

Polymers

Macro molecules formed by repetition of certain units called monomer.

Classification.


→ Source.

1. Natural

eg. Starch → α -D-Glucopyranose.

Cellulose → β -D-Glucopyranose.

Protein → Amino Acid.

Natural rubber → isoprene 
3-methyl-1,3-butadiene.

Nucleic acid $\left\{ \begin{array}{l} \text{DNA} \\ \text{RNA} \end{array} \right\}$ Nucleotide.

Polynucleotide

[Nucleic base + Sugar + Phosphate grp.]

2. Synthetic.

eg. Nylon 6

Nylon 6,6.

P.V.C (Poly vinyl chloride)

Teflon.

Bakelite.

Terylene / Dacron or Polyester.

Buta-S

Buta-N.

Neoprene

Artificial rubber

3. Semi-Synthetic.

eg. Cellulose acetate (Rayon).

Cellulose Nitrate

Vulcanised rubber.

→ Structure.

1. linear chain polymer.

eg.

High Density.

Poly ethene.

(HDPE).

manufacture in presence of.

$[TiCl_4 + Et_3Al]$ Ziegler Natta catalyst.

Ti^{3+} is responsible but.

$TiCl_4 \rightarrow TiCl_3 + TiCl_4$

disproportionates easily

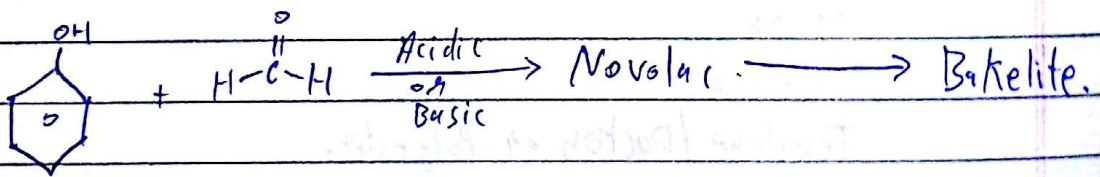
2. Branched chain Polymer.

eg.

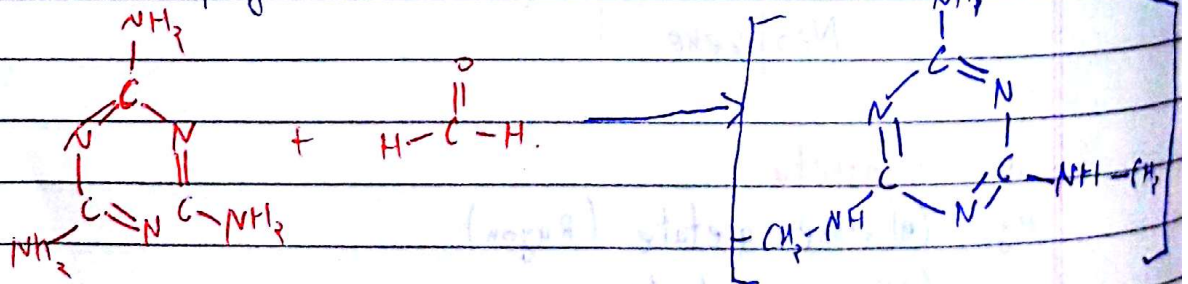
low density. Poly ethene (LDPE)

3. Cross-linked polymer.

eg. Bakelite.



