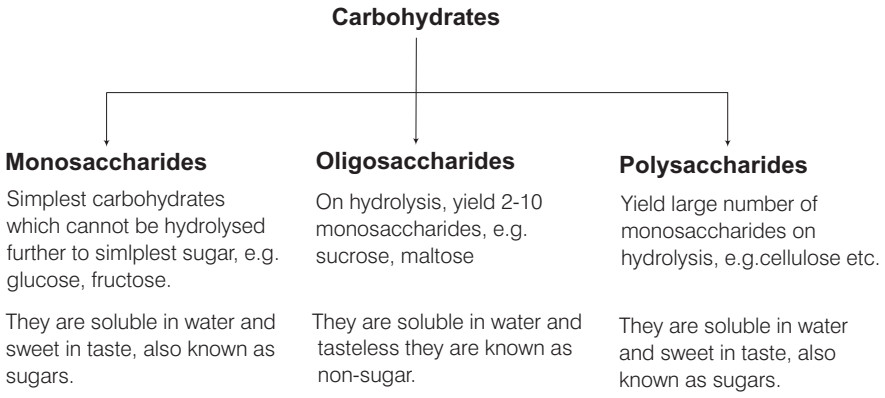
CHAPTER

14

Biomolecules

A Quick Recapitulation of the Chapter

1. Substance or molecules occurring in the living system are called **biomolecules**.
2. Carbohydrates are optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis. Most of them have a general formula, $C_x(H_2O)_y$ and are called as **hydrate of carbon**.
3. On the basis of their reducing nature, carbohydrates can be grouped as reducing sugars and non-reducing sugars.
4. **Reducing sugars** contain free aldehydic or ketonic group and reduce Fehling's solution and Tollen's reagent. All monosaccharides and disaccharides having free aldehydic or ketonic group are reducing sugars. e.g. maltose and lactose.
5. **Non-reducing sugars** do not have free aldehydic or ketonic group and do not reduce Fehling's solution and Tollen's reagent. In disaccharides, if the reducing groups of monosaccharides are bonded, they are non-reducing in nature. e.g. sucrose.
6. On the basis of their behaviour of hydrolysis, these are classified as monosaccharides, disaccharides and polysaccharides.



7. Glucose exists in two cyclic form, i.e. α-D-glucose and β-D-glucose.
8. Amino acids are the organic compounds which contain both carboxylic acid (—COOH) and amino (—NH_2) group in their molecules.

9. The amino acids which can be synthesised in the body, are known as **non-essential amino acids**, those which cannot be synthesised in the body and must be obtained through diet, are known as **essential amino acids**.
10. Proteins are the polymers of α-amino acids and they are connected to each other by peptide **bond** or peptide linkage.
11. Protein can be classified into two types on the basis of their molecular shape, i.e. **fibrous proteins** and **globular proteins**.
12. Structure and shape of proteins can be studied at four different levels, i.e. primary, secondary, tertiary and quaternary.
13. Due to temperature change or pH change, secondary and tertiary structure are destroyed but primary structure remains intact. The process is called **denaturation of proteins**.
14. **Enzymes** are the biocatalysts and specific in function.
15. **Vitamins** are certain organic compounds required in the diet in small amounts to perform specific biological functions for optimum growth and maintenance health of an organism.
16. Vitamins are classified into two groups depending upon their solubility in water or fat. Vitamins B and C are water soluble and vitamins A, D, E and K are fat soluble.
17. **Nucleic acids** are the genetic material of the cells. They are responsible for transmission of hereditary effects from one generation to the other.

    They also carry out the biosynthesis of proteins. They consists of three components *viz* a sugar, a nitrogenous base and a phosphate group.
18. DNA and RNA are two types of nucleic acids.
19. DNA has double stranded α-helix structure. It occurs in the nucleus of the cell. It controls the hereditary effects.
20. RNA has single stranded α-helix structure.It occurs in the cytoplasm of the cell. It controls the synthesis of protein.
21. DNA contains four bases *viz* adenine, guanine, cytosine and thymine. RNA also contains four bases, the first three bases are same as in DNA but the fourth one is uracil (instead of thymine in DNA).
22. A unit formed by the attachment of base to 1′ position of sugar is known as nucleoside.
23. Nucleotides are joined together by phosphodiester linkage between 5′ and 3′ carbon atoms of the pentose sugar.
24. RNA molecules are of three types, i.e. messenger RNA (*m* - RNA), ribosomal RNA (*r* - RNA) and transfer RNA (*t* - RNA).

