Very Short Answer Questions

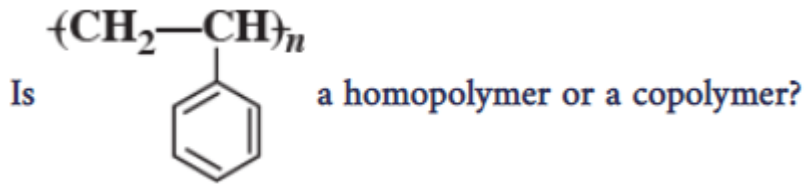
Very Short Answer Questions (PYQ)

Q.1. Give an example of elastomers.

[*CBSE Delhi 2009*]

Ans. Buna–S, neoprene.

Q.2.



Ans. Homopolymer.

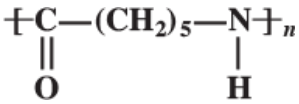
Q.3. Which of the following is a natural polymer?

Buna-S, Proteins, PVC

[*CBSE (AI) 2014*]

Ans. Proteins.

Q.4.



[*CBSE (F) 2013*]

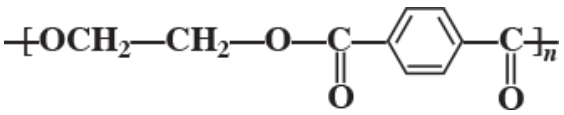
Ans. Caprolactam.

Q.5. Based on molecular forces what type of polymer is neoprene?

[*CBSE (AI) 2014*]

Ans. Elastomer

Q.6. Write the names of monomers of the following polymer:



[*CBSE (F) 2013*]

Ans. Ethylene glycol and terephthalic acid

Q.7. Give one example of a condensation polymer.

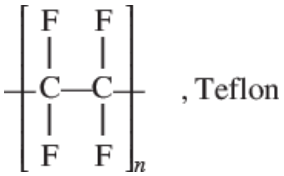
[*CBSE (AI) 2013*]

Ans. Nylon-6,6 or Dacron

Very Short Answer Questions (OIQ)

Q.1. Give the structure and name of the polymer which is used for making non-stick utensils.

Ans.


, Teflon

Q.2. What do you understand by addition polymers?

Ans. Polymers which are formed by repeated addition of monomer molecules containing double and triple bonds are called addition polymers. Examples are polythene, PVC, PAN, PMMA, etc.

Q.3. Name a synthetic polymer which is an ester.

Ans. Terylene or dacron.

Q.4. Write the monomer units of bakelite.

Ans. Phenol and formaldehyde.

Q.5. Name a synthetic polymer which is an amide.

Ans. Nylon-6, 6.

Q.6. What is a plasticiser?

Ans. Organic compounds which when added to plastics make them soft and workable are called plasticisers. Examples are di-*n*-octylphthalate, tricresyl phosphate, etc.

Q.7. What is the commercial name of PMMA? What is its use?

Ans. The commercial name of PMMA (polymethylmethacrylate) is perspex. It is used as a substitute of glass. It is used for making lenses, transparent domes, aircraft windows and sky lights.

Q.8. Identify the type of polymer.

—A—A—A—A—A—A—

[*NCERT Exemplar*]

Ans. Homopolymer

Q.9. Is $+CH_2-CH(C_6H_5)+_n$ a homopolymer or a copolymer?

Ans. It is a homopolymer and the monomer from which it is obtained is styrene $C_6H_5CH=CH_2$.

Q.9. Identify the type of polymer

—A—B—B—A—A—A—B—A—

[*NCERT Exemplar*]

Ans. Copolymer.

Q.10. Can enzyme be called a polymer?

[*NCERT Exemplar*]

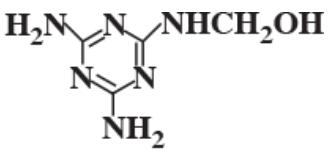
Ans. Enzymes are biocatalysts which are proteins and are thus polymers.

Q.11. Mention which of the following are addition polymers:

(*i*) Terylene (*ii*) Nylon-6, 6 (*iii*) Neoprene (*iv*) Teflon.

