

CHAPTER 14

MACROMOLECULES

MULTIPLE CHOICE QUESTIONS

- Which one of the following is inorganic polymer:
(a) Graphite (b) Rubber
(c) DNA (d) Protein
- Hardening of oil involves which of the following process:
(a) Oxidation (b) Hydrogenation
(c) Saponification (d) Hydrolysis
- Which characteristic functional group is present in fats:
(a) Aldehyde (b) Ketone
(c) Carboxylic acid (d) Ester
- In which of the following case Zn^{2+} ions are used as co-factor:
(a) Chrome oxidase (b) Carbonic anhydrase
(c) Glucose (d) Anaerobic oxidation of $\text{C}_6\text{H}_{12}\text{O}_6$
- Which of the following is an example of associated lipid:
(a) Stearin (b) Lipoprotein
(c) Vitamin D (d) Glycerol phospholipid
- Formation of Terylene and Nylon both are examples of:
(a) Addition reaction (b) Elimination reaction
(c) Condensation reaction (d) Hydrogenation reaction
- Quantitatively unsaturation of oils is determined by:
(a) Iodine-number (b) Acid number
(c) Passing H_2 gas (d) Adding Br_2

8. **Cholesterol belong to:**
(a) Vitamins (b) Carbohydrates
(c) Fats (d) Lipids
9. **Amino acids in protein are linked together by:**
(a) Ester linkage (b) Peptide linkage
(c) Ether linkage (d) Glycosidic linkage
10. **The colour which cellulose can give with I_2 solution:**
(a) Blue (b) Green
(c) Red (d) No colour
11. **Which one of the following plastic is a thermo setting plastic:**
(a) PVC (b) Polystyrene
(c) Polyethylene (d) Bakelite
12. **Which one of the following polymer is called a polyamide:**
(a) Rayon (b) Orlon
(c) Nylon (d) Terylene
13. **Which of the following enzymes bring about the hydrolysis of fats:**
(a) Urease (b) Maltase
(c) Zymase (d) Lipase
14. **Which one of the following is a water soluble vitamin:**
(a) Vit-A (b) Vit-D
(c) Vit-E (d) Vit-C
15. **Which one of the following element is not present in all proteins:**
(a) Carbon (b) Hydrogen
(c) Nitrogen (d) Sulphur
16. **Which one of the following is purine:**
(a) Cytosine (b) Uracil
(c) Adenine (d) Thyamine
17. **Which one of the following is not a fatty acid:**
(a) Oleic acid (b) Stearic acid
(c) Phtalic acid (d) Butanoic acid

18. Which of the following is optimum temperature of most of enzymes:
- (a) 0°C (b) 37°C
(c) 45°C (d) 100°C
19. Which of the following is the most abundant organic substance found in nature:
- (a) Fructose (b) Starch
(c) Cellulose (d) Glucose
20. Cholesterol is an important precursor in the biosynthesis of:
- (a) Adrenal hormone (b) Sex hormone
(c) Vitamin D (d) All of these
21. Vegetable oils are:
- (a) Unsaturated fatty acids
(b) Glycerides of saturated fatty acids
(c) Saturated fatty acids
(d) Glycerides of unsaturated fatty acids
22. The fiber which is made from acrylonitrile as monomer:
- (a) Acrylone fiber (b) Polyester fiber
(c) PVC (d) Rayon fiber
23. Which of these enzymes is an acidic pH active enzymes:
- (a) Lipase (b) Amylase
(c) Pepsin (d) Trypsin
24. Which of these polymers is a synthetic polymer:
- (a) Animal fat (b) Starch
(c) Cellulose (d) Polyester
25. Which of these polymers is an addition polymer:
- (a) Nylon-6, 6 (b) Starch
(c) Cellulose (d) Polyester
26. Which of the following is not a polymer:
- (a) Starch (b) Glucose
(c) Protein (d) Nylon