Objective Questions Based on NCERT Text

Topic 1
Carbohydrates

1. Select the biomolecule(s) that help during the formation of the living system.
(a) Carbohydrates (b) Nucleic acids
(c) Lipids (d) All of these

2. Which one of the following pairs is the essential constituent of our food?
(a) Nucleic acids and lipids
(b) Proteins and carbohydrates
(c) Proteins and nucleic acids
(d) Proteins and lipids

3. Select the incorrect statement about the sugar.
(a) It is sweet in taste
(b) Sugar present in milk is called sucrose
(c) Greek word '*sakcharon*' means sugar
(d) Not all of the carbohydrates are called sugars

4. Carbohydrates are classified on the basis of their behaviour on hydrolysis. They have been broadly divided into
(a) two groups (b) three groups
(c) four groups (d) five groups

5. Carbohydrate that cannot be hydrolysed further to give simpler unit of polyhydroxy aldehyde or ketone is called
(a) monosaccharide
(b) oligosaccharide
(c) polysaccharide
(d) sucrose

6. How many natural monosaccharides are known to occur in nature?
(a) 5 (b) 10 (c) 15 (d) 20

7. The number of monosaccharides formed when an oligosaccharide under go hydrolysis ranges between
(a) 1-10 (b) 2-10
(c) 4-10 (d) 5-10

8. What will be produced it a molecule of sucrose is hydrolysed?
(a) One molecule of glucose
(b) Two molecule of glucose
(c) One molecule of glucose and fructose
(d) One molecule of glucose and maltose

9. Why polysaccharides are called non-sugars?
(a) They yield large number of monosaccharide on hydrolysis
(b) They do not taste sweet
(c) They are reducing sugars
(d) They are non-reducing sugars

10. Find out the correct option among the following statements.
(a) In reducing sugars, aldehydic and ketonic group are not free bonded
(b) Maltose and lactose are non-reducing sugar
(c) Fehling's solution and Tollens' reagent are the non-reducing sugar
(d) All monosaccharides whether aldoses or ketoses are reducing sugar

11. On what basis are the manosaccharides classified?
(a) Number of oxygen atoms and the functional group present in them
(b) Its molecular weight
(c) Functional group present in them
(d) Number of C-atoms and the functional group present in them

12. Which of the following reactions correctly represents the synthesis of glucose?

(a) $\underset{\text{Sucrose}}{C_{12}H_{22}O_{12}} + H_2O \xrightarrow{H^+} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$

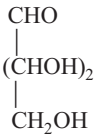
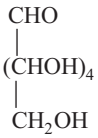
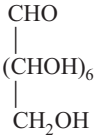
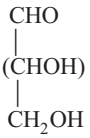
(b) $\underset{\text{Sucrose}}{C_{12}H_{22}O_{12}} + H_2O \xrightarrow{H^+} 2\underset{\text{Glucose}}{C_6H_{12}O_6}$

(c) $\underset{\text{Starch or cellulose}}{(C_6H_{10}O_5)_n} \xrightarrow[\text{393 K, 2-3 atm}]{H^+} n\underset{\text{Glucose}}{C_6H_{12}O_6}$

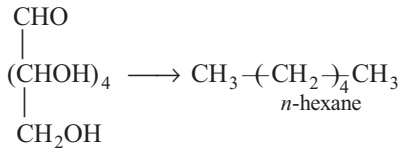
(d) $\underset{\text{Starch or cellulose}}{(C_6H_{10}O_5)_n} + H_2O \xrightarrow[\text{273 K}]{H^+} n\underset{\text{Glucose}}{C_6H_{12}O_6}$

13. Choose the correct statement(s) about glucose.
(a) It is also called dextrose
(b) It is monomer of starch and cellulose
(c) Its molecular formula is $C_6H_{12}O_6$
(d) All of the above

14. What is the following structures correctly represent of the glucose?

(a)  (b)  (c)  (d) 

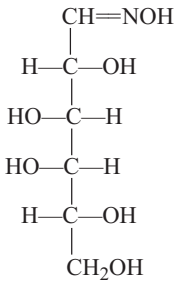
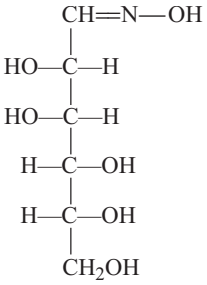
15. Name the reagent and condition required for carrying out of the following reaction.

