

## POLYMERS

**Classification: Natural and synthetic methods of the polymerization**

- 1. A high molecular weight molecule built from a large number of simple molecules is called a**
  - 1) Monomer
  - 2) Isomer
  - 3) Polymer
  - 4) Tautomer
- 2. A high molecular weight molecule which does not contain repeating structural units is called a**
  - 1) Polymer
  - 2) Macromolecule
  - 3) Both 1 & 2
  - 4) None of the above
- 3. The simple molecules from which a polymer is made are called**
  - 1) Monomers
  - 2) Metamers
  - 3) Rotamers
  - 4) Enantiomers
- 4. Which of the following is not a biopolymer?**
  - 1) Proteins
  - 2) Nucleic acids
  - 3) Cellulose
  - 4) Neoprene
- 5. Which of the following is a synthetic polymer?**
  - 1) Starch
  - 2) Silk
  - 3) Protein
  - 4) Polystyrene
- 6. Homopolymers are made from**
  - 1) Only one type of monomers
  - 2) Two different types of monomers
  - 3) Three different types of monomers
  - 4) Several different types of monomers
- 7. Amongst the following, a homopolymer is**
  - 1) PMMA
  - 2) Bakelite
  - 3) Glyptal
  - 4) Dacron
- 8. Which of the following is copolymer?**
  - 1) Buna-S
  - 2) PAN
  - 3) Polythene
  - 4) PTFE

9. Which of the following is a linear polymer?

- 1) Nylon
- 2) Bakelite
- 3) Alkyed resin
- 4) Melamine-formaldehyde polymer

10. Amongst the following, the branched chain polymer is

- 1) PVC
- 2) Polyester
- 3) Low density polythene
- 4) Nylon-66

11. A copolymer of acrylonitrile and 1, 3-butadiene is called

- 1) Buna-N
- 2) Polystrene
- 3) Neoprene
- 4) Buna-S

12. Which of the following is wrong?

- 1) PMMA is called plexiglas
- 2) PTEE is called teflon
- 3) SBR is natural rubber
- 4) LDPE is called low density polythene

13. Which of the following statement/s is/are correct?

- 1) Vinyon is a copolymer of vinyl chloride and vinyl acetate
- 2) Saran is a copolymer of isobutylene and isoprene
- 3) Butyl rubber is a copolymer of isobutylene and isoprene
- 4) All are correct

14. Mark the correct statement about thiokol rubber

- 1) It is a synthetic polysulphide rubber
- 2) It is obtained by condensation chloride with sodium tetrasulphide
- 3) It is resistant to oils and abrasion
- 4) All are correct

15. Which of the following pairs is not correctly matched?

- 1) Terylene-condensation polymer of terphthalic acid and ethylene glycol
- 2) Teflon - polymer of phenol and formaldehyde
- 3) Perspex-A homopolymer of methyl methacrylate
- 4) Synthetic rubber-A copolymer of butadiene and styrene

**16. Which of the following an addition (chain growth) polymer?**

- 1) Nylon-66                      2) Polyester
- 3) PVC                              4) Glyptal

**17. Which of the following is not an addition polymer?**

- 1) Polystyrene                      2) PVC
- 3) Polypropylene                      4) Nylon

**18. An example of addition copolymer is**

- 1) Polythene                      2) Butyl rubber
- 3) Neoprene                      4) Natural rubber

**19. Which of the following is an addition homopolymer?**

- 1) Polythene                      2) Teflon
- 3) PVC                              4) all the above

**20. Which of the following sets contain only addition homopolymers?**

- 1) Polythene, natural rubber, cellulose
- 2) Starch, Nylon, polyester
- 3) Teflon, Bakelite, orlon
- 4) Neoprene, PVC, polythene

**21. Which of the following is not a condensation (step growth) polymer?**

- 1) Melamine-formaldehyde resin                      2) Bakelite
- 3) Polythene                              4) Polyester

**22. An example of a condensation homopolymer is**

- 1) Bakelite                      2) Melamine-formaldehyde resin
- 3) Alkyel resin                      4) Perlon or Nylon-6

**23. A polymer formed by coordination polymerization is**

- 1) Low density polythene                      2) High density polythene
- 3) Nylon-6                              4) Dacron