27. **Starch is a polymer of:**
- (a) Fructose (b) α -D glucose
(c) β -D glucose (d) Sucrose
28. **After digestion protein change to:**
- (a) Fatty acid (b) Glucose
(c) Amino acid (d) Glycerol
29. **Raffinose is a/an:**
- (a) Monosaccharide (b) Disaccharide
(c) Trisaccharide (d) Polysaccharide
30. **The substance that retard the activity of enzyme is called:**
- (a) Co-enzyme (b) Apo-enzyme
(c) Activator (d) Inhibitor
31. **Which one of the following is not a polymer:**
- (a) Glycogen (b) Starch
(c) Teflon (d) Petroleum
32. **The molecular formula of a trisaccharide will be:**
- (a) $C_3H_3O_3$ (b) $C_3H_6O_3$
(c) $C_{18}H_{36}O_{18}$ (d) $C_{18}H_{32}O_{16}$
33. **All fats are:**
- (a) Carbohydrate (b) Hydrocarbon
(c) Esters (d) Aldehydes
34. **Which one of the following is a co-polymer:**
- (a) PVC (b) PVA
(c) Polyethylene (d) Nylon
35. **Glycosidic linkage is present in:**
- (a) Proteins (b) Nylon-6, 6
(c) Starch (d) DNA

answers

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



SOLVED EXERCISE

Q.1 Fill in the blanks:

- (i) Macromolecules are built up from small units called _____.
- (ii) Nylon is a polyamide and terylene is a _____.
- (iii) Nylon is prepared by the reaction of _____ and hexamethylenediamine.
- (iv) Based on their thermal properties, plastics are divided into _____ main classes.
- (v) Polyvinyl chloride is a _____ plastic.
- (vi) Glucose is stored as _____ in the liver.
- (vii) Glucose and fructose are water _____ carbohydrates.
- (viii) Protein after digestion changes to _____.
- (ix) Purine and pyrimidine are _____ of nucleic acids.
- (x) Addition of a plasticizer _____ the flexibility of the polymer.

answers

(i)	monomer	(ii)	polyester	(iii)	adipic acid
(iv)	two	(v)	thermo	(vi)	glycogen
(vii)	soluble	(viii)	amino acid	(ix)	bases
(x)	increase				

Q.2 Indicate True or False:

- (i) Nylon 6, 6 and terylene are condensation polymers.
- (ii) The disposal of plastics does not cause any pollution problem.
- (iii) Fructose is a polysaccharide carbohydrate.
- (iv) Human beings get no food nutrient from cellulose.
- (v) The most abundant and the most important steroid in the human body is vitamin D.
- (vi) Enzymes are the compounds containing C, H and O only.

- (vii) The degree of unsaturation of fats is measured by their iodine number.
- (viii) Activity of an enzyme varies with temperature and pH.
- (ix) Nucleic acids are biological catalysts.
- (x) The nucleic acids are responsible for protein synthesis in the human body.

answers

(i)	True	(ii)	False	(iii)	False	(iv)	True	(v)	False
(vi)	False	(vii)	True	(viii)	True	(ix)	False	(x)	True

Q.3 Multiple choice questions. Encircle the correct answer:

- (i) In which of these processes are small organic molecules made into macromolecules:
- The cracking of petroleum fractions
 - The fractional distillation of crude oil
 - The polymerization of ethene
 - The hydrolysis of proteins
- (ii) Which of these polymers is an addition polymer:
- Nylon-6, 6
 - Polystyrene
 - Terylene
 - Epoxy resin
- (iii) Which of these polymers is a synthetic polymer:
- Animal fat
 - Starch
 - Cellulose
 - Polyester
- (iv) Plastics are a pollution problem because many plastics:
- Are made from petroleum
 - Are very inflammable
 - Burn to produce toxic fumes
 - Decompose to produce toxic products
- (v) The fibre which is made from acrylonitrile as monomer:
- PVC
 - Rayon fibre
 - Acrylic fibre
 - Polyester fibre
- (vi) A polymeric substance that is formed in the liquid state and then hardened to a rigid solids is called a:
- Fibre
 - Plastic

