

### I. Multiple Choice Questions (Type-I)

1. Which of the following polymers of glucose is stored by animals?

- (i) Cellulose
- (ii) Amylose
- (iii) Amylopectin
- (iv) Glycogen

**Solution:**

Option (iv) is the answer.

2. Which of the following is not a semisynthetic polymer?

- (i) cis-polyisoprene
- (ii) Cellulose nitrate
- (iii) Cellulose acetate
- (iv) Vulcanised rubber

**Solution:**

Option (i) is the answer

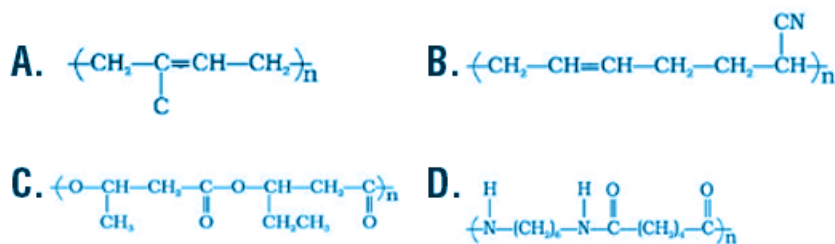
3. The commercial name of polyacrylonitrile is \_\_\_\_\_.

- (i) Dacron
- (ii) Orlon (Acrilan)
- (iii) PVC
- (iv) Bakelite

**Solution:**

Option (ii) is the answer.

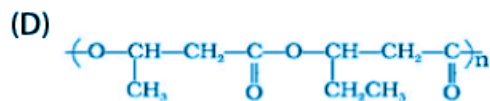
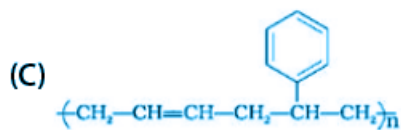
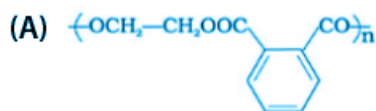
4. Which of the following polymer is biodegradable?



**Solution:**

Option (D) is the answer.

5. In which of the following polymers ethylene glycol is one of the monomer units?



**Solution:**

Option (i) is the answer.

6. Which of the following statements is not true about low-density polythene?

(i) Tough

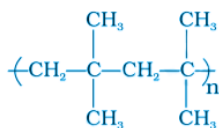
(ii) Hard

(iii) Poor conductor of electricity

(iv) Highly branched structure

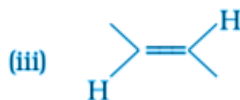
**Solution:**

Option (iii) is the answer.



7. \_\_\_\_\_ is a polymer having monomer units \_\_\_\_\_.

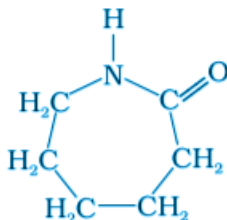
\_\_\_\_\_ is a polymer having monomer



**Solution:**

Option (i) is the answer.

8. Which of the following polymer can be formed by using the following monomer unit?



**Solution:**

Option (iv) is the answer.

**II. Multiple Choice Questions (Type-II)**

**Note:** In the following questions two or more options may be correct.

**9. Which of the following polymers, need at least one diene monomer for their preparation?**

- (i) Dacron
- (ii) Buna-S
- (iii) Neoprene
- (iv) Novolac

**Solution:**

Option (ii) and (iii) are the answers.

**10. Which of the following are characteristics of thermosetting polymers?**

- (i) Heavily branched cross-linked polymers.
- (ii) Linear slightly branched long-chain molecules.
- (iii) Become infusible on moulding so cannot be reused.
- (iv) Soften on heating and harden on cooling, can be reused.

**Solution:**

Option (i) and (iii) are the answers.

**11. Which of the following polymers are thermoplastic?**

- (i) Teflon
- (ii) Natural rubber
- (iii) Neoprene
- (iv) Polystyrene

**Solution:**

Option (i) and (iv) are the answers.