**24. Low density polythene is prepared by**

- 1) Free radical polymerization
- 2) Cationic polymerization
- 3) Anionic polymerization
- 4) Ziegler-Natta polymerization

**25. The best way to prepare polyisobutylene is**

- 1) Coordination polymerization
- 2) Free radical polymerization
- 3) Cationic polymerization
- 4) Anionic polymerization

**26. Natural rubber is**

- 1) Polyvinyl chloride
- 2) cis-Polyisoprene
- 3) trans-Polyisoprene
- 4) Polychloroprene

**27. Gutta percha is**

- 1) Trans-Polyisoprene
- 2) A synthetic polymer
- 3) A very hard material
- 4) All statements are correct

**28. Natural silk is a**

- 1) Polypeptide
- 2) Polysaccharide
- 3) Polychloroprene
- 4) Polyacrylonitrile

**29. Artificial silk is a**

- 1) Polypeptide
- 2) Polysaccharide
- 3) Polychloroprene
- 4) Polyacrylonitrile

**30. Which of the following is not a polyamide?**

- 1) Wool
- 2) Leather
- 3) Nylon
- 4) Natural rubber

**31. Among the following polymers, the strongest intermolecular forces of attraction are present in**

- 1) Elastomers
- 2) Fibres
- 3) Thermoplastic
- 4) Thermosetting polymers

**32. Among the following, the weakest interparticle forces of attraction are present in**

- 1) Thermosetting polymers
- 2) Thermoplastic polymers
- 3) Fibres
- 4) Elastomers

**33. Thermoplastics are**

- 1) Linear polymers
- 2) Soften or melt on heating
- 3) Molten polymer can be moulded in desired shape
- 4) All are correct

**34. Thermosetting polymers are**

- 1) Cross-lined polymers
- 2) Do not melt or soften on heating
- 3) Cross-linking occurs during heating when it hardens irreversibly
- 4) All are correct

**35. Which of the following is not a thermosetting polymer?**

- 1) Alkyel resin      2) Bakelite
- 3) Melmac          4) SBR

**36. Which are true for elastomers?**

- 1) They posses electricity
- 2) These possess weak intermolecular forces of attraction between polymer chains
- 3) Vulcanization rubber is an example of elastomers
- 4) All are correct

**37. Which of the following can be remelted time and again without producing any change?**

- 1) Thermosetting polymers      2) Thermoplastic polymers
- 3) Bakelite                          4) Melamine-formaldehyde polymer

**38. The tensile strength, elasticity and resistance to abrasion can be increased by a process called**

- 1) Diazotisation      2) Vulcanization
- 3) Isomerization     4) Polymerization

**39. The process of vulcanization was introduced by**

- 1) Charles Goodyear    2) Kolbe
- 3) Wohler                4) Zeiger

**40. In vulcanization of rubber**

- 1) Sulphure reacts to form a new compound
- 2) Sulphur cross-links are introduced
- 3) Sulphur forms a very thin protective layer over rubber
- 4) All statements are correct

**41. Vulcanized rubber resists**

- 1) wear and tear due to friction    2) Cryogenic temperature
- 3) High temperature                 4) Action of acids

**42. The polymer contained by condensation of sebacic acid and hexamethylenediamine is called**

- 1) Nylon 6, 6            2) Nylon 6
- 3) Nylon 6, 10        4) Dacron

**43. The linear chains in nylon are held together by**

- 1) H-bonds            2) Covalent bonds
- 3) Ionic bonds        4) Vanderwaals forces

**44. The monomer of PVC is**

- 1) Ethylene            2) vinyl cyanide
- 3) Vinyl chloride    4) chloroprene

**45. The repeating structural unit in neoprene is**

- 1) Chloroprene        2) Chloropicrin
- 3) Chloroethene      4) ethylene

**46. Chloroprene is obtained by addition of HCl to**

- 1) Acetylene            2) Vinylacetylene
- 3) Divinylacetylene   4) Phenylacetylene

**47. The monomer used for the manufacture of PVC is obtained by the addition of**

- 1) HCl to acetylene in presence of  $Hg^{2+}$  salts
- 2)  $Cl_2$  to acetylene
- 3) HCl to ethylene
- 4)  $Cl_2$  to ethylene