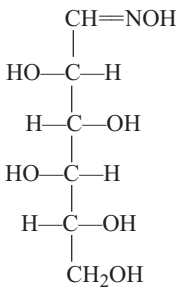
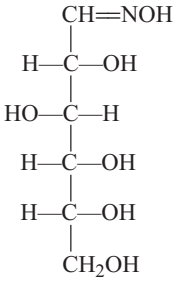


(a) HF, Δ (b) HCl, Δ (c) HBr, Δ (d) HI, Δ

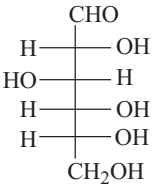
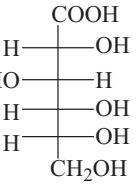
16. D - (+) - glucose reacts with hydroxylamine and yields an oxime.The structure of the oxime would be

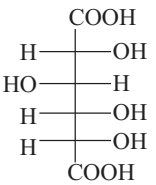
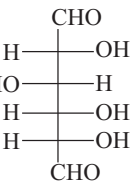
(CBSE AIPMT 2014)

(a)  (b) 

(c)  (d) 

17. What is the product formed when D-glucose is treated with Br_2 water?

(a)  (b) 

(c)  (d) 

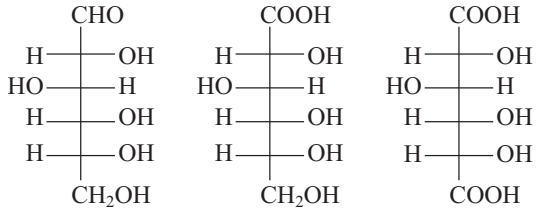
18. Select the evidence for the open chain structure of glucose.

(a) Reaction with Tollens' reagent
(b) Reaction with Fehling's solution
(c) Pentaacetyl derivative of glucose
(d) Cyanohydrin formation with HCN

19. Name the product which is formed by the oxidation of glucose and gluconic acid with nitric acid.

(a) Rhamnose
(b) Saccharic acid
(c) Citric acid
(d) Oxalic acid

20. The spacial arrangement of different —OH groups in the molecules is given.



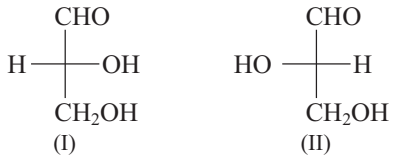
Choose the correct option with names for I, II and III.

(a) I → Gluconic acid II → Glucose, III → Saccharic acid
(b) I → Saccharic acid, II → Glucose, III → Gluconic acid
(c) I → Glucose, II → Gluconic acid, III → Saccharic acid
(d) I → Glucose, II → Saccharic acid, III → Gluconic acid

21. What does 'D' and (+) signifies in D-(+)-glucose?

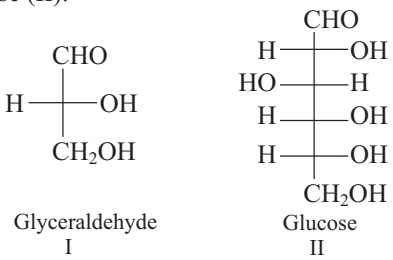
(a) D represents conformation and (+) represents the laevorotatory nature of molecule
(b) D represents configuration and (+) represents the dextrorotatory nature of molecule
(c) D represents conformation and (+) represents the dextrorotatory nature of molecule
(d) D represents configuration and (+) represents the laevorotatory nature of molecule

22. Which of the following statement is false about the given structure?



(a) These are the isomers of glyceraldehyde
(b) Both contain one asymmetric carbon atom
(c) Both exist in the two enantiomeric form
(d) I → (–)-glyceraldehyde said to have L-configuration
II → (+)-glyceraldehyde said to have D-configuration

23. Assign the configuration to glyceraldehyde (I) and glucose (II).

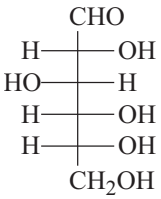


Choose the correct option.

