Ordinary Thinking

Objective Questions

Classification of Polymer

1. Which one among the following is a thermosetting plastic **[MP PMT 1993, 95; AIIMS 1999]**

(a) PVC (b) PVA
(c) Bakelite (d) Perspex

2. The basis on the mode of their formation, the polymers can be classified **[MP PET 1999]**

(a) As addition polymers only
(b) As condensation polymers only
(c) As copolymers
(d) Both as addition and condensation polymers

3. Thermoplastics are

(a) Linear polymers (b) Highly cross-linked
(c) Both (a) and (b) (d) Crystalline

4. '*Cis*-1, 4-polyisoprene' is

(a) Thermoplastic (b) Thermosetting plastic
(c) Elastic (rubber) (d) Resin

5. 'Shellac' secreted by lac insects is

(a) Natural plastic (b) Natural resin
(c) Natural elastic (d) Any of these

6. Which of the following is not a polymer

(a) Gun cotton
(b) Perspex
(c) Shellac (*eg*. lac shellac)
(d) Wax (*eg*. bees wax)

7. Which of the following is not a polymer

(a) Wool (b) Cotton
(c) Leather (d) Fat

8. Melmoware are

(a) Thermosetting (b) Thermoplastic
(c) Both (a) and (b) (d) None of these

9. Among the following a natural polymer is **[MP PET 1993; BCECE 2005]**

(a) Cellulose (b) PVC
(c) Teflon (d) Polyethylene

10. Which of the following is thermoplastic

(a) Nylon (b) Polyethylene
(c) Terylene (d) All of these

11. Which of the following is an example of condensation polymer

(a) Nylon
(b) Bakelite
(c) Urea-formaldehyde resin
(d) All of these

12. Which of the following is a natural polymer

(a) Polyester (b) Glyptal
(c) Starch (d) Nylon-6

13. Which is a naturally occuring polymer **[BHU 1980]**

(a) Polythene (b) PVC
(c) Acetic acid (d) Protein

14. Which of the following is a branched polymer

(a) Low density polymer (b) Polyester
(c) High density polymer (d) Nylon

15. Which is the monomer of polypeptide

(a) Propene (b) Butadiene
(c) Adipic acid (d) Amino acid

16. Which of the following is an addition polymer

(a) Glucose (b) Polyethylene
(c) Ethylene (d) Terylene

17. Which one of the following is a linear polymer **[KCET 1998]**

(a) Amylopectin (b) Glycogen
(c) Starch (d) Amylose

18. Which of the following polymer is an example of fibre **[AIIMS 2000; Pb. CET 2001]**

(a) Silk (b) Dacron
(c) Nylon-66 (d) All of these

19. Natural rubber is which type of polymer **[DCE 2002]**

(a) Condensation polymer (b) Addition polymer
(c) Co-ordination polymer (d) None of these

20. Polyethylene is **[DCE 2003]**

(a) Random copolymer (b) Homo polymer
(c) Alternate copolymer (d) Crosslinked copolymer

21. Which of the following is a biodegradable polymer **[AIIMS 2004]**

(a) Cellulose (b) Polythene
(c) Polyvinyl chloride (d) Nylon-6

22. Which of the following is an example of condensation polymers **[MP PMT 1995; BHU 2000; UPSEAT 2004]**

(a) Polythene (b) PVC
(c) Orlon (d) Terylene

23. Nylon is not a **[KCET 2004]**

(a) Condensation polymer (b) Polyamide
(c) Copolymer (d) Homopolymer

24. Which of the following is not an example of additional polymer **[KCET 2001; CBSE 2001]**

(a) Terylene (b) Polypropylene
(c) Polyethylene (d) Polystyrene

25. Polythene is
(a) Thermoplastic (b) Thermosetting
(c) Both (a) and (b) (d) None of these

26. Bakelites are
(a) Rubber (b) Rayon
(c) Resins (d) Plasticisers

27. Which of the following is a step-growth polymer
(a) Polyisoprene (b) Polythene
(c) Nylon (d) Polyacrylonitrile

28. An example of chain growth polymer is **[Pb. PMT 1999]**
(a) Nylon-66 (b) Bakelite
(c) Terylene (d) Teflon

29. Which of the following is synthetic rubber **[NCERT 1978]**
(a) Buna-S (b) Neoprene
(c) Both (a) and (b) (d) None of these

30. Which of the following is a linear polymer
(a) Nylons
(b) Bakelite
(c) Low density polythene
(d) Melamine-formaldehyde polymer

31. Which of the following is not an example of natural polymer **[BHU 1987]**
(a) Wool (b) Silk
(c) Leather (d) Nylon

32. Which of the following is a chain growth polymer
(a) Nylon-6 (b) Dacron
(c) Glyptal (d) Polypropylene

33. Natural rubber is a **[MP PMT 1994]**
(a) Polyester (b) Polyamide
(c) Polyisoprene (d) Polysaccharide

34. Which of the following is not a synthetic polymer **[MP PET 1999]**
(a) Polyethylene (b) *PVC*
(c) Nylon (d) Cellophane

35. Nylon-66 is a **[RPET 1999; MP PMT 1993]**
(a) Natural polymer (b) Condensation polymer
(c) Addition polymer (d) Substitution polymer

36. A condensation polymer among the following polymers is **[KCET 2002]**
(a) PVC (b) Teflon
(c) Decron (d) Polystyrene

37. Which of the following is not a natural polymer **[AFMC 2003]**
(a) Cellulose (b) Protein
(c) PVC (d) Nucleic acid

38. Which of the following is not correct regarding terylene **[Kerala PMT 2004]**
(a) Step-growth polymer
(b) Synthetic fibre
(c) Condensation polymer
(d) It is also called decron
(e) Thermosetting plastic

39. Which is not a polymer **[DPMT 2005]**
(a) Sucrose (b) Enzyme
(c) Starch (d) Teflon

General Methods of Preparation and Mechanism of Polymerisation

1. Which of the following is a syndiotactic polymer in $-[-CH_2-C(YZ)-]_n-$
(a) All *Y* groups lie on one side of the chain and all Z groups on the other side
(b) The *Y* and *Z* groups lie alternately on each side of the chain
(c) The *Y* and *Z* groups are arranged in a random fashion
(d) *Y* and *Z* groups are same

2. Polymers of the type *Z* – *Mn* – *Y*, i.e. those which contain a foreign molecule in addition to the recurring unit are known as
(a) Semisynthetic polymers (b) Atactic polymers
(c) Telomers (d) Plasticiser

3. In the natural rubber 'Caoutchouc', the isoprene units are joined by
(a) Head-to-head (b) Tail-to-tail
(c) Head-to-tail (d) All of these