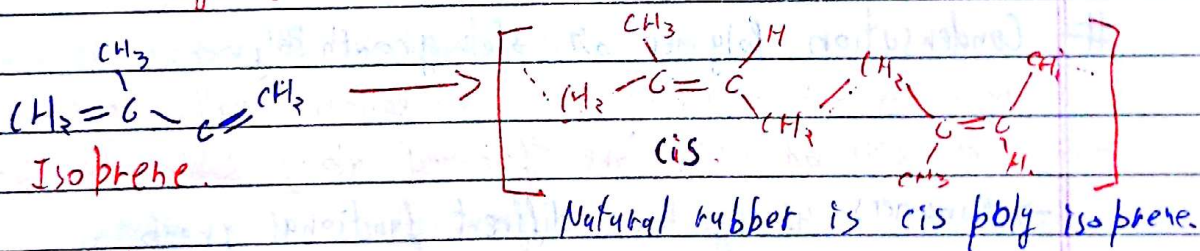
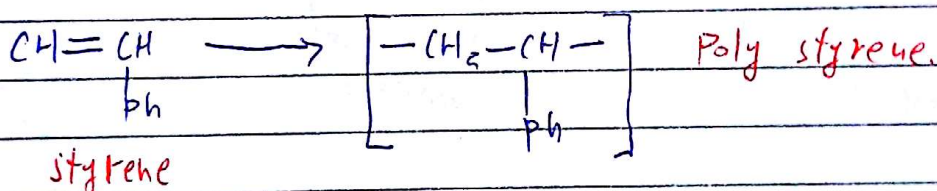
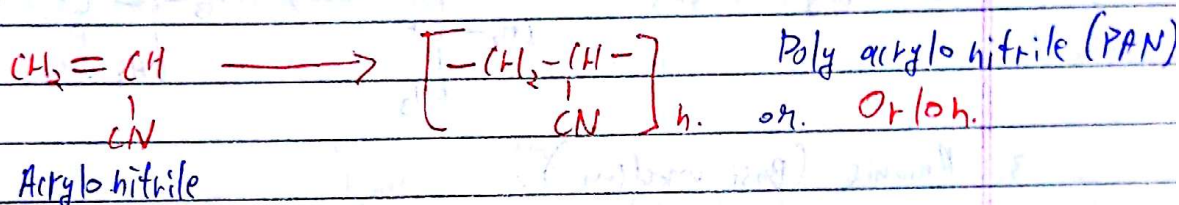
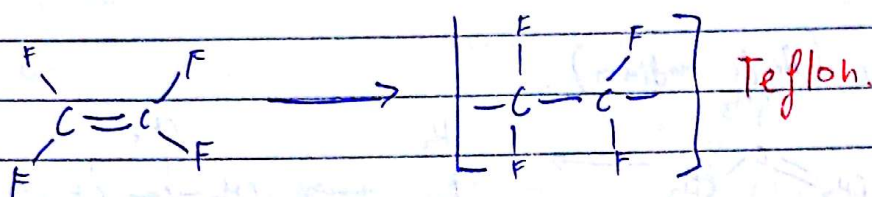
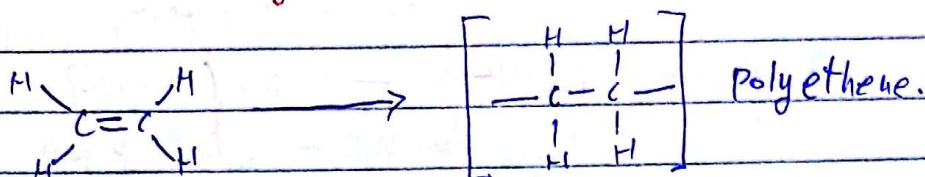
e. Melamine polymer.



Addition Polymer

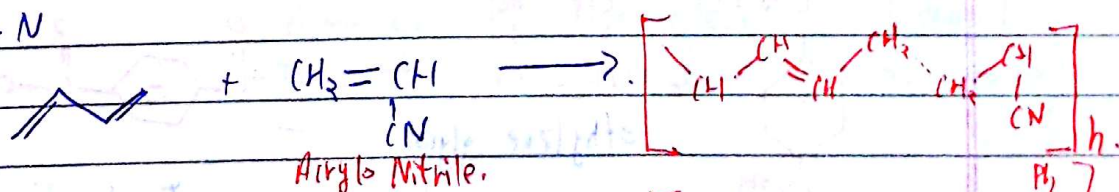
also called chain growth polymer.

The π bonds get converted to σ bond.

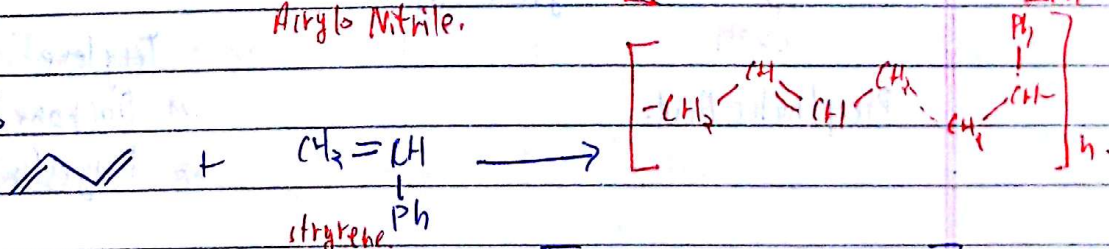


Artificial Rubber.