**12. Which of the following polymers are used as fibre?**

- (i) Polytetrafluoroethane
- (ii) Polychloroprene
- (iii) Nylon

(iv) Terylene

**Solution:**

Option (iii) and (iv) are the answers.

**13. Which of the following are addition polymers?**

(i) Nylon

(ii) Melamine formaldehyde resin

(iii) Orlon

(iv) Polystyrene

**Solution:**

Option (iii) and (iv) are the answers.

**14. Which of the following polymers are condensation polymers?**

(i) Bakelite

(ii) Teflon

(iii) Butyl rubber

(iv) Melamine formaldehyde resin

**Solution:**

Option (i) and (iv) are the answers.

**15. Which of the following monomers form biodegradable polymers?**

(i) 3-hydroxybutyric acid + 3-hydroxypentanoic acid

(ii) Glycine + aminocaproic acid

(iii) Ethylene glycol + phthalic acid

(iv) Caprolactam

**Solution:**

Option (i) and (ii) are the answers.

**16. Which of the following is an example of a synthetic rubber?**

(i) Polychloroprene

(ii) Polyacrylonitrile

(iii) Buna-N

(iv) cis-polyisoprene

**Solution:**

Option (i) and (iii) are the answers.

**17. Which of the following polymers can have strong intermolecular forces?**

(i) Nylon

(ii) Polystyrene

(iii) Rubber

(iv) Polyesters

**Solution:**

Option (i) and (iv) are the answers.

**18. Which of the following polymers have vinylic monomer units?**

(i) Acrilan

(ii) Polystyrene

(iii) Nylon

(iv) Teflon

**Solution:**

Option (i), (ii) and (iv) are the answers.

**19. Vulcanisation makes rubber \_\_\_\_\_.**

(i) more elastic

(ii) soluble in inorganic solvent

(iii) crystalline

(iv) more stiff

**Solution:**

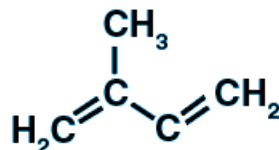
Option (i) and (iv) are the answers.

III. Short Answer Type

**20. A natural linear polymer of 2-methyl-1, 3-butadiene becomes hard on treatment with sulphur between 373 to 415 K and —S—S— bonds are formed between chains. Write the structure of the product of this treatment?**

**Solution:**

The structure of 2-methyl-1,3-butadiene is



This process is known as vulcanization of rubber. Sulphur here acts as a crosslinking agent and the rubber gets stiffened during this process having improved physical properties than natural rubber.

**21. Identify the type of polymer.**

—A—A—A—A—A—A—

**Solution:**

Here the monomer is —A—. Since the same or identical monomer is being repeated to form this above polymer, so this is a homopolymer. ('Homo' means same or identical)

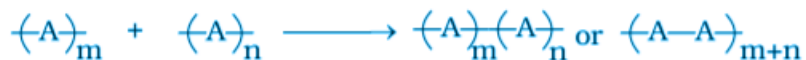
**22. Identify the type of polymer.**

—A—B—B—A—A—A—B—A—

**Solution:**

Here the monomers 'A' and 'B' are being joined in a random manner in the same polymer chain. So this is an example of a copolymer. A Copolymer is formed usually when the mixture of two or more unsaturated monomers react.

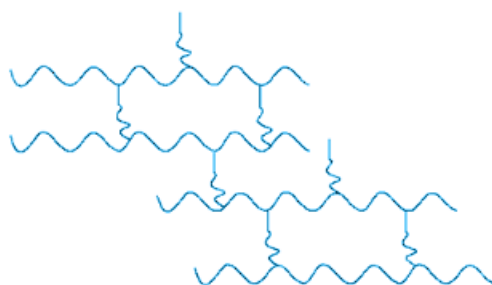
23. Out of chain growth polymerisation and step-growth polymerisation, in which type will, you place the following.



**Solution:**

In this diagram, two monomers simply and combine to form the polymer by a chain-growth polymerization reaction. Here only monomers react with each other to continue the growing chain.