Ans. Neoprene and teflon are addition polymers.

Q.11. How is the following resin intermediate prepared and which polymer is formed by this monomer unit?



(Resin intermediate)

[*NCERT Exemplar*] [*HOTS*]

Ans. Melamine and formaldehyde are starting materials for this intermediate. Its polymerisation gives melamine polymer.

Q.14. Can nucleic acids, proteins and starch be considered as step growth polymers?

[*NCERT Exemplar*] [*HOTS*]

Ans. Yes, step growth polymers are condensation polymers and they are formed by the loss of simple molecules like water leading to the formation of high molecular mass polymers.

Short Answer Questions-I

Short Answer Questions-I (PYQ)

Q.1. Write the name of monomers used for getting the following polymers:

[*CBSE (AI) 2014*]

Q. Teflon

Ans. Tetrafluoroethene

Q. Buna-N

Ans. 1, 3–butadiene and acrylonitrile

Q.2. Write the name of monomers used for getting the following polymers:

[*CBSE (AI) 2014*]

Q. Bakelite

Ans. Phenol and formaldehyde

Q. Neoprene

Ans. Chloroprene

Q.3. Name the sub-groups into which polymers are classified on the basis of magnitude of intermolecular forces.

[*CBSE Delhi 2011*]

Ans. On the basis of magnitude of intermolecular forces polymers are classified into following four sub-groups:

i. Elastomers
ii. Fibres
iii. Thermoplastic polymers
iv. Thermosetting polymers

Q.4. Arrange the following polymers in increasing order of their intermolecular forces:

[*CBSE (F) 2013*]

i. **Nylon-6,6, Buna-S, Polythene**
ii. **PVC, Nylon-6, Neoprene**

Ans.

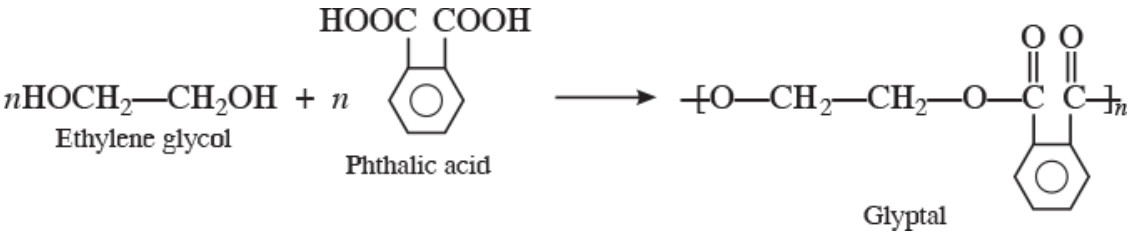
i. Buna-S < Polythene < Nylon 6,6.
ii. Neoprene < PVC < Nylon-6.

Short Answer Questions-I (OIQ)

Q.1. Write equations for the synthesis of the given polymers

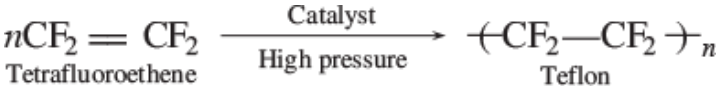
Q. Glyptal

Ans.



Q. Taflon

Ans.



Q.2. Write the structures of the monomers of the following polymers:

(*i*) PVC (*ii*) Polypropene

Ans.

S.No.	Polymers	Monomer	Structures of the Monomer
(*i*)	PVC	Vinyl chloride	CH_2= CH—Cl
(*ii*)	Polypropene	Propene	CH_3—CH=CH_2

Q.3. Differentiate the following pair of polymers based on the property mentioned against each.

Q. Novolac and bakelite (structure)

Ans. Novolac is a straight chain linear polymer but bakelite is cross linked.

Q. Buna-S and terylene (intermolecular forces of attraction)

Ans. Buna-S is an elastomer having weak van der Waals intermolecular forces whereas terylene is a fibre having strong intermolecular hydrogen bonding.

Q.4. What are LDPE and HDPE? How are they prepared?