4. The degree of crystallinity of which of the following is highest
(a) Atactic polyvinylchloride
(b) Isotactic polyvinylchloride
(c) Syndiotactic polyvinylchloride
(d) All of these

5. Monomers are converted to polymer by **[DCE 2002]**
(a) Hydrolysis of monomers
(b) Condensation reaction between monomers
(c) Protonation of monomers
(d) None of these

6. Polymer formation from monomers starts by **[AIEEE 2002]**
(a) Condensation reaction between monomers
(b) Coordinate reaction between monomers

(c) Conversion of monomer to monomer ions by protons

(d) Hydrolysis of monomers

7. When condensation product of hexamethylenediamine and adipic acid is heated to $553\,K(80^{o}C)$ in an atmosphere of nitrogen for about 4-5 hours, the product obtained is **[DCE 2002; MHCET 2004]**

(a) Solid polymer of nylon 66

(b) Liquid polymer of nylon 66

(c) Gaseous polymer of nylon 66

(d) Liquid polymer of nylon 6

8. Polymerization of glycol with dicarboxylic acids is

(a) Addition polymerisation

(b) Condensation polymerisation

(c) Telomerisation

(d) Any of these

9. The 'mercerised cellulose' is chemically prepared by

(a) Acetylation (b) Mercuriation

(c) Halogenation (d) Hydrolysis

10. The plastics if are hard, become soft and readily workable by addition of certain compounds called

(a) Catalysts (b) Telomers

(c) Plasticisers (d) Vulcaniser

11. The alkyd resins are condensation polymers obtained from dibasic acids and

(a) Phenol (b) Glycol

(c) Glycerol (d) Formaldehyde

12. Celluloid is

(a) A thermoplastic material obtained from caprolactam and urea

(b) A thermoplastic material obtained from cellulose nitrate and camphor

(c) A thermosetting material obtained from urea and formaldehyde

(d) A thermosetting material obtained from glycerol and phthalic anhydride

13. The product of addition polymerisation reaction is **[KCET 1993]**

(a) PVC (b) Nylon

(c) Terylene (d) Polyamide

14. Example of condensation polymer is **[RPMT 1999]**

(a) Formaldehyde $\rightarrow$ meta-formaldehyde

(b) Acetaldehyde $\rightarrow$ para-aldehyde

(c) Acetone $\rightarrow$ mesityl oxide

(d) Ethene $\rightarrow$ polyethene

15. Complete hydrolysis of cellulose gives **[AIEEE 2003]**

(a) D-fructose (b) D-ribose

(c) D-glucose (d) L-glucose

16. Which of the following can be polymerised to polythene

(a) Ethylene (b) Ethylene chlorohydrin

(c) Ethyl acetate (d) Ethylmethyl ketone

17. Polypropylene can be obtained by polymerisation of

(a) $CH \equiv CH$ (b) $CH_2 = CH_2$

(c) $CH_3 - CH = CH_2$ (d) $CH_3 - C \equiv CH$

18. When heated with zinc chloride, lactides forms a linear polymer which may be

(a) Polystyrene (b) Polyamide

(c) Polyester (d) Polythene

19. Which of the following has been used in the manufacture of non-inflammable photographic films

(a) Cellulose nitrate

(b) Cellulose acetate

(c) Cellulose xanthate

(d) Cellulose perchlorate

20. The phenol-formaldehyde resins are formed by polymerisation of phenol and formaldehyde by

(a) Addition polymerisation

(b) Condensation polymerisation

(c) Both (a) and (b)

(d) None of these

21. PVC is obtained by polymerization of

(a) $CH_2 = CH - CH_2 - Cl$ (b) $CH_2 = CH - Cl$

(c) $CH_3 - Cl$ (d) $CH_3 - CHCl_2$

22. The monomers used in the production of nylon-66 are **[CBSE 1999; RPET 2000; KCET 2000; Kurukshetra CEE 2002]**

(a) Hexamethylene diamine and ethylene glycol

(b) Adipic acid and ethylene glycol

(c) Adipic acid and hexamethylene diamine

(d) Dimethyl terephthalate and ethylene glycol

23. A raw material used in making nylon is **[NCERT 1980; MP PET 2004]**

(a) Adipic acid (b) Butadiene

(c) Ethylene (d) Methyl methacrylate

24. Nylon is formed when a dicarboxylic acid is treated with a

(a) Dihydric alcohol (b) Polyhydric alcohol
(c) Diamine (d) Diester

25. Vinyl chloride can be converted into PVC. In this reaction, the catalyst used is
(a) Peroxides (b) Cuprous chloride
(c) Anhydrous zinc chloride (d) Anhydrous $AlCl_3$

26. Terylene is **[BHU 2000]**
(a) An addition polymer with a benzene ring in every repeating unit
(b) A condensation polymer with a benzene ring in every repeating unit
(c) An addition polymer with two carbon atoms in every repeating unit
(d) A condensation polymer with two nitrogen atoms in every repeating unit

27. **Teflon** is a polymer of the monomer **or** Teflon is obtained by the polymerisation of
[CPMT 1986, 91; MP PET/PMT 1998; AIIMS 2002]
(a) Monofluoroethene (b) Difluoroethene
(c) Trifluoroethene (d) Tetrafluoroethene

28. The catalyst used in the manufacture of polyethene by Ziegler method is **[KCET 1993, 99]**
(a) Titanium tetrachloride and triphenyl aluminium
(b) Titanium tetrachloride and trimethyl aluminium
(c) Titanium dioxide
(d) Titanium isopropoxide

29. Acetate rayon is prepared from**[Kurukshetra CEE 1998]**
(a) Acetic acid (b) Glycerol
(c) Starch (d) Cellulose

30. The compound required for the formation of a thermosetting polymer with methanol is
[CBSE 1992, 95; MNR 1993; JIPMER 1999; BHU 2000; AFMC 2000; MP PET 2003; RPMT 2002]
(a) Benzene (b) Phenyl amine
(c) Benzaldehyde (d) Phenol

31. Which polymer is formed by chloroethene **[RPET 1999]**
(a) Teflon (b) Polyethene
(c) PVC (d) Nylon

32. The starting material for the preparation of styrene is
[MP PMT 2001]
(a) Ethane (b) Ethene
(c) Ethyne (d) Vinyl chloride

33. The catalyst used for the polymerisation of olefins is
[Kerala (Engg.) 2002]
(a) Ziegler Natta catalyst
(b) Wilkinson's catalyst
(c) Pd-catalyst
(d) Zeise's salt catalyst