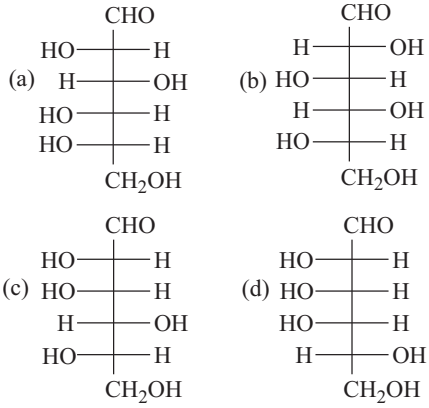
(a) I → D; II → D (b) I → L; II → L
(c) I → L; II → D (d) I → D; II → L

24. The structure of D-(+)-glucose is?

(JEE Adv. 2015)



The structure of L-(–)-glucose is



25. How is the α-form of glucose obtained?

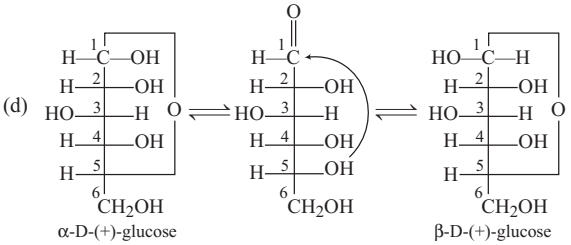
(a) It is obtained by the crystallisation from concentrated solution of glucose at 317 K
(b) It is obtained by the crystallisation from concentrated solution of glucose at 303 K
(c) It is obtained by the crystallisation from hot saturated aqueous solution at 303 K
(d) It is obtained by the crystallisation from hot and saturated aqueous solution at 371 K

26. Select the false statement about the cyclic glucose.

(a) If the —OH group is added to —CHO group it will form cyclic hemiacetal structure
(b) Glucose form six-membered ring in which —OH is at C-5 position

(c) Melting point of α-glucose is 423 K and of β-glucose is 419 K

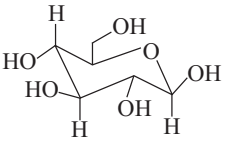
(d)



α-D-(+)-glucose β-D-(+)-glucose

27. Which of the following is β-pyranose among the given options?

(a)



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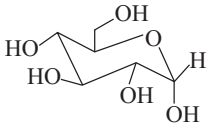

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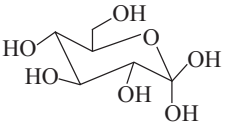

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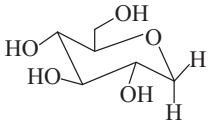


28. In which of the following classes does the glucose and mannose are placed?

(a) Epimers (b) Anomers
(c) Ketohexose (d) Disaccharide

29. What are the number of chiral carbon atoms present in α-D-glucose molecule?

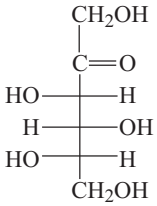
(a) 3 (b) 4 (c) 5 (d) 6

30. What is the relation between the two hemiacetal form of glucose?

(a) They are anomers (b) They are isomers
(c) They are epimer (d) They are pyranose

31. Choose the structure of D-(–)-fructose.

(a)



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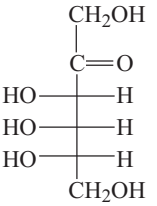

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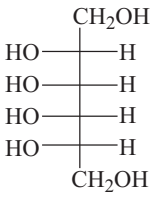

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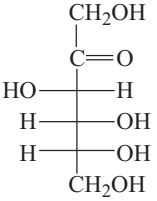
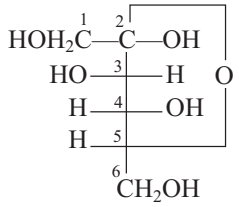


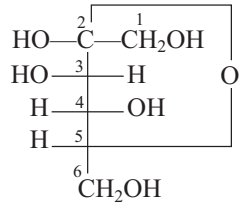
32. Which of the following statement is correct about fructose?

(a) It is dextrorotatory compound
(b) It exists in the two cyclic forms which is obtained by the addition of —OH at C-5 to the $>C=O$ group
(c) It exists as six membered ring
(d) It is named as furanose as it contain one oxygen and six carbon atom

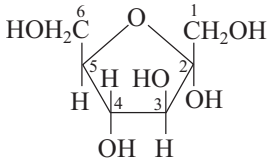
33. Identify the α-D -(–) - fructofuranose and β -D - (–) - fructofuranose from the following structure.