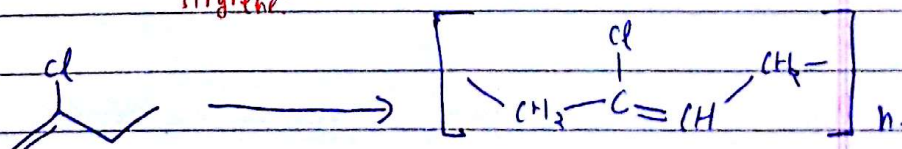
1. Buna - N



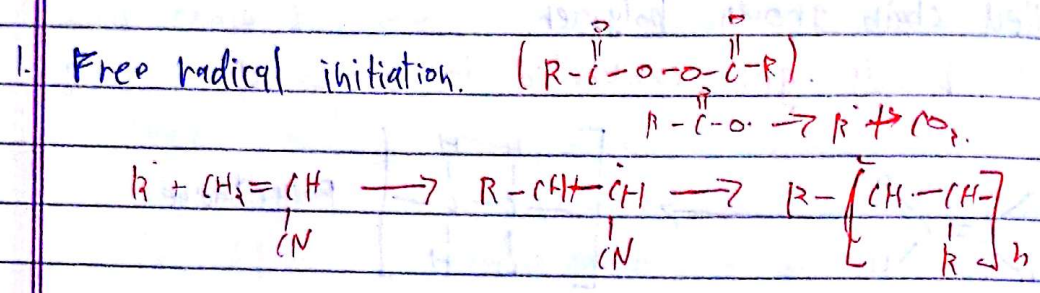
2. Buna - S



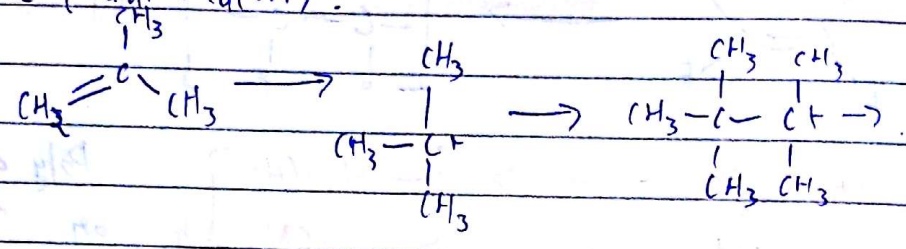
3. Neoprene



Mechanism of addition.



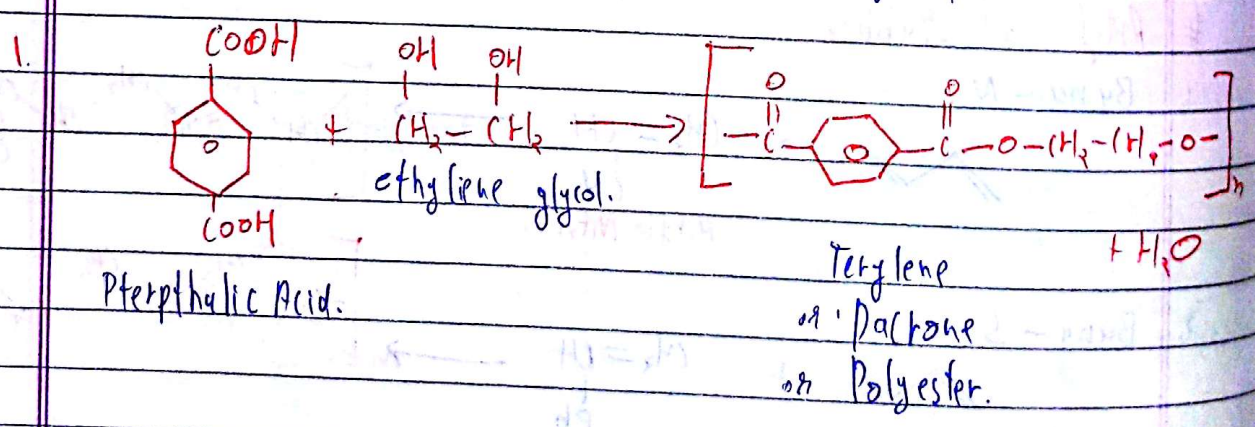
2. Cationic (Acid medium).