34. Rayon yarns are obtained from **[MP PET 2001]**
(a) Polymethylene (b) Polyesters
(c) Cellulose (d) Styrene

35. Which one of the following monomers gives the polymer neoprene on polymerization **[CBSE PMT 2003]**
(a) $CF_2 = CF_2$ (b) $CH_2 = CHCl$
(c) $CCl_2 = CCl_2$ (d) $CH_2 = \overset{Cl}{\overset{|}{C}} - CH = CH_2$

36. Terylene is the polymer of
[AFMC 1993; Manipal MEE 1995; KCET 1998; 2001]
(a) Ethylene glycol and terephthalic acid
(b) Melamine and formaldehyde
(c) Vinyl chloride and formaldehyde
(d) Hexamethylene diamine and adipic acid

37. The compound used in the manufacture of terylene is
[MP PET 1996]
(a) Ethylene (b) Vinyl chloride
(c) Ethylene glycol (d) Adipic acid

38. PVC is prepared by the polymerisation of**[Pb. CET 2002]**
(a) Ethylene (b) 1-chloropropene
(c) Propene (d) 1-chloroethene

39. Condensation product of caprolactum is**[BCECE 2005]**
(a) Nylon-6 (b) Nylon-66
(c) Nylon-60 (d) Nylon-6,10

Composition, Properties and Uses of Polymer

1. Discovery of 'nylon' is associated with
(a) Newyork and London (b) Newyork and Longuet
(c) Nyholm and London (d) None of these

2. Which of the following is resistant to boiling aqua-regia
(a) Polythene (b) Perspex
(c) Teflon (d) Bakelite

3. Nylon polymers are
(a) Acidic (b) Basic
(c) Amphoteric (d) Neutral

4. Nylon yarns are usually

(a) Highly inflammable
(b) Non-inflammable
(c) Both (a) and (b) types are known
(d) Uncertain inflammability

5. Which of the following is a synthetic polymer
(a) Rubber (b) Perspex
(c) Protein (d) Cellulose

6. The mass average molecular mass & number average molecular mass of a polymer are respectively 40,000 and 30,000. The polydispersity index of polymer will be **[Kerala CET 2005]**
(a) < 1 (b) > 1
(c) 1 (d) 0
(e) – 1

7. In the process of forming 'mercerised cellulose' the swelling of cellulose is caused by
(a) Water (b) Na_2CO_3
(c) $Aq.\ NaOH$ (d) $Aq.\ HCl$

8. 'Rayon' is
(a) Natural silk (b) Artificial silk
(c) Natural plastic or rubber (d) Synthetic plastic

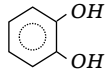
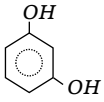
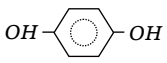
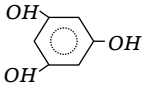
9. As the molecular weight increases the tensile strength of polymers
(a) Increases (b) Decreases
(c) Remains unchanged (d) Uncertain

10. Triethyl aluminium titanium chloride used in plastic industry is a
(a) Vulcaniser (b) Plasticiser
(c) Ziegler-Natta catalyst (d) Telomer

11. Glyptals are chiefly employed in
(a) Toy making (b) Surface coating
(c) Photofilm making (d) Electrical insulators

12. The sterile gauze (or cotton) used in medicine is obtained by oxidising cellulose with
(a) Nitrogen (b) $KMnO_4$
(c) Nitrogen dioxide (d) Potassium chlorate

13. Ethylene-propylene rubber (EPR) is
(a) Unsaturated, stereoregular
(b) Saturated, stereoregular
(c) Atactic, unsaturated
(d) Syndiotactic, unsaturated

14. The monomeric units of terylene are glycol and which of the following
(a) 
(b) 
(c) 
(d) 

15. Neoprene, a synthetic rubber contains which of the following element besides *C* and *H*
(a) *N* (b) *O*
(c) *Cl* (d) *F*

16. Acrylic resins are
(a) Colourless and transparent
(b) Dark brown and thermosetting
(c) Dark brown and thermoplastic
(d) White like milk

17. Which of the following has a higher glass-transition temperature
(a) Polyethylene (b) Polypropylene
(c) Polyvinylchloride (d) Polystyrene

18. A polymer with the high chemical stability has $M.P.\ 327^{o}C$ and the density of complete crystalline sample is $2.3\ g/cm^3$. It can be
(a) PVC (b) Teflon
(c) Melamine (d) Bakelite

19. The process of vulcanisation makes rubber
(a) Soluble in water (b) Elastic
(c) Hard (d) Soft

20. Terylene is a **[AFMC 1989; MP PET 1994; RPET 1999; Kerala (med.) 2002; MP PMT 2004]**
(a) Polyamide (b) Polyester
(c) Polyethylene (d) Polypropylene

21. $F_2C = CF_2$ is the monomer of **[CBSE PMT 2000]**
(a) Nylon-6 (b) Buna-S
(c) Glyptal (d) Teflon

22. Molecular mass of a polymer is
(a) Small (b) Very small
(c) Negligible (d) Large

23. Which of the following has cross-links
(a) Vulcanised rubber
(b) Nylon
(c) Phenol-formaldehyde resins
(d) Both (a) and (c) are correct

24. Orlon is a polymer of **[NCERT 1984; BHU 1995; AFMC 1997; DCE 2001]**
(a) Styrene (b) Tetrafluoro ethylene
(c) Vinyl chloride (d) Acrylonitrile

25. Caprolactam is the monomer of **[DCE 2000]**
(a) Nylon-6 (b) Glyptal
(c) P.T.F.E. (d) Melamine

26. Which of the following intermolecular forces are present in 'nylon – 66' **[JIPMER 1997]**
(a) Vander Waals (b) Hydrogen bonding
(c) Dipole-dipole interaction (d) None of these

27. *Neoprene* is a polymer of **[AFMC 1993; NCERT 1980, 84, 86; CBSE 1991; DCE 2001]**
(a) Propene (b) Vinyl chloride
(c) Chloroprene (d) Butadiene

28. Polyvinyl chloride is
(a) An isomer of vinyl chloride
(b) An addition product of vinyl chloride
(c) An allotrope polymer of vinyl chloride
(d) A polymer of hydrated vinyl chloride

29. Which of the following polymers are hard
(a) Linear (b) Cross-linked
(c) Branched chain (d) Thermoplastic

30. Which of the following has the largest molecular mass
(a) Monomer (b) Dimer
(c) Polymer (d) Oligomer

31. Heating of rubber with sulphur is known as **[CBSE PMT 1989]**
(a) Galvanisation (b) Vulcanisation
(c) Bessemerisation (d) Sulphonation

32. $CH_2 = CH_2$ is a **[MP PMT 1986; CBSE PMT 1991]**
(a) Monomer (b) Polymer
(c) Isomer (d) Equimer