**48. To make PVC a flexible plastic, the additive used is called**

- 1) Filler                2) Antioxidant
- 3) Stabilizer           4) Plasticizer

**49. Which of the following cannot be used as a plasticizer?**

- 1) Diethyl phthalate   2) Di-n-butylphthalate
- 3) Di-n-octylphthalate   4) Tricresyl phosphate

**50. A polymer of prop-2-enitrile is called**

- 1) Saran    2) Orlon   3) Dacron   4) Teflon

**51. The polymer melmac is obtained by**

- 1) Addition polymerization of melamine and formaldehyde
- 2) Condensation of polymerization of melamine and formaldehyde
- 3) Coordination polymerization of melamine
- 4) Free-radical polymerization of tetrafluoroethylene

**52. The chemical name for melamine is**

- 1) 1, 3, 5-Triamino-2, 4, 6-triazine
- 2) 2, 4, 6-Triamino-1, 3, 5-triazine
- 3) 2-amino-1, 3, 5-triazine
- 4) 2, 4-Diamino-1, 3, 5-triazine

**53. Starch is the condensation polymer of**

- 1) -glucose                      2) -glucose
- 3) -Fructose                    4) -Fructose

**54. Repeating disaccharide unit of starch is**

- 1) Lactose                      2) Sucrose
- 3) Maltose                      4) Cellobiose

**55. Cellulose is a condensation polymer of**

- 1) -Galactose                  2) -Glucose
- 3) -Glucose                    4) -Galactose

**56. The repeating disaccharide unit of cellulose is**

- 1) Cellobiose   2) Maltose   3) Lactos   4) Sucrose

**57. A polymer which has better light transmission properties than even glass is**

- 1) Perspex                      2) Bakelite
- 3) Buna-S                      4) Poly (ethyl acrylate)

**58. The polymer used in manufacture of electrical goods such as switches, plugs etc is**

- 1) Polythene                  2) Bakelite
- 3) Melamine formaldehyde resin
- 4) Neoprene

**59. The polymer used for coating electrical wires, cables etc is**

- 1) Natural rubber            2) neoprene
- 3) Nitrile rubber             4) PVC

60. A polymer which is commonly used as a packaging material is

- 1) Polythene                      2) Polypropylene  
3) PVC                                4) Bakelite

61. A synthetic rubber which is resistant to the action of oils, gasoline and other solvents is

- 1) Buna-S                            2) Polyisoprene  
3) Neoprene                        4) Polystyrene

62. The monomer unit of silicone-a water repellent, heat and acid resistant polymer is

- 1) Si            2) SiO<sub>2</sub>    3) R<sub>2</sub>SiO    4) R<sub>4</sub>Si

63. If N<sub>1</sub>, N<sub>2</sub>, N<sub>3</sub>,.....N<sub>i</sub> are the number of molecules with molecular masses M<sub>1</sub>, M<sub>2</sub> M<sub>3</sub> ..... M<sub>i</sub> respectively, then the weight average molecular mass ( $\overline{M}_w$ ) is expressed as

- 1)  $\frac{\sum N_i M_i^2}{\sum N_i M_i}$                       2)  $\frac{\sum N_i M_i}{\sum N_i}$   
3)  $\frac{\sum M_i^2}{\sum N_i}$                                 4)  $\frac{\sum N_i M_i}{\sum M_i}$

64. If N<sub>1</sub>, N<sub>2</sub>, N<sub>3</sub>,.....N<sub>i</sub> are the number of molecules with molecular masses M<sub>1</sub>, M<sub>2</sub> M<sub>3</sub> ..... M<sub>i</sub> respectively, then the number average molecular mass ( $\overline{M}_n$ ) is expressed as

- 1)  $\frac{\sum N_i M_i^2}{\sum N_i M_i}$                       2)  $\frac{\sum N_i M_i}{\sum N_i}$   
3)  $\frac{\sum M_i^2}{\sum N_i}$                                 4)  $\frac{\sum N_i M_i}{\sum M_i}$

65. Number average molecular mass ( $\overline{M}_n$ ) and weight average molecular mass ( $\overline{M}_w$ ) of synthetic polymers are related as