Ans. LDPE (Low Density Polyethylene): LDPE is obtained by the polymerisation of ethene under high pressure of 1000–2000 atm at 350–570 K in the presence of an initiator.

HDPE (High Density Polyethylene): It is obtained when polymerisation is done in the presence of Ziegler–Natta catalyst at 333–343 K under 6–7 atm pressure.

Q.5. How does the presence of benzoquinone inhibit the free radical polymerisation of a vinyl derivative?

Ans. Benzoquinone traps the radical intermediate to form a non-reactive radical, which is highly stabilised by resonance. Due to the lack of reactivity of this intermediate, further progress of the chain reaction is interrupted and the reaction stops.

Q.6. Answer the following questions:

Q. Why are rubbers called elastomers?

[*NCERT Exemplar*]

Ans. Rubbers are stretched on application of force and regain original state after the force is removed. Therefore, these are called elastomers.

Q. Why should the monomers used in addition polymerisation through free radical pathway be very pure?

[*NCERT Exemplar*]

Ans. Pure monomers are required because even the traces of impurities may act like inhibitors which leads to the formation of polymers with shorter chain length.

Q.7. Answer the following question :

Q. How does vulcanisation change the properties of natural rubber?

Ans. Rubber gets cross-linked through —S—S— bonds and becomes hard on vulcanisation.

Q. Why are the numbers 6,6 and 6 put in the names of nylon 6, 6 and nylon 6?

Ans. In nylon-6,6, two sixes stand for hexamethylene diamine (a monomer with 6C–atoms) and adipic acid (another monomer with 6C–atoms).

In nylon-6, six stands for the only monomer caprolactam (6 C–atoms).

Short Answer Questions-II

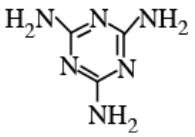
Short Answer Questions-II (PYQ)

Q.1. Write the structures of the monomers used for getting the following polymers:

[*CBSE (AI) 2017*]

i. **Polyvinyl chloride (PVC)**
ii. **Melamine-formaldehyde polymer**
iii. **Buna-N**

Ans.

S.No.	Polymer	Monomer Name	Monomer Structure
(*i*)	PVC	Vinyl chloride	CH_2=CH—Cl
(*ii*)	Melamine-formaldehyde polymer	Melamine	 HCHO
		Formaldehyde	HCHO
(*iii*)	Buna-N	1,3-Butadiene	CH_2=CH—CH=CH_2
		Acrylonitrile	CH_2=CH—CN

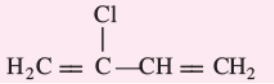
Q.2. Write the names and structures of the monomers of the following polymers:

i. **Nylon–6, 6**
ii. **PHBV**
iii. **Neoprene**

[*CBSE Delhi 2015*]

Ans.

	Polymers	Monomer Structures	Monomer Names

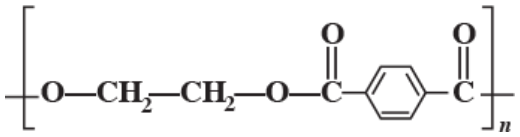
(*i*)	Nylon-6, 6	$H_2N(CH_2)_6NH_2$ $HOOC—(CH_2)_4COOH$	Hexamethylene diamine Adipic acid
(*ii*)	PHBV	$CH_3CH(OH)CH_2COOH$ $CH_3CH_2CH(OH)CH_2COOH$	3-hydroxybutanoic acid 3-hydroxypentanoic acid
(*iii*)	Neoprene		Chloroprene

Q.3. Answer the following question :

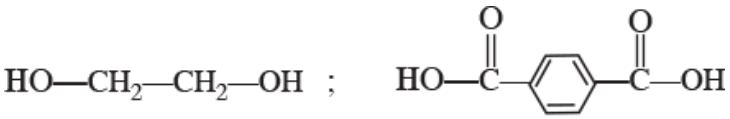
Q. What is the role of sulphur in the vulcanisation of rubber?

Ans. On vulcanisation, sulphur forms cross-links at the reactive sites of the double bond and thus rubber gets stiffened.

Q. Identify the monomers in the following polymer:



Ans.