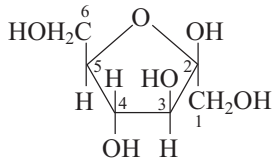
I



II



III

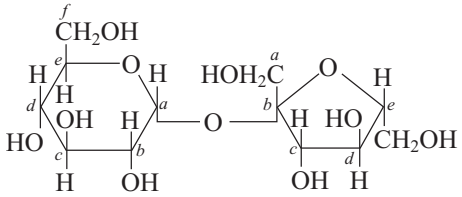


IV

Choose the correct option.

	α-D-(–)-fructofuranose	β-D-(–)-fructofuranose
(a)	I and II	III and IV
(b)	I and III	II and IV
(c)	II and III	I and IV
(d)	II and IV	I and III

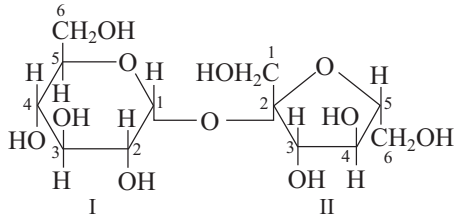
34. Identify the monosaccharide units in the given structure.



I II

(a) I → α-D-glucose, II → β-D-fructose
(b) I → α-D-fructose, II → β-D-glucose
(c) I → α-D-fructose, II → β-D-glucose
(d) I → α-L-glucose, II → β-L-fructose

35. Which one of the following statements is correct about disaccharide?



I II

(a) Ring I is furanose with β-glycosidic link
(b) Ring II is furanose with β-glycosidic link
(c) Ring I is pyranose with β-glycosidic link
(d) Ring II is pyranose with β-glycosidic link

36. Which one of the following statements is not true regarding (+)- lactose? **(CBSE AIPMT 2011)**

(a) (+)- lactose, $C_{12}H_{22}O_{11}$ contains 8 —OH groups

(b) On hydrolysis (+)-lactose gives equal amount of D-(+) glucose and D-(+) galactose

(c) (+)-lactose is a β-glycoside formed by the union of molecule of D-(+)-glucose and a molecule of D-(+)-galactose

(d) (+)-lactose is reducing sugar and does not exhibit mutarotation

37. Name the constituents and type of linkage present in α-maltose.

(a) one α-D-glucopyranose unit and one β-D-glucopyranose unit with 1, 2-glycosidic linkage

(b) two α-D-glucopyranose unit with 1, 2-glycosidic linkage

(c) two β-D-glucopyranose units with 1, 4-glycosidic linkage

(d) two α-D-glucopyranose units with 1, 4-glycosidic linkage

38. Which one of the following pair is the reducing sugar?

(a) Sucrose and maltose (b) Maltose and lactose

(c) Lactose and sucrose (d) Sucrose and glucose

39. Which of the following polymer is stored in the cell wall?

(a) Cellulose (b) Amylose

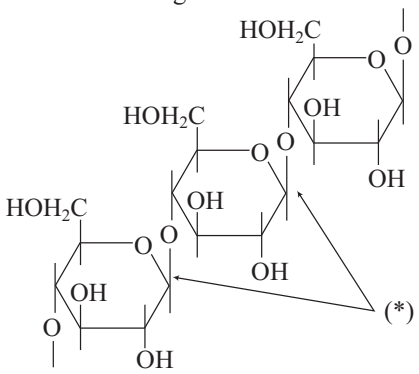
(c) Amylopectin (d) Glycogen

40. A polysaccharide is composed only of β-D-glucose units which are joined by glycosidic linkage between C-1 of one glucose unit and C-4 of the next glucose unit. Name the polysaccharide.

(a) Amylose (b) Cellulose

(c) Amylopectin (d) Glycogen

41. Consider the following the structure.



Name the kind linkage which has been indicated with (*) in the above figure.