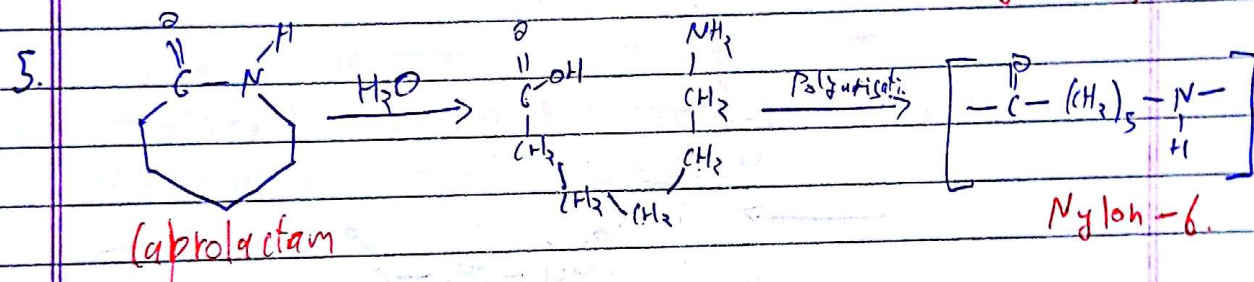
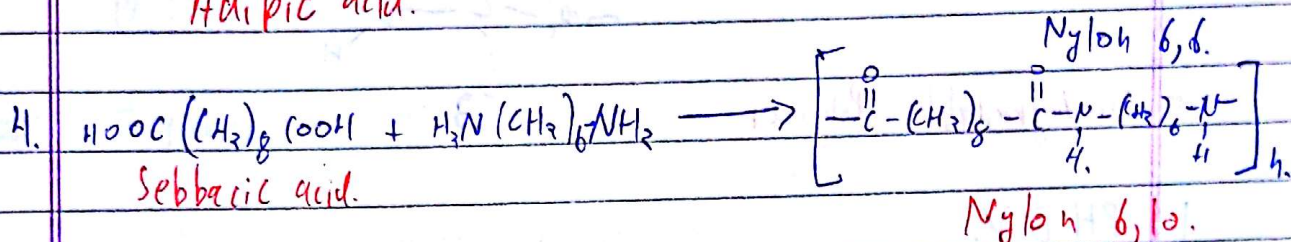
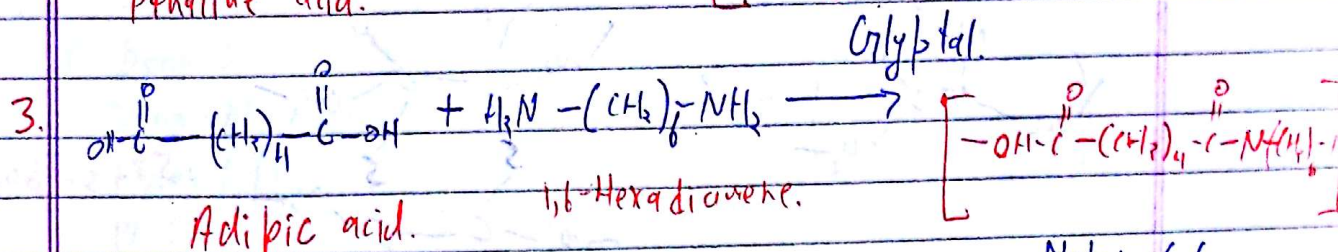
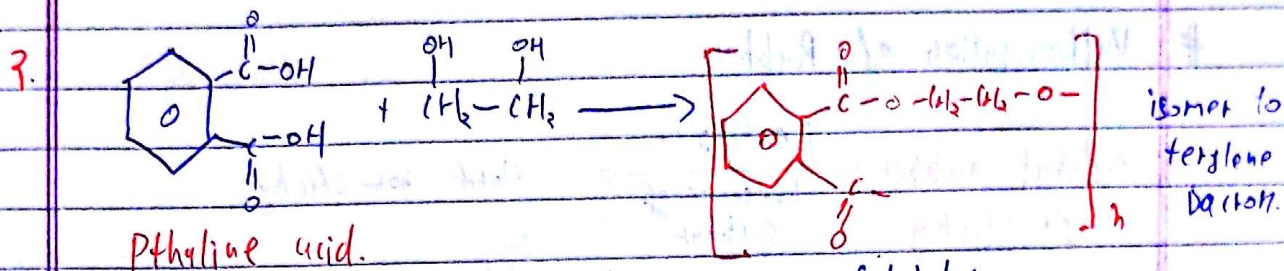