33. Which of the following fibres are made of polyamides **[CPMT 1982; NCERT 1981; MNR 1992; DCE 1999; UPSEAT 2001, 02]**
(a) Dacron (b) Orlon
(c) Nylon (d) Rayon

34. Which is not a polymer **[CPMT 1994]**
(a) Ice (b) Starch
(c) Protein (d) Cellulose

35. Acrylonitrile forms **[BHU 1995]**
(a) Terylene (b) Orlon
(c) PVC (d) Bakelite

36. Synthetic fibres like nylon-66 are very strong because
(a) They have high molecular weights and high melting points
(b) They have a high degree of cross-linking by strong $C-C$ bond
(c) They have linear molecules consisting of very long chains
(d) They have linear molecules interlinked with forces like hydrogen bonding

37. Natural rubber contains several thousand units of X linked together in the polymer chain. X is **[NCERT 1980, 84; BHU 1983; CBSE PMT 1991; MP PMT 2001]**
(a) Neoprene (b) Isoprene
(c) Chloroprene (d) Styrene

38. Natural rubber is basically a polymer of **or** The monomer of natural polymer rubber is **[MP PMT 1993, 95, 98, 99, 2000, 01; RPET 2000; MP PMT/PET 1998; MP PET 1994, 95, 98, 2001; BHU 1999; 2001; CBSE PMT 1999]**
(a) Neoprene (b) Isoprene
(c) Chloroprene (d) Butadiene

39. What is not true about polymers **[MP PET 1999]**
(a) Polymers do not carry any charge
(b) Polymers have high viscosity
(c) Polymers scatter light
(d) Polymers have low molecular weight

40. The synthetic polymer which resembles natural rubber is **[Bihar MEE 1996; DCE 2004]**
(a) Neoprene (b) Chloroprene
(c) Glyptal (d) Nylon

41. Which one is a polymer compound **[CPMT 1997; Bihar MEE 1997]**
(a) SO_2 (b) CO_2
(c) CH_4 (d) *PVC*

42. Which one of the following in used to make 'non-stick' cookware **[CBSE PMT 1997; AIIMS 1998]**
(a) *PVC*
(b) Polystyrene
(c) Polyethylene terephthalate
(d) Polytetrafluoroethylene

43. The polymer used for making contact lenses for eyes is **[AMU 1999]**
(a) Polymethylmethacrylate (b) Polyethelene
(c) Polyethylacrylate (d) Nylon-6

44. Which polymer is used for making magnetic recording tapes **[AMU 1999]**
(a) Dacron (b) Acrilan
(c) Glyptal (d) Bakelite

45. Characteristic property of Teflon is **[RPET 2000]**
(a) 2000 poise viscosity
(b) High surface tension
(c) Non-inflammable and resistant to heat
(d) Highly reactive

46. Which of the following is not a polymer **[MP PET 2001]**
(a) Silk (b) DNA
(c) DDT (d) Starch

47. Nylone 66 is **[RPMT 2002; MH CET 2003; AFMC 1998]**
(a) Polyamide (b) Polyester

(c) Polystyrene (d) Polyvinyl

48. Isoprene is a valuable substance for making **[MP PET 2002; UPSEAT 2004]**

(a) Propene (b) Liquid fuel

(c) Synthetic rubber (d) Petrol

49. Terylene is used for making **[AFMC 2002]**

(a) Silks (b) Fabrics

(c) Seat belts (d) All of these

50. Nylon threads are made of **[MP PMT 2001, 03; AIEEE 2003]**

(a) Polyvinyl polymer (b) Polyester polymer

(c) Polyamide polymer (d) Polyethylene polymer

51. Nylon – 66 is **[RPMT 2003]**

(a) $\left(-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}-NH-(CH_2)_6-NH- \right)_n$

(b) $\left(-NH-(CH_2)_5-\overset{O}{\overset{\|}{C}}- \right)$

(c) $\left(CH_2-\underset{COOMe}{\overset{CH_3}{\overset{|}{\underset{|}{C}}}}- \right)_n$

(d) $\left[-\underset{F}{\overset{F}{\overset{|}{\underset{|}{C}}}}-\underset{F}{\overset{F}{\overset{|}{\underset{|}{C}}}}- \right]_n$

52. Which of the following is currently used as a tyre cord **[Kerala (Med.) 2003]**

(a) Terelene (b) Polyethylene

(c) Polypropylene (d) Nylon - 6

53. PVC is polymer of **[CPMT 2003]**

(a) $CH_2=CH_2$ (b) $CH_2=CH-Cl$

(c) $CH_2=CH-CH_2Cl$ (d) $CH_3-CH=CH-Cl$

54. Teflon is a polymer of **[Kerala PMT 2004]**

(a) Tetrafluoro ethane

(b) Tetrafluro propene

(c) Difluorodichloro ethane

(d) Difluoro ethene

(e) Trifluoro ethene

55. Which of the following is used in vulcanization of rubber **[MH CET 2004]**

(a) SF_6 (b) CF_4

(c) Cl_2F_2 (d) C_2F_2

56. PVC is used for ..... **[Orissa JEE 2002]**

(a) Manufacture of cosmetics

(b) Manufacture of tyres

(c) Manufacture of nonstick pans

(d) Manufacture of plastic pipes

57. Polythene is a resin obtained by polymerisation of **or** The monomer unit in polythene is **[CPMT 1983; JIPMER 1997; MP PMT 2002]**

(a) Butadiene (b) Ethylene

(c) Isoprene (d) Propylene

58. The monomer of the polymer

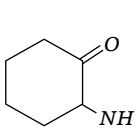
$\sim\!\!\sim CH_2-\underset{CH_3}{\overset{CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2-C^{\oplus}\!<\!\begin{matrix}CH_3\\CH_3\end{matrix}$ is **[MH CET 2004; CBSE PMT 2005]**

(a) $H_2C=C\!<\!\begin{matrix}CH_3\\CH_3\end{matrix}$ (b) $(CH_3)_2C=C(CH_3)_2$

(c) $CH_3CH=CHCH_3$ (d) $CH_3CH=CH_2$

59. The monomer of Nylon-6 is/are **[DPMT 2004]**

(a) $HO-CH_2-CH_2-OH$

(b)  $+HOOC-C_6H_4-COOH$ $+H_2O$

(c) $F_2C=CF_2$

(d) $H_2C=CH_2$

60. Which of the following is **teflon** **[MP PMT 2000, 03]**

(a) $\left[-\underset{H}{\overset{H}{\overset{|}{\underset{|}{C}}}}-\underset{H}{\overset{H}{\overset{|}{\underset{|}{C}}}}- \right]_n$ (b) $\left[-\underset{H}{\overset{H}{\overset{|}{\underset{|}{C}}}}-\underset{H}{\overset{CH_3}{\overset{|}{\underset{|}{C}}}}- \right]_n$