- 1)  $\overline{M}_n < \overline{M}_w$                       2)  $\overline{M}_n > \overline{M}_w$   
3)  $\overline{M}_n = \overline{M}_w$                       4)  $\overline{M}_n = \sqrt{\overline{M}_w}$

66. The abbreviation PDI refers to

- 1) Name of the polymer                      2) Poly dispersity index  
3) Planck's disposal index                      4) Poly diagonal index

67. PDI for natural polymers is generally close to

- 1) Zero    2) 100                      3) 1    4) 10



## KEY LEVEL -1

- 1) 3    2) 2    3) 1    4) 4    5) 4    6) 1    7) 1    8) 1    9) 1    10) 3    11) 1    12) 3
- 13) 4    14) 4    15) 2    16) 3    17) 4    18) 2    19) 4    20) 4    21) 3    22) 4    23) 2    24) 1
- 25) 3    26) 2    27) 1    28) 1    29) 2    30) 4    31) 2    32) 4    33) 4    34) 4    35) 4    36) 4
- 37) 2    38) 2    39) 1    40) 2    41) 1    42) 3    43) 1    44) 3    45) 1    46) 2    47) 1    48) 4
- 49) 1    50) 2    51) 2    52) 2    53) 1    54) 3    55) 3    56) 1    57) 1    58) 2    59) 2    60) 1
- 61) 3    62) 3    63) 1    64) 2    65) 1    66) 2    67) 3

### SOME IMPORTANT POLYMERS NATURAL AND SYNTHETIC LIKE POLYMERS LIKE POLYESTERS, BAKELITE, RUBBER, BIODEGRABLE AND NON-BIODEGRABLE POLYMERS

**1. Polymer obtained by condensation polymerization is**

- 1) Polythene                      2) Teflon  
3) Phenol-formaldehyde        4) Nitrile rubber

**2. Which is an example of thermosetting polymer?**

- 1) Polythene                      2) PVC  
3) Neoprene                        4) Bakelite

**3. Which of the following fibres is made of polyamides?**

- 1) Dacron    2) Orlon    3) Nylon    4) Rayon

**4. Which one of the following can be used as a monomer in polymerization reaction?**

- 1)  $\text{CH}_3\text{CH}_2\text{Cl}$                       2)  $\text{CH}_3\text{CH}_2\text{OH}$   
2)  $\text{C}_6\text{H}_6$                                 4)  $\text{C}_3\text{H}_6$

5. The catalyst used in the manufacture of polyethylene by Ziegler method is

- 1) Titanium tetrachloride and triphenyl aluminium
- 2) Titanium tetrachloride and triethyl aluminium
- 3) Titanium dioxide
- 4) Titanium isopropoxide

6. Bakelite is obtained from phenol by reacting it with

- 1) Acetaldehyde
- 2) Acetal
- 3) Formaldehyde
- 4) Chlorobenzene

7. Synthetic human hair wigs are made from a copolymer of vinyl chloride and acrylonitrile and is called

- 1) PVC
- 2) Polyacrylonitrile
- 3) Cellulose
- 4) Dynel

8. An example of biopolymer is

- 1) Teflon
- 2) Neoprene
- 3) Nylon-66
- 4) DNA

9. Synthetic polymer prepared by using caprolactam is known as

- 1) Terylene
- 2) Teflon
- 3) Nylon-6
- 4) Neoprene

10. The turbidity of polymer solution measures

- 1) The light scattered by solution
- 2) The light absorbed by a solution
- 3) The light transmitted by a solution
- 4) None of the above

11. Plexiglas (PMMA) is a polymer of

- 1) Acrylic acid
- 2) Methyl acrylate
- 3) Methyl methacrylate
- 4) Adipic acid

13. The monomeric unit of orlon molecule is

- 1)  $\text{CH}_2=\text{CH}-\text{Cl}$
- 2)  $\text{CH}_3\text{COO}-\text{CH}=\text{CH}_2$
- 3)  $\text{CH}_2=\text{CH}-\text{CN}$
- 4)  $\text{C}_6\text{H}_5-\text{CH}=\text{CH}_2$

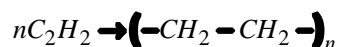
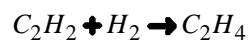
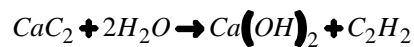
14. Which of the following is not an example of addition polymer?