Ethylene glycol ; Terephthalic acid

Q. Arrange the following polymers in the increasing order of their intermolecular forces:

Terylene, Polythene, Neoprene

[*CBSE Central 2016*]

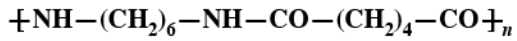
Ans. Neoprene < Polythene < Terylene

Q.4. Answer the following question

Q. What is the role of *t*-butyl peroxide in the polymerisation of ethene?

Ans. It acts as a free radical generating initiator in the chain initiation step of polymerisation of ethene.

Q. Identify the monomers in the following polymer:



Ans.

Q. Arrange the following polymers in the increasing order of their intermolecular forces:

Polystyrene, Terylene, Buna-S

[*CBSE Delhi 2016*]

Ans. Buna-S < Polystyrene < Terylene

Q.5. Explain the following terms giving a suitable example for each:

Q. Elastomers

Ans. Elastomers: These are the polymers having the weakest intermolecular forces of attraction between the polymer chains. The weak forces permit the polymer to be stretched. A few 'cross links' are introduced between the chains, which help the polymer to retract to its original position after the force is released as in vulcanised rubber. Elastomers thus possess an elastic character, *e.g*., buna-S, buna-N, neoprene, etc.

Q. Condensation polymers

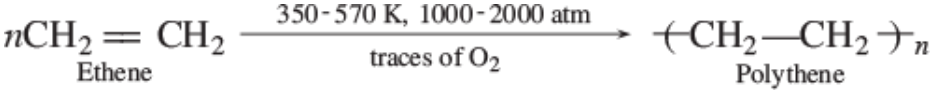
Ans. Condensation polymers: The condensation polymers are formed by the repeated condensation reaction between different bifunctional or trifunctional monomer

units usually with elimination of small molecules such as water, alcohol, hydrogen chloride, etc. Nylon 6, 6, nylon 6, terylene are some examples.

Q. Addition polymers

[*CBSE (AI) 2012*]

Ans. Addition polymers: Addition polymers are formed by repeated addition of same or different monomer molecules. The monomers used are unsaturated compounds, *e.g*., alkenes, alkadienes and their derivatives. Polythene is an example of addition polymer.



Q.6. Give one example each of

Q. Addition polymers

Ans. Polythene, PVC

Q. Condensation polymers

Ans. Nylon-6, Nylon-6,6

Q. Copolymers.

[*CBSE Delhi 2010*]

Ans. Buna-S, Buna-N.

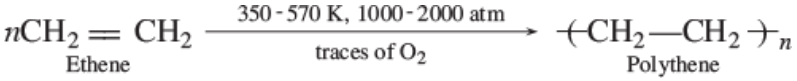
Q.7. What are addition polymers? How are the two types of addition polymers different from each other? Give one example of each type.

[*CBSE (F) 2011*]

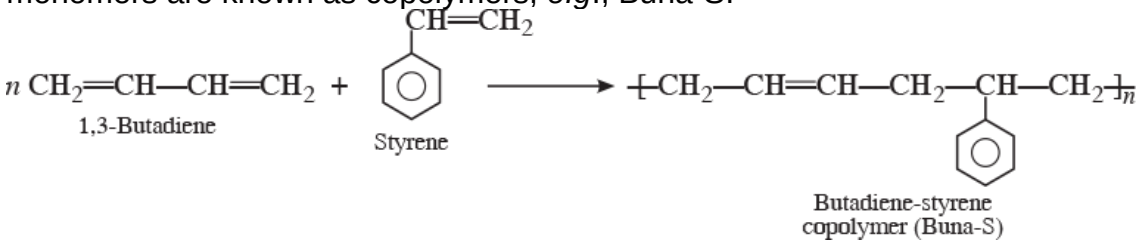
Ans. Polymers which are formed by the repeated addition of monomers molecules possessing double or triple bonds are called the addition polymers.

The two types of addition polymers are:

i. Homopolymers: The addition polymers formed by the polymerisation of a single monomeric species are called homopolymers, *e.g*., polythene.



ii. Copolymers: The polymers made by addition polymerisation from two different monomers are known as copolymers, *e.g.*, Buna-S.