(c) $\left[-\underset{F}{\overset{F}{\overset{|}{\underset{|}{C}}}}-\underset{F}{\overset{F}{\overset{|}{\underset{|}{C}}}}- \right]_n$ (d) $\left[-\underset{F}{\overset{H}{\overset{|}{\underset{|}{C}}}}-\underset{Cl}{\overset{F}{\overset{|}{\underset{|}{C}}}}- \right]_n$

61. Thermosetting plastics are

(a) Soluble in water (b) Soluble in alcohol

(c) Soluble in benzene (d) Insoluble

62. Cellulose is

(a) $(C_6H_{10}O_5)_n$ (b) $(C_3H_3N_3)_n$

(c) $(C_3H_6N_6)_n$ (d) $(C_{12}H_{22}O_{11})_n$

63. The molecular weight of cellulose varies between

(a) 1000 to 20000 (b) 20000 to 500000

(c) 100 to 200 (d) 1000000 to 5000000

64. The value of n in the formula $(C_5H_{10}O_5)_n$ for inulin is about

(a) 30 (b) 300

(c) 3000 (d) 300000

65. 'Starch' consists of two fractions; one is $\alpha-\text{amylose}$ and the other is

(a) Amylopectin (b) Glycogen

(c) Pecticamide (d) Alginic acid

66. The process of heat-softening, moulding and cooling to rigidness' can be repeated for which plastics

(a) Thermoplastics (b) Thermosetting plastics

(c) Both (a) and (b) (d) None of the above

67. In the trinitrocellulose each glucose unit contains how many $-OH$ groups

(a) 2 (b) 3

(c) 4 (d) 5

68. Shellac contains mainly

(a) Cellulose

(b) Polyhydroxy organic acids

(c) Polyamides

(d) Polyesters

69. In elastomer, intermolecular forces are **[AIIMS 2000; BHU 2004]**

(a) Nil (b) Weak

(c) Strong (d) Very strong

70. Cellulose is a polymer of **[CBSE PMT 2002]**

(a) Fructose (b) Ribose

(c) Glucose (d) Sucrose

71. Which of the following polymer has ester linkage **[BVP 2004]**

(a) Nylon-66 (b) PVC

(c) Terylene (d) SBR

72. Acrilan is a hard, horny and a high melting material. Which of the following represents its structure **[CBSE PMT 2003]**

(a) $\left(-CH_2-\underset{Cl}{\underset{|}{CH}}-\right)_n$ (b) $\left(-CH_2-\underset{CN}{\underset{|}{CH}}-\right)_n$

(c) $\left(-CH_2-\underset{COOCH_3}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-\right)_n$ (d) $\left(\underset{COOC_2H_5}{\underset{|}{CH}}-\right)_n$

73. Which of the following has amide links

(a) Protein (b) Nylon

(c) Peptide (d) All of these

74. Which of the following is a polyamide **[AIEEE 2005]**

(a) Teflon (b) Nylon –66

(c) Terylene (d) Bakelite

75. Which of the following is fully fluorinated polymer **[AIEEE 2005]**

(a) Neoprene (b) Teflon

(c) Thiokol (d) PVC

76. Three dimensional molecules with cross links are formed in the case of a **[KCET 2005]**

(a) Thermoplastic (b) Thermosetting plastic (c) Both (d) None

Critical Thinking

Objective Questions

1. Trans-form of polyisoprene is

(a) Guttapercha (b) Hydrochloride rubber

(c) Buna-N (d) Synthetic rubber

2. Wash and wear clothes are manufactured using

(a) Nylon fibres (b) Cotton mixed with nylon

(c) Terylene fibres (d) Wool fibres

3. In the manufacture of polythene by the Ziegler process using ethylene, the temperature for proper polymerisation required is

(a) Below 10^oC (b) 10^o to 50^oC

(c) 50^o to 80^oC (d) 80^o to 140^oC

4. High density polyethylene (HDPE) can be prepared from ethylene by

(a) Ziegler-Natta process

(b) Heating with peroxides

(c) Condensing in sealed tubes

(d) Condensing with styrenes

5. Perlon is **[AFMC 2001]**

(a) Rubber (b) Nylon-6

(c) Terelene (d) Oxlon

6. Styrene at room temparature is

(a) Solid (b) Liquid

(c) Gas (d) Colloidal solution

7. Which one of the following can be used as monomer in a polymerisation reaction **[MP PMT 1993]**

(a) CH_3CH_2Cl (b) CH_3CH_2OH

(c) C_6H_6 (d) C_3H_6

8. The Zieglar-Natta catalysts are

(a) Stereospecific
(b) Non-metallic complexes
(c) Gaseous catalysts
(d) Universal in all polymerisation reactions

9. Melamine is
(a) Gas (b) Yellow liquid
(c) White crystalline solid (d) Colloidal solution

10. Glyptal is a
(a) Viscose rayon (b) Nylon
(c) Polystyrene (d) Alkyd resin

11. Which of the following is not polyamide **[AFMC 2000; CBSE PMT 2001; KCET 2001]**
(a) Nylon-66 (b) Protein
(c) Glyptal (d) Nylon-6

12. Which of the following statement is correct regarding the drawbacks of raw rubber **[AIIMS 2001]**
(a) It is plastic in nature
(b) It has little durability
(c) It has large water-absorption capacity
(d) All of these

13. Which of the following is a chain growth polymer **[CBSE PMT 2004]**
(a) Polystyrene (b) Protein
(c) Starch (d) Nucleic acid

14. '*Celanese silk*' is
(a) Cellulose trinitrate (b) Cellulose acetate
(c) Cellophane (d) Pyroxylin

15. Ebonite is **[CBSE PMT 2000]**
(a) Polropene (b) Natural rubber
(c) Synthetic rubber (d) Highly vulcanized rubber

16. Polymer used in bullet proof glass is **[MP PET 2004]**
(a) Lexane (b) PMMA
(c) Nomex (d) Kevlar

AR Assertion & Reason
For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : The time of vulcanisation and temperature is increased by adding accelerators.
Reason : By vulcanising, a material of high tensile strength can be obtained.

2. Assertion : Hydrogenation is the process of converting an oil into a fat, called vegetable ghee.
Reason : Hydrogenation as carried out in presence of a catalyst usually finely divided nickel.

3. Assertion : In vulcanisation of rubber, sulphur cross links are introduced.
Reason : Vulcanisation is a free radical initiated chain reaction.