3. Anionic (Basic medium).

Condensation polymer or step growth Polymer.

Those in which during polymerisation, small molecules like H_2O , ROH or HCl are formed along with polymer.
 → Monomers usually have different functional group





Strength of Intra molecular forces.

Thermosetting > Fibre > Thermoplastic > Elastomer.

Bakelite

Nylon-6

Polythene.

Rubber.

Melamine

Nylon-6,6

Teflon

Buna-N

Nylon, 6,10

Polyacrylonitrile.

Buna-S.

Tyrene/dacron.

Polystyrene.

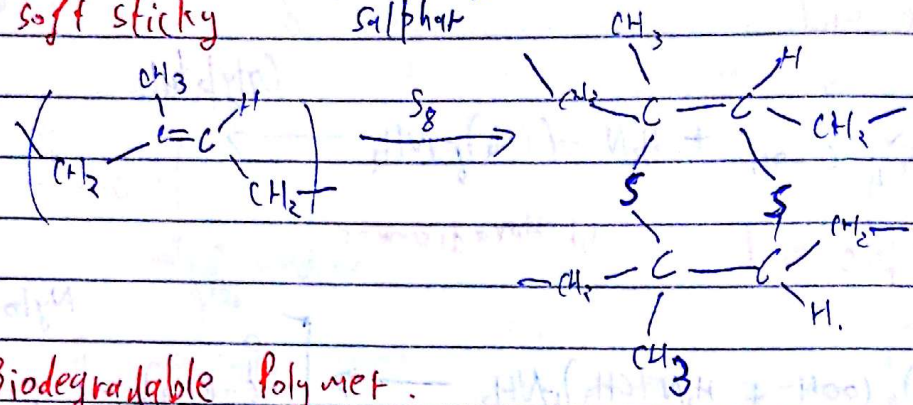
Neoprene.

Thermosetting :- Become solid on heating.

Thermoplastic :- Change shape when heated.

Vulcanisation of Rubber.

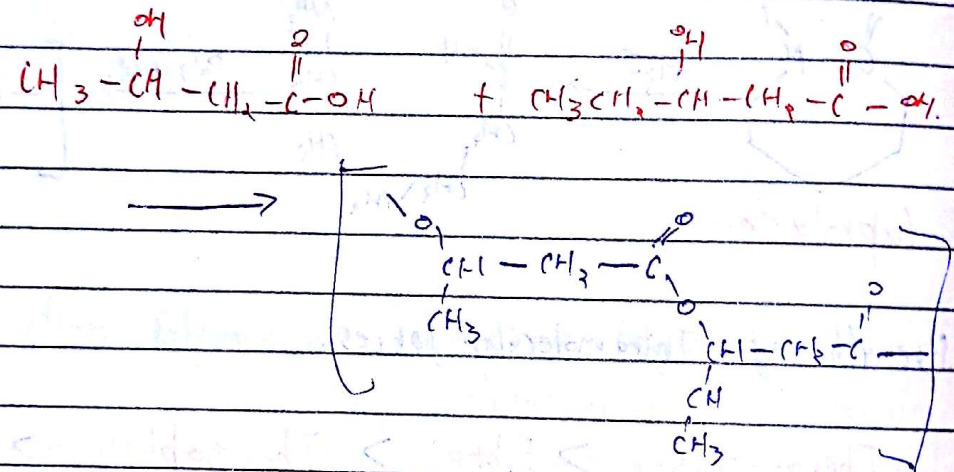
Natural rubber $\xrightarrow[\text{presence of sulphur}]{\text{Heating in}}$ Hard non-sticky.
soft sticky