- 1) Polystyrene      2) Nylon  
3) PVC              4) Polypropylene

15. Teflon is a polymer of monomer

- 1) Difluoroethene              2) Monofluoroethene  
3) Tetrafluoroethene          4) Trifluoroethene

16. Formation of polyethylene from calcium carbide takes place as follows



The amount of polyethylene obtained from 64.1 kg of  $\text{CaC}_2$  is

- 1) 7 kg    2) 14 kg    3) 21 kg    4) 28 kg

17. Which one of the following is used to make 'nonstick' cookware?

- 1) PVC                      2) Polystyrene  
3) Poly (ethylene terephthalate)  
4) Polytetrafluoroethylene

18. Ebonite is

- 1) Natural rubber              2) Synthetic rubber  
3) Highly vulcanized rubber    4) Polypropene

19. Orlon is a polymer of

- 1) Styrene              2) Tetrafluoroethylene  
3) Vinyl chloride      4) Acrylonitrile

20. Which of the following polymers do not involve cross linkages?

- 1) Melmac              2) Bakelite  
3) Polythene          4) Vulcanised rubber

21. Bakelite is prepared by the reaction between

- 1) Phenol and formaldehyde  
2) Ethylene glycol and dimethyl phthalate  
3) Urea and formaldehyde  
4) Tetramethylene glycol and hexamethylenediamine

22. Polymer which has amide linkage is

- 1) Nylon-6, 6      2) Terylene      3) Teflon      4) Bakelite

23. Glyptal polymer is obtained from glycerol by reacting with

- 1) Malonic acid      2) Phthalic acid  
3) Maleic acid      4) Acetic acid

24. The monomer unit of polyvinyl chloride has the formula

- 1)  $CH_3 - CH_2Cl$       2)  $CH_2 = CH_2$   
3)  $CHCl = CHCl$       4)  $CH_2 = CHCl$

25. Which compound/set of compounds is used in the manufacture of Nylon-6,6?

- 1)  $HOOC(CH_2)_4COOH + H_2N(CH_2)_6NH_2$   
2)  $CH_3 = CH - C(CH_3) = CH_2$   
3)  $CH_2 = CH_2$   
4)  $HOOC - COOH + HOCH_2 - CH_2OH$

26. P.V.C. is formed by polymerization of

- 1) 1-chloroethene      2) Ethene  
3) Propene      4) 1-Chloropropane

27. Dimethyl phthalate and ethylene glycol react to form

- 1) Nylon-6      2) Nylon-66  
3) Dacron      4) Neoprene

28. Which of the following contains isoprene units?

- 1) Natural rubber      2) Nylon-66  
3) Polyethylene      4) Dacron

29. Which is not a macromolecule?

- 1) DNA      2) starch  
3) Palmitate      4) Insulin

30. Which one of the following is not an example of chain growth polymer?

- 1) Neoprene      2) Buna-S  
3) PMMA      4) Glyptal

**31. Ziegler-Natta catalyst is**

- 1) Pd + BaSO<sub>4</sub>                      2) HCl + ZnCl<sub>2</sub>  
3) TiCl<sub>4</sub> + Al (C<sub>2</sub>H<sub>5</sub>)<sub>3</sub>              4) LiAlH<sub>4</sub>

**32. Nylon-66 is made by using**

- 1) Phenol                      2) Benzaldehyde  
3) Adipic acid                4) Succinic acid

**33. Natural rubber is a polymer of**

- 1) Butadiene                2) Ethyne  
3) Styrene                    4) Isoprene

**34. Terylene is a condensation polymer of ethylen glycol and**

- 1) Benzoic acid              2) Phthalic acid  
3) Salicylic acid            4) Terephthalic acid

**35. Which is not true about polymers?**

- 1) Polymers do not carry any charge  
2) Polymers have high viscosity  
3) Polymers scatter light  
4) Polymers have low molecular weight

**36. On the basis of mode of formation, polymers can be classified?**

- 1) As addition polymers only  
2) As condensation polymers only  
3) As copolymers  
4) Both as addition and condensation polymers

**37. The process of involving heating of rubber with sulphur is called**

- 1) Galvanization            2) Vulcanization  
3) Bessemerisation        4) Sulphonation