4. Assertion : Bakelite is a thermosetting polymer.
Reason : Bakelite can be melted again and again without any change.

5. Assertion : Teflon has high thermal stability and chemical inertness.
Reason : Teflon is a thermoplastic.

Answers

Classification of Polymer

1	c	2	d	3	a	4	c	5	b
6	d	7	d	8	a	9	a	10	d
11	d	12	c	13	d	14	a	15	d
16	b	17	d	18	d	19	b	20	b
21	a	22	d	23	d	24	a	25	a
26	c	27	c	28	d	29	c	30	a
31	d	32	d	33	c	34	d	35	b
36	c	37	c	38	e	39	a		

General methods of preparation and mechanism of polymerisation

1	b	2	c	3	c	4	c	5	b
6	a	7	b	8	b	9	d	10	c
11	b	12	b	13	a	14	c	15	c
16	a	17	c	18	a	19	b	20	b
21	b	22	c	23	a	24	c	25	a
26	b	27	d	28	b	29	d	30	d
31	c	32	c	33	a	34	c	35	d
36	a	37	c	38	d	39	a		

Composition, Properties and Uses of Polymer

1	a	2	c	3	c	4	c	5	b
6	b	7	c	8	b	9	a	10	c
11	b	12	c	13	b	14	c	15	c
16	a	17	d	18	b	19	c	20	b
21	d	22	d	23	d	24	d	25	a
26	b	27	c	28	b	29	b	30	c
31	b	32	a	33	c	34	a	35	b
36	d	37	b	38	b	39	d	40	a
41	d	42	d	43	a	44	d	45	c
46	c	47	a	48	c	49	d	50	c
51	a	52	d	53	b	54	a	55	a
56	d	57	b	58	a	59	b	60	c
61	d	62	a	63	b	64	a	65	a
66	a	67	b	68	b	69	b	70	c
71	c	72	b	73	d	74	b	75	b
76	b								

Critical Thinking Questions

1	a	2	c	3	c	4	a	5	b
6	b	7	d	8	a	9	c	10	d
11	c	12	d	13	a	14	b	15	d
16	b								

Assertion and Reason

1	e	2	b	3	b	4	c	5	b

Answers and Solutions

Classification of Polymer

1. (c) Bakelite is thermosetting polymer. It becomes infusible on heating and can not be remoulded

4. (c) Natural rubber is the only addition polymer of nature and is known as $Cis-1,4-$ polyisoprene.

6. (d) Wax is a molecular solid.

9. (a) It is present in the cell wall of plant.

12. (c) Starch is a natural polymer and other are synthetic.

13. (d) Protein is a natural polymer of $\alpha-$amino acids.

17. (d) Amylose is a linear polymer of $\alpha-D-$Glucose

$$(-\text{Glucose}-\text{Glucose}-\text{Glucose}-)_n$$
$$(C_1-C_4\ \alpha-\text{linkage})$$

18. (d) Silk is protein fibre. Dacron is polyester fibre and Nylon-66 is polyamide fibre.

19. (b) Natural rubber is addition polymer of isoprene (2-methyl-1, 3-butadiene)

$$nCH_2=\overset{CH_3}{\overset{|}{C}}-CH=CH_2 \xrightarrow{\text{Polymerisation}} -(CH_2-\overset{CH_3}{\overset{|}{C}}=CH-CH_2)_n-$$

Natural rubber

20. (b) Polyethylene is a homopolymer

$$nCH_2=CH_2 \rightarrow (-CH_2-CH_2)_n$$

21. (a) Cellulose is the natural fibre which are biodegradable polymer rest are synthetic polymer which are not biodegradable.

23. (d) Nylon is the copolymer of Hexamethylene diamine and adipic acid. It is not a homo-polymer because homopolymer formed by two same monomer unit.

25. (a) Thermoplastic are those which becomes soft on heating and can be remoulded again.

26. (c) Resins are amorphous organic solids or semisolids which usually have a typical lustre and are often transparent or translucent.

27. (c) Step growth polymerization involves condensation reaction between two difunctional monomer to produce dimer which in turn, produce, tetramer and so on with the loss of simple molecules like H_2O, NH_3, HCl etc.

29. (c) Buna-*S* and Neoprene both are synthetic rubber.

31. (d) Nylon is a synthetic polymer.

35. (b) Nylon-66 is manufactured by the condensation polymerization of adipic acid and hexamethylenediamine with the lose of H_2O as steam.

36. (c) The polymer formed by the condensation polymerisation is known as condensation polymer. Decron (Terylene) is a condensation polymer. It is formed by the condensation polymerisation of terephthalic acid and ethylene glycol.

37. (c) PVC is a synthetic polymer made by vinylchloride.

38. (e) Terylene is fibre not a thermosetting plastic because on heating they melt and do not show plastic property while rest option are true regarding to Terylen

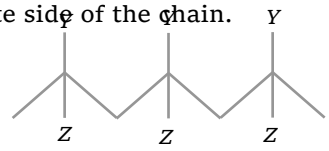
39. (a) Sucrose is a disaccharides which upon acid or enzymatic hydrolysis gives only two molecules of monosaccharides.

$$\text{Sucrose} \xrightarrow{H^+ \text{or invertaase}} \text{D(+)-glucose+(D)(-)-fructose}$$

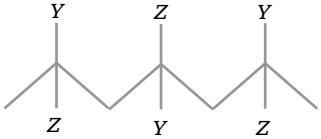
General methods of preparation and mechanism of Polymerisation

1. (b) There are 3 stereo chemical arrangements are possible

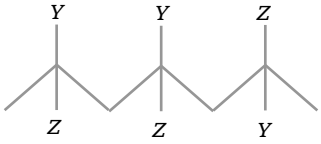
(i) Isotactic (Same order):- Here groups are arranged on one side of the chain. All *Y* groups lie on one side and all *Z* groups on the opposite side of the chain.



(ii) Syndiotactic (Alternating order) - The *Y* and *Z* groups lie alternately on each side of the chain.



(iii) Atactic (Random order) - The *Y* and *Z* groups are arranged in a random fashion.



3. (c) $\overset{\text{Head}}{CH_2}=\underset{CH_3}{\overset{|}{C}}-CH=\overset{\text{Tail}}{CH_2}+\overset{\text{Head}}{CH_2}=\underset{CH_3}{\overset{|}{C}}-CH=\overset{\text{Tail}}{CH_2}\rightarrow$

$$(-CH_2-\underset{CH_2}{\overset{|}{C}}=CH-CH_2-CH_2-\underset{CH_3}{\overset{|}{C}}=CH-CH_2-)_n$$

From steric effects, the polymer formed has head to tail configuration.