Q.8. Mention two important uses for each of the following polymers:

[*CBSE (F) 2011*]

Q. Bakelite

Ans. It is used for making combs, fountain pen barrels, phonograph records.

It is used widely in making electrical goods such as switches, plugs, handles of various utensils.

Q. Nylon 6,6

Ans. It is used for making combs, fountain pen barrels, phonograph records.

It is used widely in making electrical goods such as switches, plugs, handles of various utensils.

It is used in making bristles for brushes, ropes.

It is used for making carpets and fabrics in textile industry.

Q. PVC

Ans. It is used in the manufacture of raincoats, handbags, water pipes, vinyl flooring.

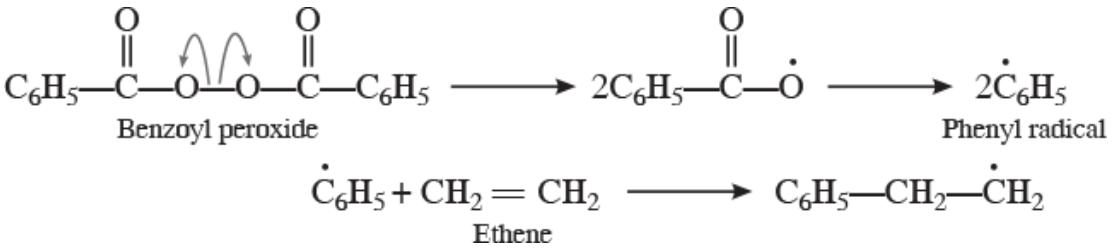
It is used for insulating electric wires.

Q.9. Write the mechanism of free radical polymerisation of ethene.

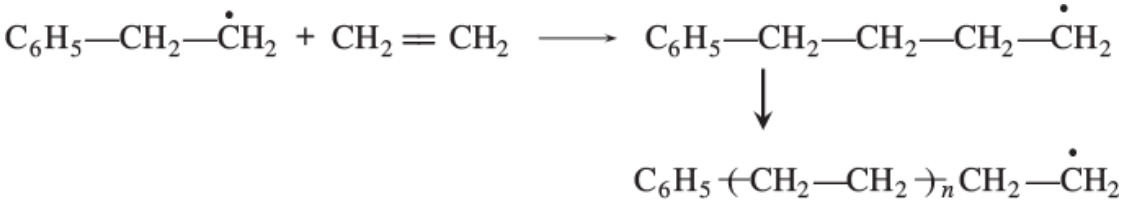
[*CBSE Delhi 2016*]

Ans. The sequence of steps governing the free radical polymerisation of ethene to form polythene are follows:

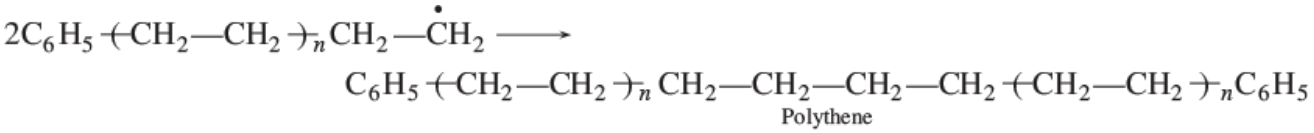
Chain initiation step: Benzoyl peroxide undergoes homolytic fission to form free radicals.



Chain propagating step:



Chain termination step: The chain reaction stops when two free radical chains combine.



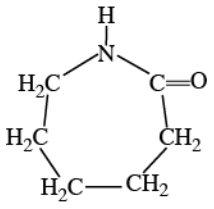
Short Answer Questions-II (OIQ)

Q.1. Write the structure and name of the monomers of the following polymers:

i. **Buna-S**
ii. **Nylon-6**
iii. **Teflon.**

Ans.