- (c) Varnish (d) Polyamide resin
- (vii) **Vegetable oils are:**
- (a) Unsaturated fatty acids
(b) Glycerides of unsaturated fatty acids
(c) Glycerides of saturated fatty acids
(d) Essential oils obtained from plants
- (viii) **Which one of the following elements is not present in all proteins:**
- (a) Carbon (b) Hydrogen
(c) Nitrogen (d) Sulphur
- (ix) **Which one of the following is a water soluble vitamin:**
- (a) Niacin (b) Riboflavin
(c) Trypsin (d) Ascorbic acid
- (x) **Which one of the following enzymes brings about the hydrolysis of fats:**
- (a) Urease (b) Maltase
(c) Zymase (d) Lipase
- (xi) **The reaction between fat and NaOH is called:**
- (a) Esterification (b) Hydrogenolysis
(c) Fermentation (d) Saponification
- (xii) **Which one of the following statements about glucose and sucrose is incorrect:**
- (a) Both are soluble in water (b) Both are naturally occurring
(c) Both are carbohydrates (d) Both are disaccharides

answers

(i)	(c)	(ii)	(b)	(iii)	(d)	(iv)	(c)	(v)	(c)
(vi)	(b)	(vii)	(b)	(viii)	(d)	(ix)	(d)	(x)	(d)

(xi)	(d)	(xii)	(d)
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Q.4 Explain the following terms:

- (a) Addition polymer (b) Condensation polymer
(c) Thermoplastic (d) Thermosetting plastic

Ans.

- (a) **Addition Polymer:** The polymers which are formed by the repeated addition of monomers is called addition polymer. Monomers are unsaturated compounds (derivatives of ethene). For example: PVC, PVA, Polyethylene.
- (b) **Condensation Polymer:** When two monomers join together to produce a polymer along with the elimination of a small molecule like water then the resultant polymer is called as condensation polymer. e.g., Polyester, Bakelite.
- (c) **Thermoplastic:** Such type of plastic which can be softened repeatedly when heated and hardened when cooled with a little change in properties. e.g., PVC pipes.
- (d) **Thermosetting Plastic:** The polymers which become hard on heating and cannot be softened again are called thermosetting polymers. A thermosetting polymer decomposes instead of melting. e.g., Epoxy resins.

Q.5 Write notes on:

- (a) Polyester resins (b) Polyamide resins
(c) Epoxy resins

Ans.

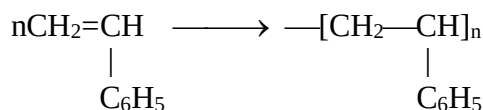
Detailed question. See text book.

Q.6 What is the repeating unit in each of the following polymers?

- (a) Polystyrene (b) Nylon-6, 6
(c) Teflon (d) Orlon

Ans.

- (a) **Polystyrene:** In polystyrene repeating unit is styrene ($\text{H}_2\text{C} = \text{CH}-\text{C}_6\text{H}_5$)



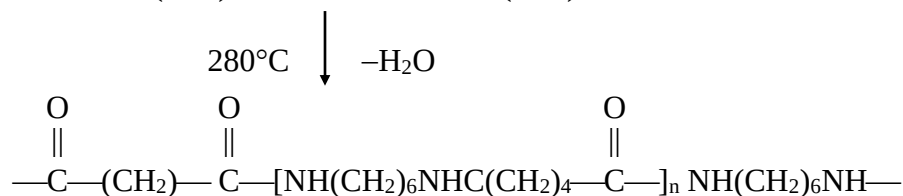
Styrene

Polystyrene

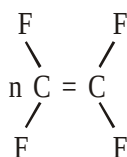
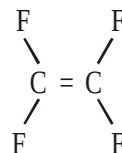
- (b) **Nylon-6, 6:** In nylon-6, 6 repeating units are:

Adipic acid $\text{HOOC}-(\text{CH}_2)_4-\text{COOH}$

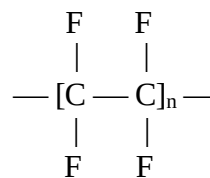
Hexamethylene diamine $\text{H}_2\text{N}-(\text{CH}_2)_6-\text{NH}_2$



(c) **Teflon:** In teflon repeating unit is tetrafluoro ethene



Tetrafluoro ethene



Polytetrafluoro ethene (teflon)

(d) **Orlon:** In orlon repeating unit is acrylonitrile $\text{CH}_2=\text{CH}-\text{CN}$



Acrylonitrile

Orlon fiber or acrylic fiber

Q.7 What are carbohydrates and how are they classified?