4. (c) Syndiotactic polyvinylchloride

$$\left(-CH_2-\underset{Cl}{\overset{|}{CH}}-CH_2-\overset{Cl}{\overset{|}{CH}}-CH_2-\underset{Cl}{\overset{|}{CH}}-CH_2-\overset{Cl}{\overset{|}{CH}}-CH_2-\underset{Cl}{\overset{|}{CH}}-\right)_n$$

In this arrangement the chlorine atoms are alternately arranged. The polymer is stereoregular and has high crystallinity.

5. (b) $H^+ + H_2C=\underset{G}{\overset{|}{CH}}\rightarrow H-CH_2-\underset{G}{\overset{|}{\overset{+}{C}H}} \xrightarrow{H_2C=\overset{O}{\overset{||}{C}}H}$

$$\text{Repeat} \Rightarrow (CH_2-\underset{G}{\overset{|}{C}}H-)_n$$

Polym

7. (b) The condensation polymerisation of hexamethylene diamine and adipic acid is done in solution form by interface technique. In this liquid nylon polymer is obtained.

$$n.H_2N-(CH_2)_6-NH_2$$

$$nHOOC-(CH_2)_4-COOH \xrightarrow[-nH_2O]{\text{Polymerisation}}$$

$$\underset{\text{Nylon}}{[-HN-(CH_2)_6-NHCO-(CH_2)_4-CO-]_n}$$

8. (b) Condensation Polymerization because loss of water molecule takes place.

10. (c) *e.g.*- PVC is extremely stiff and hard but the addition of *di-n* butyl phthalate Plasticizers makes it soft and rubber like.

14. (c) Polymers formed by condensation process with eliminaiton of small molecule like H_2O, CO_2 etc. are known as condensation polymers.

eg. $\underset{CH_3}{\overset{CH_3}{>}}C=O+H_2CH-\underset{O}{\overset{||}{C}}-CH_3 \xrightarrow[HCl]{\text{dil}}$

Acetone

$$H_2O + \underset{CH_3}{\overset{CH_3}{>}}C = CH - \overset{O}{\overset{\|}{C}} - CH_3$$

Mesityloxide

15. (c) *D*-glucose is the monomer of cellulose.

16. (a) $\underset{\text{Ethylene}}{n\,CH_2 = CH_2} \rightarrow \underset{\text{Polythene}}{(-CH_2 - CH_2-)_n}$

17. (c) $\underset{\text{Propene}}{nCH_3 - CH = CH_2} \rightarrow (-CH_2 - \underset{\underset{\text{Polypropylene}}{CH_3}}{\underset{|}{CH}} -)_n$

21. (b) $\underset{\text{Vinylchloride}}{n(CH_2 = CH - Cl)} \rightarrow (-CH_2 - \underset{\underset{(PVC)}{Cl}}{\underset{|}{CH}} -)_n$

22. (c) Adipic acid $(HOOC-(CH_2)_4-COOH)$ and Hexamethylene diamine $(NH_2-(CH_2)_6-NH_2)$

27. (d) Tetrafluoroethene $(CF_2 = CF_2)$.

29. (d) Rayon fibre is chemically identical to cotton but has a shine like silk, rayon is also called a regenerated fibre because during its preparation. Cellulose is regenerated by dissolving it in *NaOH* and CS_2.

30. (d) When phenol react with *HCHO* form bakelite which is a thermosetting polymer.

31. (c) Generally chloroethene (vinyl chloride) formed PVC polyvinyle chloride.

33. (a) $Al(C_2H_5)_3 + TiCl_4$ is Ziegler Natta catalyst.

37. (c) Terylene is a polymer of ethylene glycol and terephthalic acid.

38. (d) PVC is polyvinyl chloride, a polymer of vinyl chloride.

$$\underset{\text{1-chloroethene}}{n.CH_2 = CH.Cl} \xrightarrow{\text{Polymerisation}} \underset{PVC}{\left[\begin{array}{c} Cl \\ | \\ -CH_2 - CH- \end{array}\right]_n}$$

Composition, properties and uses of Polymers

1. (a) Nylon was simultaneously discovered in New york and London.

2. (c) Teflon is flexible, inert to solvents and to boiling with acids even to aqua - regia and is stable upto 598 *K*.

4. (c) Both highly inflammable and Non-inflammable

5. (b) Perspex is a synthesized polymer.

6. (b) Average number molecular weight $\overline{M_n} = 30{,}000$

Average mass molecular weight $\overline{M_w} = 40{,}000$

Polydispersity index (PDI) $= \dfrac{\overline{M_w}}{\overline{M_n}} = \dfrac{40{,}000}{30{,}000} = 1.33$

7. (c) Cellulose forms a transluscent mass on treatment with conc. *NaOH* which imparts a silky lustre to cotton. This process is mercerisation and the cotton so produced is known as mercerised cotton.

8. (b) 'Rayon' is man-made fibre which consists of purified cellulose in the form of long threads. Rayon resembles silk in appearance. Hence called as artificial silk.

$$\underset{\text{(from woodpulp)}}{\text{Cellulose}} \xrightarrow[CS_2]{NaOH} \underset{\text{(Syrup like liquid)}}{\text{Viscose}} \xrightarrow[\text{into dil. } H_2SO_4]{\text{Pass through Spinneret}} \underset{\text{(Fine silken thread)}}{\text{Rayon}}$$

10. (c) Ziegler-Natta catalyst $(C_2H_5)_3Al + TiCl_4$

14. (c) Terylene is made from glycol and Terephthalic acid

$$\underset{\text{(Glycol)}}{HO - CH_2 - CH_2 - OH} \text{ and } HOOC - \underset{\text{(Terephthalic acid)}}{C_6H_4} - COOH$$

15. (c) $\underset{\text{Chloroprene}}{n(CH_2 = \underset{\underset{Cl}{|}}{C} - CH = CH_2)} \rightarrow \underset{\text{Neoprene}}{\left(CH_2 - \underset{\underset{Cl}{|}}{C} = CH - CH_2\right)_n}$

19. (c)

Natural rubber $+ S \xrightarrow{\text{Vulcanization}}$ Vulcanized

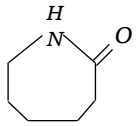
Soft, gummy, sticky, and less elastic

Hard, non-sticky and more

22. (d) Polymer always consists of hundreds to thousands of repeating structural units. Hence they have very high molecular mass.

24. (d) Acrylonitrile is a hard, horny and high melting material. It is used in the manufacture of oron and Acrilan fibres which are used for making clothes, carpets and blankets.

25. (a)



Caprolactam

27. (c)

$$n(\underset{\text{Chloroprene}}{CH_2 = \underset{\underset{Cl}{|}}{C} - CH = CH_2}) \rightarrow (-\underset{\text{Neoprene}}{CH_2 - \underset{\underset{Cl}{|}}{C} = CH - CH_2}-)_n$$

34. (a) Ice is a molecular solid.