S.No.	Polymers	Monomer Names	Monomer Structures
(*i*)	Buna-S	1, 3–Butadiene Styrene	$CH_2=CH-CH=CH_2$ $CH_2=CH-C_6H_5$

(*ii*)	Nylon-6	Caprolactam	
(*iii*)	Teflon	Tetrafluoroethene	$CF_2=CF_2$

Q.2. Give one example for each of the following:

Q. Thermoplastic

Ans. Polythene

Q. Natural polymer

Ans. Natural rubber.

Q. Chain growth polymer

Ans. PVC (polyvinyl chloride)

Q.3. Which of the following polymers soften on heating and harden on cooling? What are the polymers with this property collectively called? What are the structural similarities between such polymers?

Bakelite, urea–formaldehyde resin, polythene, polyvinyls, polystyrene.

[*NCERT Exemplar*] [*HOTS*]

Ans. Polythene, polyvinyls and polystyrene soften on heating and harden on cooling. Such polymers are called thermoplastic polymers. These polymers are linear or slightly branched long chain molecules. These possess intermolecular forces whose strength lies between strength of intermolecular forces of elastomers and fibres.

Q.4. Write names of monomer/s of the following polymers and classify them as addition or condensation polymers.

i. **Teflon**
ii. **Bakelite**
iii. **Natural Rubber**

Ans.

	Polymers	**Type**	**Monomer**
(*i*)	Teflon	Addition	Tetrafluoroethene
(*ii*)	Bakelite	Condensation	Phenol and formaldehyde
(*iii*)	Natural rubber	Addition	*cis*-isoprene

Q.5. What is vulcanisation? Why is it done? Why is diphenyl amine added to rubber?

Ans. Vulcanisation is a process of heating natural rubber with sulphur. This is done so as to make it more elastic, hard, more abrasion resistant by sulphur cross-linking. Diphenyl amine is added to rubber so as to prevent its oxidation.

Q.6. Explain the following processes with a suitable example in each case:

Q. Chain growth polymerization

Ans. Chain growth polymerisation: This type of polymerisation involves the initial formation of a free radical or an ion (from small amount of initiator such as organic peroxide) to which monomers get added up by a chain reaction. Here, the polymers are exact multiples of organic monomeric molecules and have only carbon atoms in their main chain. Various steps involved in chain growth polymerisation of ethene are:

a.

$$\text{Initiator} \xrightarrow[\text{split up}]{\text{Heat, light, etc.}} \underset{\text{Free radical}}{\overset{\bullet}{\text{A}}}$$

b.

$$\overset{\bullet}{\text{A}} + \underset{\text{Monomer}}{\text{CH}_2 = \text{CH}_2} \longrightarrow \underset{\text{(Intermediate species)}}{\text{A—CH}_2\text{—}\overset{\bullet}{\text{C}}\text{H}_2}$$

c.

$$\text{A—CH}_2\text{—}\overset{\bullet}{\text{C}}\text{H}_2 + \underset{\text{Monomer}}{\text{CH}_2 = \text{CH}_2} \longrightarrow \underset{\text{(Bigger intermediate species)}}{\text{A—CH}_2\text{—CH}_2\text{—CH}_2\text{—}\overset{\bullet}{\text{C}}\text{H}_2}$$

Examples: polyethylene, teflon, etc.

Q. Step growth polymerisation.

Ans. Step growth polymerisation: This type of polymerisation involves a series of condensation reactions between simple monomers containing polar groups, with or without the elimination of small molecules like water, HCl, NH_3, etc. In addition to carbon atoms, these polymers contain other atoms also in their main chain. Steps may be illustrated as follows:

a. $\underset{\text{Monomer}}{A} + \underset{\text{Monomer}}{B} \xrightarrow{\text{Condensation}} AB$

b. $A—B + A \xrightarrow{\text{Condensation}} A—B—A$

c. $A—B + A—B \xrightarrow{\text{Condensation}} A—B—A—B.....$

Examples:Terylene, nylon, etc.

The step wise growth can also occur in another manner:

a. $A + B \xrightarrow{\text{Condensation}} A—B$

b. $AB + AB \xrightarrow{\text{Condensation}} \underset{\text{Polymer}}{ABAB.....(AB)_n}$

Q.7. Answer the following:

Q. To have practical applications, why are cross links required in rubber?

[*NCERT Exemplar*]

Ans. Cross links bind the planar polymer sheets thus increasing its elastomeric properties.