**38. Terylene is made by polymerization of terephthalic acid with**

- 1) Ethylene glycol        2) Phenol  
3) Ethanol                    4) Catechol

**39. Teflon, styrene and neoprene are all**

- 1) Copolymers              2) Condensation polymers  
3) Homopolymers        4) Monomers

**40. Interparticle forces present in Nylon-6,6 are**

- 1) Vander Waal's
- 2) Hydrogen bonding
- 3) Dipole-dipole interactions
- 4) None of these

**41.  $F_2C=CF_2$  is a monomer of**

- 1) Teflon
- 2) Glyptal
- 3) Nylon-6
- 4) Buna-5

**42. Soft drinks and baby feeding bottles are generally made up of**

- 1) Polyester
- 2) Polyurethane
- 3) Polyurea
- 4) Polyamide

**43. Polymer used in bullet proof glass is**

- 1) PMMA
- 2) Lenan
- 3) Nomex
- 4) Kevlar

**44. Which of the following is a constituent of nylon?**

- 1) Adipic acid
- 2) Styrene
- 3) Teflon
- 4) None of these

**45. Caprolactam polymerises to give**

- 1) Terylene
- 2) Teflon
- 3) Glyptal
- 4) Nylon-6

**46. Polyvinyl alcohol can be prepared by**

- 1) Polymerization of vinyl alcohol
- 2) Alkaline hydrolysis of polyvinyl acetate
- 3) Polymerization of acetylene
- 4) Reaction of acetylene with  $H_2SO_4$  in presence of  $HgSO_4$

**47. A condensation polymer among the following is**

- 1) Dacron
- 2) PVC
- 3) Polystyrene
- 4) Teflon

**48. The catalyst used for the polymerization of olefins is**

- 1) Ziegler-Natta catalyst
- 2) Wilkinson's catalyst
- 3) Pd-catalyst
- 4) Zeise's salt complex

49. Which of the following used in paints?

- 1) Terylene                      2) Nylon
- 3) Glyptal                      4) Chloroprene

50. Polymer formation from monomers starts by

- 1) Condensation reaction between monomers
- 2) Coordination reaction between monomers
- 3) Conversion of monomer to monomer ions by protons
- 4) Hydrolysis of monomers

51. Which of the following is a polyamide molecule?

- 1) Terylene                      2) Rayon
- 3) Nylon-6                      4) Polystyrene

52. Nylon threads are made of

- 1) Polyethylene polymer                      2) Polyvinyl polymer
- 3) Polyester polymer                      4) Polyamide polymer

53. Rubber is a polymer of

- 1) Pyrene                      2) Isoprene
- 3) Urea                      4) Ethylene

54. Which of the following is currently used as a tyre cord?

- 1) Terylene                      2) Polyethylene
- 3) Polypropylene                      4) Nylon-6

55. List - I

List - II

A) Natural Polymer

1) PVC

B) Synthetic Polymer

2) Nylon - 6,6

C) Condensation polymer

3) Silk

D) Addition polymer

4) Polyethylene

	A	B	C	D
1)	2	3	4	1
2)	3	2	1	4
3)	3	4	2	1
4)	3	2	4	1

56. List - I

- A) Rayon
- B) Glass
- C) Polystyrene
- D) Poly isoprene

List - II

- 1) Cationic Polymerization
- 2) Organic Polymers
- 3) Inorganic polymers
- 4) nionic polymerisation

	A	B	C	D
1)	2	3	4	1
2)	3	2	4	1
3)	2	1	3	4
4)	2	3	1	4

KEY

- 1) 3    2) 4    3) 3    4) 4    5) 2    6) 3    7) 4    8) 4    9) 3    10) 1    11) 3    12) 3
- 13) 3    14) 2    15) 3    16) 4    17) 4    18) 3    19) 4    20) 3    21) 1    22) 1    23) 2    24) 4
- 25) 1    26) 1    27) 3    28) 1    29) 3    30) 4    31) 3    32) 3    33) 4    34) 4    35) 4    36) 4
- 37) 2    38) 1    39) 3    40) 2    41) 1    42) 3    43) 2    44) 1    45) 4    46) 2    47) 1    48) 1
- 49) 3    50) 1    51) 3    52) 4    53) 1    54) 2    55) 2    56) 4