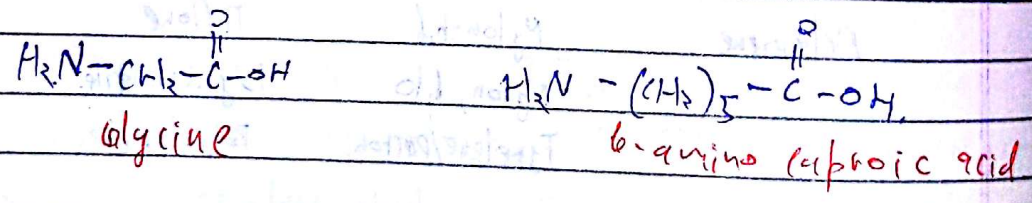
5% sulphur

Biodegradable Polymer.

1. PHBV.

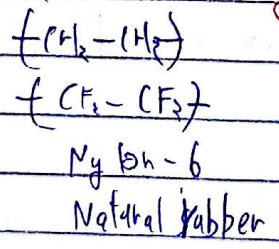


2. Nylon-2 - Nylon 6.



Homo polymer.

Those in which only one molecule acts as monomer.

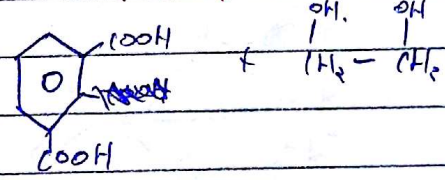
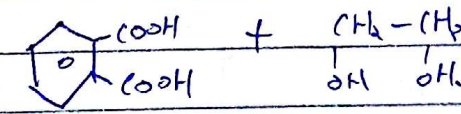

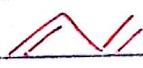
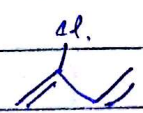



Co-polymer.

If more than one molecule act as a monomer, then it is co-polymer.

- Buna-S.
- Buna-N
- Nylon-6,6
- PHBV.

Polymer — Monomer.

1. Polythene — $\text{CH}_2 = \text{CH}_2$
2. Teflon — $\text{CF}_2 = \text{CF}_2$
3. Polystyrene — $\text{Ph} - (\text{CH} = \text{CH}_2)$
4. PAN (orlon) — $\text{H}_2\text{C} = \text{CHCN}$
5. Nylon-6 — Caprolactam.
6. Nylon-6,6 — Adipic acid + $\text{H}_2\text{N} - (\text{CH}_2)_4 - \text{NH}_2$.
7. Nylon 6,10 — $\text{NH}_2 - (\text{CH}_2)_6 - \text{NH}_2$ + $\text{HOOC} - (\text{CH}_2)_8 - \text{COOH}$.
8. Terylene / Dacron or Polyester —  + $\text{HO} - \text{CH}_2 - \text{CH}_2 - \text{OH}$
9. Glyptal —  + $\text{CH}_2 - \text{CH}_2$
 $\text{OH} \quad \text{OH}$
10. Bakelite — Phenol + formaldehyde.
11. Melamine polymer. — Melamine + formaldehyde.
12. Buna-S —  + $\text{Ph} - (\text{CH} = \text{CH}_2)$
13. Buna-N —  + $\text{CH}_2 = \text{CH} - \text{CN}$
14. Neoprene — 
15. Natural rubber — 

Be Positive...

16. Starch — α -D-Glucopyranose.
17. Protein — Amino acid.
18. Cellulose — β -D-Glucopyranose.
19. Nucleic acid — Nucleotide.
20. PHBV — $\text{CH}_3 - \overset{\text{OH}}{\underset{\text{P}}{\text{C}}} - \text{CH}_2 - \text{C}(=\text{O})\text{OH} + \text{CH}_3 - \text{CH}_2 - \text{CH}(\text{OH}) - \overset{\text{P}}{\text{C}}(=\text{O})\text{OH}$
21. Nylon 2-Nylon 6 — Glycine + $\text{H}_2\text{N} - (\text{CH}_2)_5 - \text{COOH}$.
6-aminocaproic acid.