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

[*NCERT Exemplar*]

Ans. Strong intermolecular forces like hydrogen bonding, lead to close packing of chains that imparts crystalline character.

Q. Which type of biomolecules have some structural similarity with synthetic polyamides? What is this similarity?

[*NCERT Exemplar*]

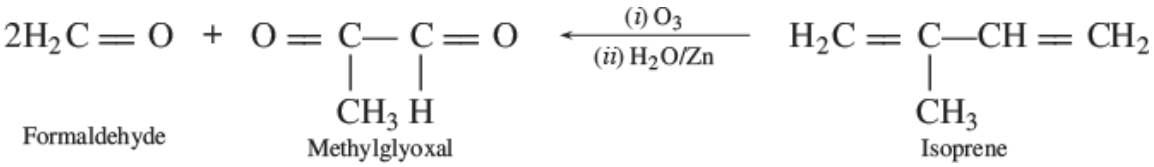
Ans. Proteins have structural similarity with synthetic polyamides. Polyamides and proteins both contain amide linkage.

Q.8. A monomer of a polymer upon ozonolysis gives one mole of methylglyoxal and two moles of formaldehyde.

i. **Identify the monomer of the polymer.**
ii. **Give its free radical mode of addition polymerisation.**

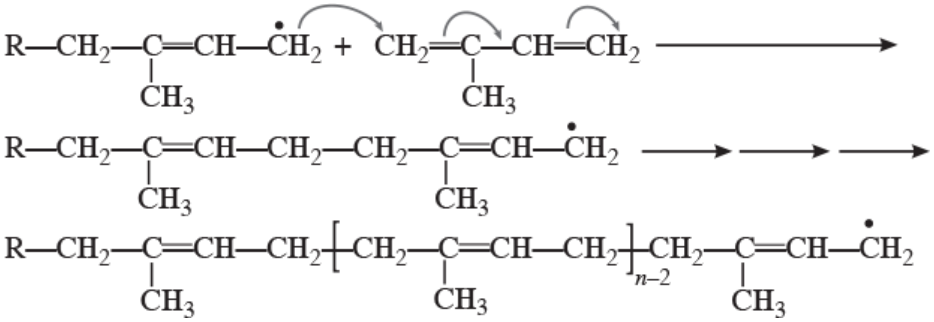
[*HOTS*]

Ans. i. As the monomer on ozonolysis gives one mole of methylglyoxal and two moles of formaldehyde, therefore, the monomer is isoprene.

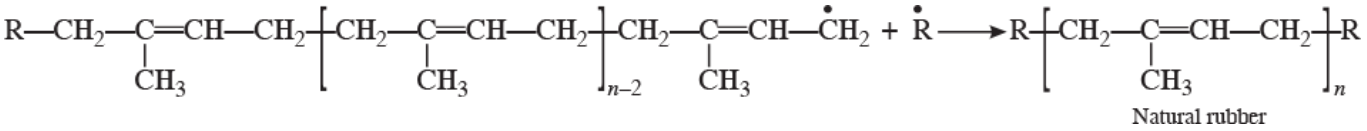


ii. The free radical mechanism of polymerisation of isoprene may be given as follows:

Chain propagation:



Chain termination: One of the mode of chain termination is

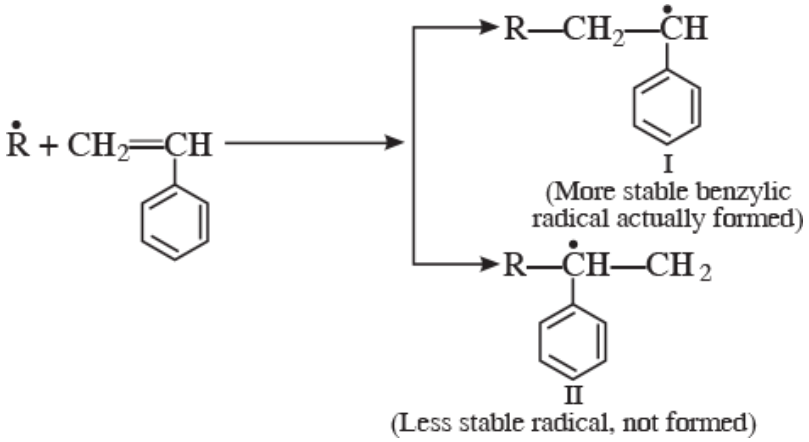


Q.9. Explain why free radical polymerisation of styrene gives a product in which phenyl groups are on alternate carbon atoms rather than on adjacent carbon atoms.

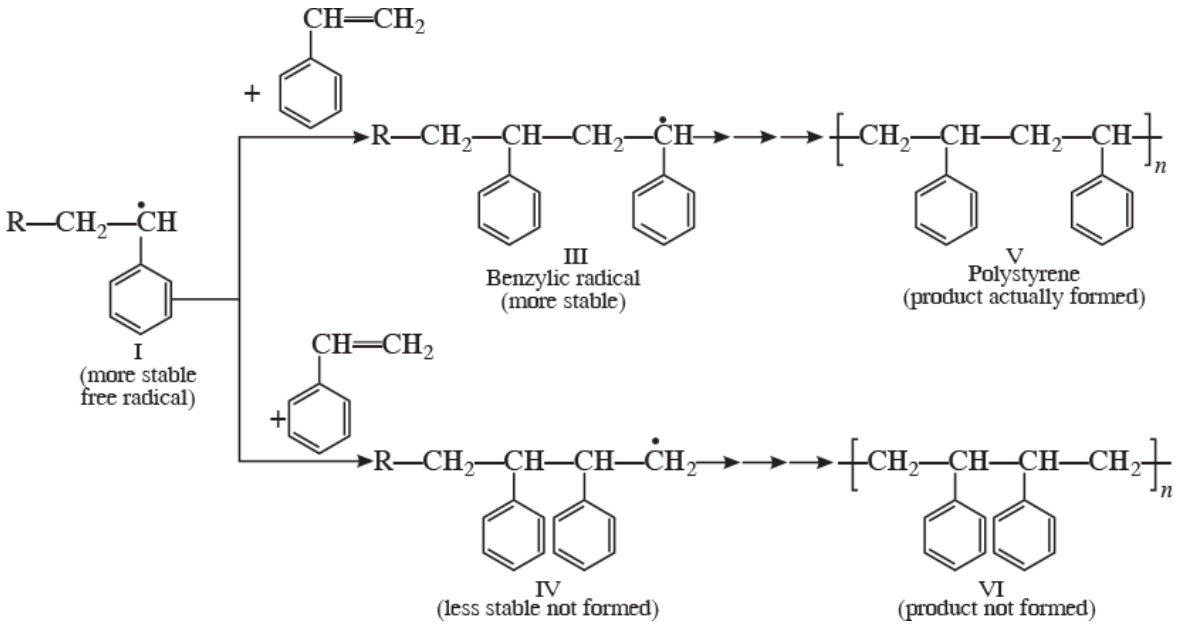
[*HOTS*]

Ans. During free radical polymerisation, the addition of free radical to monomer molecules occurs in accordance with Markovnikov's rule so as to give more stable benzylic free radical.

For example,



This process goes on till polystrene (V) in which the phenyl groups are on alternate carbon atoms is obtained rather than the product (VI) in which the phenyl groups are on adjacent carbon atoms.

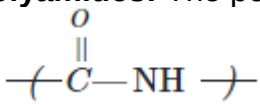


Q.10. Briefly describe the following terms giving one example of each:

Q. Polyolefins

Ans. Polyolefins: These are polymers derived from unsaturated hydrocarbons, for example, polypropene.

Q. Polyamides

Ans. Polyamides: The polymers having large number of amide linkage  in the chain are called polyamides, for example, nylon-6, 6 and nylon-6.

Q. Polyesters

Ans. Polyesters: These are the polycondensation products of dicarboxylic acids and diols. Dacron or terylene is the best known example of polyesters.