24. Identify the type of polymer given in the following figure.



**Solution:**

This is a cross-linked or Network polymer. Two linear polymers are joined by cross-linking.

25. Identify the polymer given below :



**Solution:**

This is polyisoprene or natural rubber.

The monomeric unit of this polymer is 2-methyl-1,3-butadiene.

26. Why are rubbers called elastomers?

**Solution:**

Rubbers can be stretched by applying force and come back to its original form after the removal of applied force. So they are called elastomers.

**27. Can the enzyme be called a polymer?**

**Solution:**

The enzyme acts as a catalyst which enhances the biological reactions. They are made up of proteins. Proteins are the polymers having monomeric unit known as amino acids. Thus, enzymes are also polymers.

**28. Can nucleic acids, proteins and starch be considered as step growth polymers?**

**Solution:**

Nucleic acids, proteins and starch can be considered as step-growth polymers. Step growth polymers are condensation polymers. Monomers which possess bifunctional or trifunctional functional groups can combine by the loss of a simple molecule

**29. How is the following resin intermediate prepared and which polymer is formed by this monomer unit?**



**Solution:**

Melamine and formaldehyde are the two starting monomers for this Resin intermediate. Their condensed polymerisation gives melamine polymer.

**30. To have practical applications why are cross-links required in rubber?**

**Solution:**

To improve these physical properties, cross-linking is done which helps to bind its planar polymer sheets thus increasing elastomeric properties, thermal stability.

**31. Why does cis-polyisoprene possess elastic property?**

**Solution:**

Due to the presence of these weak forces the polymer can be stretched by applying force. The polymer returns to its original state as soon as the external force is removed, thus exhibiting elastic property.

**32. What is the structural difference between HDP and LDP? How does the structure account for different behaviour and nature, hence the use of a polymer?**

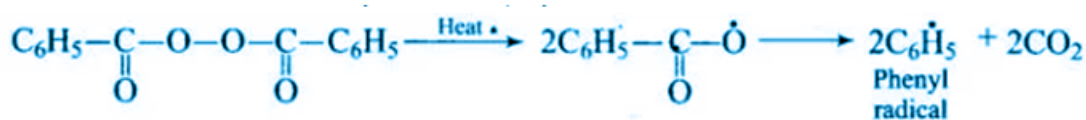
**Solution:**

HDP is a high-density polymer which has a linear structure and LDP is a low density structure which has branched structure. HDP is chemically inert and has a higher melting point whereas LDP is a lower melting point and flexible.

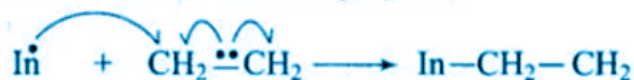
**33. What is the role of benzoyl peroxide also polymerisation of alkenes? Explain its mode of action with the help of an example.**

**Solution:**

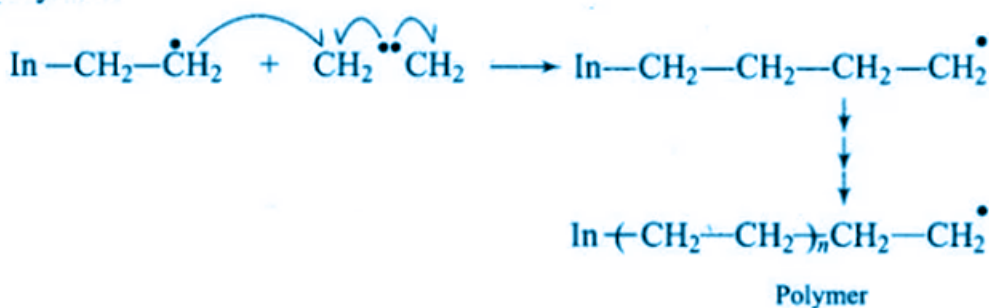
Benzoyl peroxide helps to generate free radical in chain initiation step which is the first step of the reaction in the Addition polymerization reaction. Thus it acts as a free radical generating initiator catalyst.



The radical formed adds to the carbon-carbon double bond of an alkene molecules and ultimately forms the polymer.