36. (d) They have linear molecules interlinked with forces like hydrogen bonding.

37. (b) Isoprene $(CH_2 = \underset{\underset{CH_3}{|}}{C} - CH = CH_2)$

38. (b) $n\,CH_2 = \underset{\underset{CH_3}{|}}{C} - CH = CH_2 \rightarrow \underset{\text{Natural rubber}}{\left(-CH_2 - \underset{\underset{CH_3}{|}}{C} = CH - CH_2 -\right)_n}$

39. (d) Polymers have high molecular weight.

40. (a) In Neoprene monomer unit is

$CH_2 = \underset{\underset{Cl}{|}}{C} - CH = CH_2$ (chloroprene)

while Isoprene $(CH_2 = \underset{\underset{CH_3}{|}}{C} - CH = CH_2)$ is the monomer of natural rubber.

42. (d) Teflon has great chemical inertness and high thermal stability, hence used for making non-stick utensils. For this purpose, a thin layer of teflon is coated on the inner side of the vessel.

43. (a) Also known as PMMA. It is a transparent, excellent light transmitter and its optical clarity better than glass so it is used in the preparation of lenses for eyes.

45. (c) Teflon is non-inflammable and resistant to heat so it is used in coating, particularly in non-sticking frying pans.

46. (c) DDT is an organic compound used as insectiside not is a polymer.

47. (a) All the nylons are polyamides.

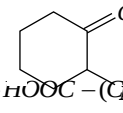
48. (c) Rubber is a polymer of isoprene. Its chemical formula is $(C_5H_8)_n$.

54. (a) $\underset{\text{Tetrafluoro ethane}}{nCF_2 = CF_2} \longrightarrow \underset{\text{Teflon}}{[-CF_2 - CF_2-]_n}$

55. (a) SF_6 is used in the vulcanisation of rubber. Sulphur is heated with polymer to introduce cross-linking and thus, form tough polymer.

58. (a) $H_2C = C\begin{matrix}CH_3\\CH_3\end{matrix}$

59. (b) The monomer used in the preparation of Nylon-6 is caprolactam.



$+H_2O \rightarrow HOOC-(CH_2)_5-NH_2 + HNO$

$\rightarrow HOOC-(CH_2)_5-HN-CO-(CH_2)_5-NH_2$

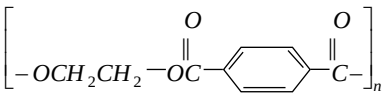
$\left[-\underset{\underset{O}{\|}}{C}-(CH_2)_5-\underset{\underset{H}{|}}{N}-\right]_n$

Nylon-6

64. (a) 30-Inulin $(C_5H_{10}O_5)_{30}$ is found in the "Roots of Dahaliya".

69. (b) Polymer chain in elastomer are held together by weak intermolecular forces eg. Vulacanised rubber.

71. (c) Terylene has ester linkage. It is the polymer of ethylene glycol with terephthalic acid. It is used in textile industry.



Dacron or

74. (b) Nylons are polyamide fibres.

76. (b) Thermosetting plastics have three dimensional cross-linked structure. Such polymers are prepared in two steps. The first step is the foramtion of long chain molecules which are capable of further reaction with each other. the second step is the application of heat which cause a reaction to occur between the chains, thus producing a complex cross-linked polymer.

Critical Thinking Questions

1. (a) Guttapercha rubber is very hard horny material consisting of trans 1, 4 - polyisoprene polymer

2. (c) The fibre of terylene is highly crease - resistant, durable and has low moisture content. It is also not damaged by pests like moths and mildew. It is therefore used for the manufacture of wash and wear fabrics. It is also blended with cotton (Terycot) and wool (Terywool) to increase their resistance to wear and tear.

3. (c) The reaction carried out at temp. 50°-80°C.

4. (a) *HDPE* is prepared by co-ordination polymerization which occurs through the intermediate formation of co-ordination complexes. For example, ethylene first forms a co-ordination complex with the transition metal titanium by donating its π-electrons. The π complex thus formed then reacts stepwise with a large number of ethylene molecules ultimately leading to the formation of a polymer. The polythene so obtained has high density $(0.97\ g/cm^3)$ and higher *m.pt.* $(403K)$ as compare to *LDPE* (density- 0.92 g/cm^3 and *m.pt.* $384K$)

5. (b) Perlon is Nylon-6. It is prepared from a single monomer having a potential amino group of one end and a potential carbonyl group of other end.

6. (b) Styrene at room temperature is liquid.

7. (d) $\underset{\text{Propene}}{n\,CH_3 - CH = CH_2} \rightarrow \underset{\text{Poly propene}}{\left(-CH_2 - \underset{\underset{CH_3}{|}}{CH} -\right)_n}$

8. (a) Zieglar Natta catalyst is a mixture of $TiCl_4$ and $(C_2H_5)_3Al$ used in the synthesis of stereoregular polymers.

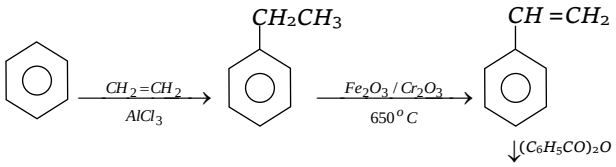
9. (c) Melamine is the phenol-urea resin which are white crystalline solid.

10. (d) Glyptal is a polymer of phthallic acid and Glycol.

11. (c) Glyptal is an alkyd resin of ethylene glycol $(HO-CH_2-CH_2-OH)$.

12. (d) The raw rubber is plastic in nature. It becomes soft at high temperature. It has little durability and it has large water absorption capacity.

13. (a) Chain growth polymers involve a series of reaction each of which consume a reactive particles & produces another similar one. The reactive particles may be free radicals or ions (cation or anion) to which monomers get added by a chain reaction. It is an important reaction of alkenes & conjugated dienes or indeed of all kinds of compounds that contains $C-C$ double bond



14. (b) Cellulose acetate known as celanese silk.

15. (d) Ebonite is a hard and highly (20-30%) vulcanized rubber.

16. (b) PMMA is used in bullet proof glass.

Assertion & Reason

1. (e) The time of vulcanisation is reduced by adding accelerators and activators.

2. (b) Hydrogenation or hardening of oil is a process in which various unsaturated radicals of fatty glycerides are converted into more highly or completely saturated glycerides by the addition of hydrogen in the presence of a catalyst, usually finely divided nickel.

3. (b) Vulcanisation is a process of treating natural rubber with sulphur or some compounds of sulphur under heat so as to modify its properties. This cross-linking give mechanical strength to the rubber.

4. (c) Bakelite can be heated only once.

5. (b) Due to the presence of strong $C-F$ bonds, teflon has high thermal stability and chemical inertness.