Ans. Descriptive question. See text book for details.

Q.8 Point out one difference between the compounds in each of the following pairs:

(a) Glucose and fructose

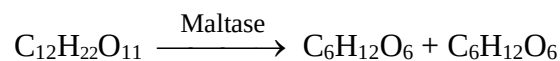
(b) Sucrose and maltose

(c) Cellulose and starch

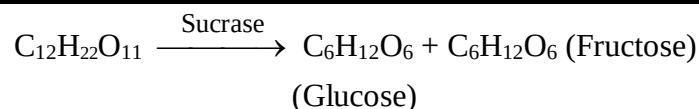
Ans.

(a) Glucose is polyhydroxy aldehyde and fructose is polyhydroxy ketone.

(b) Maltose on hydrolysis give glucose:



Sucrose on hydrolysis gives glucose and fructose:



(c) Starch is polymer of α -D-glucose, cellulose is polymer of β -D-glucose.

Q.9 What are lipids? In what way fats and oils are different?

Ans. Descriptive question. See text book for details.

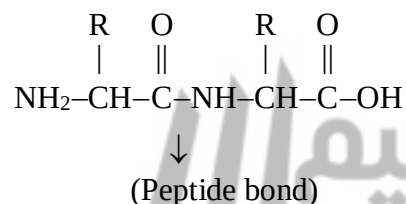
Q.10 Define saponification number and iodine number. Discuss the term rancidity.

Ans. Definitions see in text book.

Q.11 What is the difference between a glycoside linkage and a peptide linkage?

Ans. Glycoside Linkage: This is present in oligosaccharides and polysaccharides. Whenever monosaccharides combine together with the elimination of H_2O molecule, the resulting bond is Glycoside. e.g., In sucrose molecule.

Peptide Linkage: This linkage is present in proteins. Amino acids combine together through a peptide bond with the elimination of water molecule. e.g.,



Q.12 What is the chemical nature of enzymes? Discuss the classification of enzymes.

Ans. Detailed question. Consult text book.

Q.13 What are nucleic acids? Write down the role of DNA and RNA in life.

Ans. Nucleic Acids: See in text book.

DO YOU KNOW?

1. Satudinger (1920) gave the idea of formation of polymers.
2. The number of repeating units which determine the length of the polymer is called degree of polymerization.
3. The type of addition polymers which is formed by the polymerization of single type of monomer is called homopolymer.
4. The type of polymer formed by the polymerization of two types of monomers is called copolymer.
5. Orlon is used for the manufacture of textile fibre.
6. Vinyl acetate is used in chewing gums.
7. Formula of raffinose is $C_{18}H_{32}O_{16}$.
8. Natural starch contains 10 – 20% amylose and 80 – 90% amylopectin.
9. Amylose is water soluble but amylopectin is insoluble in water.
10. The number of milligrams of KOH required to saponify one gram of fat or oil is called saponification number.
11. The number of grams of iodine which will react with 100g of oil or fat is called iodine number.
12. Glucose is stored in the liver as glycogen.
13. Nylon is a polyamide but terylene is a polyester.
14. Vit-A ($C_{20}H_{30}O$) is called beauty-vitamin.
15. Deficiency disease of Vit-A is night blindness.
16. Formula of Vit-C (Ascorbic acid) is $C_6H_8O_6$.
17. Deficiency disease of Vit-C is scurvy.
18. Formula of Vit-D is $C_{28}H_{44}O$.
19. Deficiency disease of Vit-D is rickets.
20. Formula of Vit-B₁₂ $C_{63}H_{88}N_{14}O_{14}PCo$ (Cyanocobalamine).