The new free radical adds to a double bond of monomer to form a larger free radical which adds to another alkene molecules and ultimately forms the polymer.



**34. Which factor imparts crystalline nature to a polymer like nylon?**

**Solution:**

One molecule of Nylon can join another by intermolecular H-bonding which is present between two terminal groups  $-\text{C}=\text{O}$  and  $-\text{NH}$ . Since intermolecular H-bonding is relatively strong, it can lead to close packing of chains that impacts the crystalline character of Nylon.

**35. Name the polymers used in laminated sheets and give the name of monomeric units involved in its formation.**

**Solution:**

Urea-formaldehyde resin is used in laminated sheets. For the formation of laminated sheets, urea and formaldehyde are the monomeric units.

**36. Which type of biomolecules has some structural similarity with synthetic polyamides? What is this similarity?**

**Solution:**

Proteins have some structural similarity with synthetic polyamides. Polyamides like Nylon is formed by the combination of Glycine and aminocaproic acid molecule through an amide linkage. Similar amide linkage is present in protein also when two amino acids join with each other.



**37. Why should the monomers use also polymerisation through free radical pathway be very pure?**

**Solution:**

Pure monomers are used besides polymerization through free radical pathway because even the traces of impurities act as inhibitors and leads to the sudden termination of chain reaction and forms small length polymers.

#### IV. Matching Type

**Note: Match the items of Column I with the items in Column II.**

**38. Match the polymer of column I with a correct monomer of column II.**

Column I	Column II
(i) High density polythene	(a) Isoprene
(ii) Neoprene	(b) Tetrafluoroethene
(iii) Natural rubber	(c) Chloroprene
(iv) Teflon	(d) Acrylonitrile
(v) Acrilan	(e) Ethene

**Solution:**

- (i) is e
- (ii) is c
- (iii) is a
- (iv) is b
- (v) is d

**39. Match the polymers given in Column I with their chemical names given in Column II.**

Column I	Column II
(i) Nylon 6	(a) Polyvinyl chloride
(ii) PVC	(b) Polyacrylonitrile
(iii) Acrilan	(c) Polycaprolactum
(iv) Natural rubber	(d) Low density polythene
(v) LDP	(e) cis-polyisoprene

**Solution:**

- (i) is c
- (ii) is a
- (iii) is b
- (iv) is e
- (v) is d

**40. Match the polymers given in Column I with their commercial names given in Column II.**

Column I	Column II
(i) The polyester of glycol and phthalic acid	(a) Novolac
(ii) The copolymer of 1, 3-butadiene	

and styrene (iii) Phenol and formaldehyde resin (iv) The polyester of glycol and terephthalic acid (v) The copolymer of 1, 3-butadiene and acrylonitrile	(b) Glyptal (c) Buna-S (d) Buna-N  (e) Dacron
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**Solution:**

- (i) is b
- (ii) is c
- (iii) is a
- (iv) is e
- (v) is d

**41. Match the polymers given in Column I with their main applications given in Column II.**

Column I	Column II
(i) Bakelite (ii) Low-density polythene (iii) Melamine-formaldehyde resin (iv) Nylon 6 (v) Polytetrafluoroethane (vi) Polystyrene	(a) Unbreakable crockery (b) Non-stick cookwares (c) Packaging material for shock absorbance (d) Electrical switches (e) Squeeze bottles (f) Tyre, cords

**Solution:**

- (i) is d
- (ii) is e
- (iii) is a
- (iv) is f
- (v) is b
- (vi) is c

**42. Match the polymers given in Column I with the preferred mode of polymerisation followed by their monomers.**

Column I	Column II
(i) Nylon-6,6 (ii) PVC (iii) HDP	(a) Free radical polymerisation (b) Ziegler-Natta polymerisation or coordination polymerisation (c) Anionic polymerisation (d) Condensation polymerisation

**Solution:**

- (i) is d
- (ii) is a
- (iii) is b

**43. Match the polymers given in Column I with the type of linkage present in**

they have given in Column II.

