers	Polymers	Uses
①	Ethene	Polythene	Toys, pipe, Fibre
②	Styrene	Polystyrene	Toys, Radio and TV cabinets.
③	Acrylonitrile	Polyacrylonitrile (Acrilian, Orlon)	substitute of wool in making commercial Fibres.
④	Vinyl Chloride	Polyvinyl chloride (PVC)	Raincoats, Handbags, water pipes
⑤	TetraFluroethene	Teflon	Non-stick surface coated Utensils
⑥	Isoprene	Natural Rubber (cis-1,4,- polyisoprene)	Tyre
⑦	Chloroprene	Neoprene (synthetic Rubber)	Conveyer belts gaskets and hoses.
⑧	1,3 - Butadiene + Styrene	Buna-S	Auto-tyres, Footwears, Floor tiles, cable insulation.
⑨	1,3 - Butadiene + Acrylonitrile	Buna-N	Oil Seals and tank lining

- Example of Condensation Polymers :

	Monomers	Polymers	Uses
①	Hexamethylenediamine + Adipic acid	Nylon-66	Sheets, bristles for Brushes and in textile Industry.
②	Caprolactam	Nylon-6	Tyre cards, Fabrics and ropes
③	Ethylene glycol + Terepthalic acid	Terylene (Dacron)	safety helmets and wool Fibre
④	Ethylene Glycol + phthalic acid	Glyptal	Paint and lacquers
⑤	Phenol + Formaldehyde	Bakelite (Branched) Novalac (Linear)	combs, electrical switches, handles of utensils and computer dicss
⑥	Melamine + Formaldehyde	Melamine Formaldehyde Resin	Unbreakable crockery
⑦	Urea + Formaldehyde	Urea Formaldehyde Resin	Unbreakable Cups and laminated sh

- Example of Biodegradable polymers :

① 3-Hydroxy Butanoic Acid + 3-Hydroxy pentanoic Acid → PHBV (Poly β Hydroxy) Butyrate-co-β-Hydroxy Valerate

② Glycine + Amino caproic Acid → Nylon-2,6

- DDT (Dichloro Diphenyl trichloro ethane) is non-biodegradable polymer.

• Vulcanisation of Rubber :

① Vulcanised Rubber = semisynthetic rubber + Sulphur

② In manufacture of tyre rubber 5% of Sulphur (usually 3 to 10%) is used as a cross linking agent.

• characteristics :

① Resistant against oxidising agents
② Water holding capacity decreases.
③ Stability increases.
④ Hardness increases.
⑤ Softness decreases.

• Polythene :

① Low Density Polythene (LDP)

- Formed by polymerisation of ethene in presence of dioxygen or peroxide initiator at high pressure (1000 atm - 2000 atm) and temperature (350 k - 570 k).

- Formed by Free Radical addition
- Poor conductor of electricity chemically inert tough but Flexible.

• Uses: Manufacture of toys, Flexible pipes squeeze bottles and insulator etc.

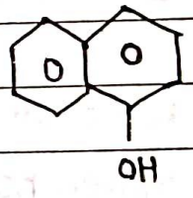
② High Density Polythene (HDP)

- Formed by polymerisation of ethane in presence of Zeiglet natta catalyst ($TiCl_4 + Et_3Al$) at low pressure (6 atm - 7 atm and temperature (333K - 343K) chemically inert tough and hard.

• Uses: Manufacture of Baskets, dustbin, bottles, pipes etc.

• Test of Carbohydrates.

① Molisch Test (For Carbohydrates)



5% solution of α-naphthol + EtOH

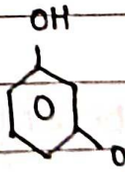
α-naphth

↓ H_2SO_4 + Carbohydrate.

Purple Ring at the Junction of two liq.

Mono ⟶ Fast.

Di or Poly ⟶ Slow.



② Seliwanoff's Test (For Ketose)

- This Test is used for or performed when sample gives positive Test for Bendict's or Fehling's Test.

- Take selewanoff's reagent and add sample.
- Boil for two samples minutes. Appearance of red to orange colour indicates the presence of Fructose.
- If no colour appears in 2 minutes, continue boiling for 5 minutes.
- If faint orange or no colour appears, then it indicates the presence of glucose.