Column I	Column II
(i) Terylene (ii) Nylon (iii) Cellulose (iv) Protein (v) RNA	(a) Glycosidic linkage (b) Ester linkage (c) Phosphodiester linkage (d) Amide linkage

**Solution:**

- (i) is b
- (ii) is d
- (iii) is a
- (iv) is d
- (v) is c

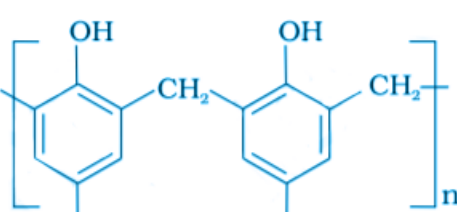
44. Match materials are given in Column I with the polymers given in Column II.

Column I	Column II
(i) Natural rubber latex (ii) Wood laminates (iii) Ropes and fibres (iv) Polyester fabric (v) Synthetic rubber (vi) Unbreakable crockery	(a) Nylon (b) Neoprene (c) Dacron (d) Melamine formaldehyde resins (e) Urea-formaldehyde resins (f) cis-polyisoprene

**Solution:**

- (i) is f
- (ii) is e
- (iii) is a
- (iv) is c
- (v) is b
- (vi) is d

45. Match the polymers given in Column I with their repeating units given in Column II.

Column I	Column II
(i) Acrilan	(a) $\left( \text{CH}_2 - \underset{\text{C}_6\text{H}_5}{\text{CH}} \right)_n$
(ii) Polystyrene	(b) $\left( \text{CH}_2 - \underset{\text{Cl}}{\text{C}} = \text{CH} - \text{CH}_2 \right)_n$
(iii) Neoprene	(c) $\left( \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_2 - \underset{\text{CN}}{\text{CH}} \right)_n$
(iv) Novolac	(d) $\left( \text{CH}_2 - \underset{\text{CN}}{\text{CH}} \right)_n$
(v) Buna-N	(e) 
	(f) $\left( \text{CH}_2 - \underset{\text{Cl}}{\text{CH}} \right)_n$

**Solution:**

- (i) is d
- (ii) is a
- (iii) is b
- (iv) is e
- (v) is c

**V. Assertion and Reason Type**

**Note:** In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (i) Assertion and reason both are correct statements but reason does not explain assertion.
- (ii) Assertion and reason both are correct statements and reason explain the assertion.
- (iii) Both assertion and reason are the wrong statements.
- (iv) The assertion is correct statement and reason is the wrong statement.
- (v) The assertion is the wrong statement and reason is the correct statement.

46. Assertion: Rayon is a semi-synthetic polymer and is taken as a better

**choice than cotton fabric.**

**Reason: Mechanical and aesthetic properties of cellulose can be improved by acetylation.**

**Solution:**

Option (ii) is correct.

**47. Assertion: Most of the Synthetic polymers are not biodegradable.**

**Reason: Polymerisation process induces toxic character in organic molecules.**

**Solution:**

Option (iv) is correct

**48. Assertion: Olefinic monomers undergo addition polymerisation.**

**Reason: Polymerisation of vinyl chloride is initiated by peroxides/persulphates.**

**Solution:**

Option (i) is correct

**49. Assertion: Polyamides are best used as fibres because of high tensile strength.**

**Reason: Strong intermolecular forces (like hydrogen bonding within polyamides) lead to close packing of chains and increase the crystalline character, hence, provide high tensile strength to polymers.**

**Solution:**

Option (ii) is correct

**50. Assertion: For making rubber synthetically, isoprene molecules are polymerised.**

**Reason: Neoprene (a polymer of chloroprene) is a synthetic rubber.**

**Solution:**

Option (iv) is correct

**51. Assertion: Network polymers are thermosetting.**

**Reason: Network polymers have high molecular mass.**

**Solution:**

Option (i) is correct

**52. Assertion: Polytetrafluoroethene is used in making non-stick cookware.**

**Reason: Fluorine has the highest electronegativity.**

**Solution:**

Option (i) is correct