(a) α-linkage (b) β-linkage (c) γ-linkage (d) δ-linkage

Topic 2
Proteins

42. Which of the following statements is/are correct about proteins?

(a) Proteins form the basis of structure and function of life

(b) They are required for growth and maintenance of body

(c) They are polymers of α-amino acids

(d) All of the above

43. Amino acids are classified as α, β, γ and δ on the basis of

(a) their relative position of amino group

(b) their relative position of amino group with respect to carboxyl group

(c) their relative position of carboxyl group

(d) the relative position of ester with respect to carboxyl group

44. Name the product obtained on the hydrolysis of protein.

(a) Only β-amino acids

(b) Only α-amino acids

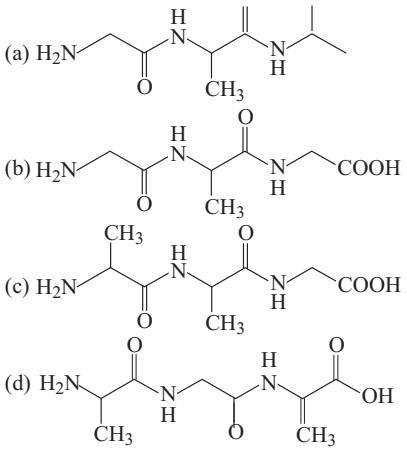
(c) Only β-carboxylic acids

(d) Only α-carboxylic acids

45. Which one of the following amino acid has phenyl —OH group?

(a) Lysine (b) Arginine (c) Proline (d) Tyrosine

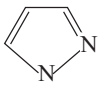
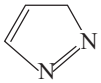
46. Which one of the following is the correct representation of tripeptide i.e. (alanine-glycine-alanine)?



47. Which one of the following amino acid does not give the ninhydrin test?

(a) Aspartic acid (b) Glycine
(c) Proline (d) Lysine

48. Which one of the following ring is present in the histidine?

(a)  (b) 
(c)  (d) 

49. Which of the following statements is not correct about a Zwitter ion?

(a) It is neutral and does not contain any charges
(b) It consists of carboxyl and amino groups
(c) It is dipolar
(d) Many amino acids exist as Zwitter ions

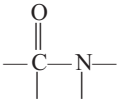
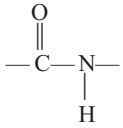
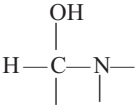
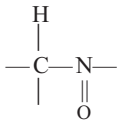
50. Amino acids exist in Zwitter ion form, considering this fact what is the structure of glycine at pH = 4?

(a) $H_3N^{\oplus}—CH_2—COO^-$ (b) $H_3N^{\oplus}—CH_2—COOH$
(c) $H_2N—CH_2—COOH$ (d) $H_2N—CH_2—COO^-$

51. Which of the following amino acids is not optically active?

(a) Lysine (b) Glycine (c) Leucine (d) Glutamine

52. Which is the correct representation of peptide bond?

(a)  (b) 
(c)  (d) 

53. Name the molecule which is eliminated during the formation of peptide bond.

(a) Hydrogen (b) Oxygen (c) Water (d) Alcohol

54. The maximum number of tripeptides which can be obtained from the 20 naturally occurring amino acids is

(a) 8000 (b) 6470
(c) 7465 (d) 5360

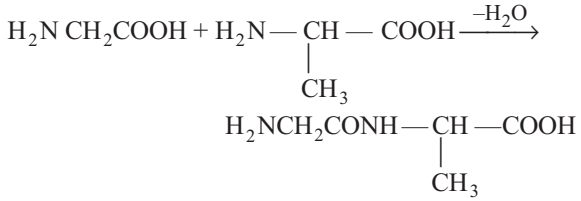
55. How many number of water molecules are removed from the *n* number of amino acids during the formation of peptide bond?

(a) $(n-1)$ b) n
(c) $(n/2)$ (d) $(n+1)$

56. A tripeptide is composed equally of L-tyrosine, L-glycine and L-valine (one molecule of each). How many number of tripeptides can be obtained?

(a) 3 (b) 4 (c) 6 (d) 8

57. In the given reaction,



Name the dipeptide which is formed in the above reaction.

(a) Alanglycine (b) Glycylalanine
(c) Alaninglycine (d) Glycinalanine

58. Which of the following statements is/are correct?

(a) When four, five or six amino acids are linked, the respective products are known as tetrapeptide, pentapeptide, or hexapeptide
(b) Polypeptide with more than hundred amino acid residues, having molecular mass higher than 10000 u is called protein
(c) Polypeptide with fewer amino acids are called proteins if they have well defined conformation of protein such as insulin
(d) All of the above

59. On what basis, do the fibrous and globular proteins are classified?

(a) On the basis of number of the amino acids
(b) On the basis of their molecular shape
(c) On the basis of type of the amino acids
(d) On the basis of molecular weight

60. "When the polypeptide chains run parallel are held together by hydrogen and disulphide bonds, then fibre like structure is formed. Such proteins are generally insoluble in water."

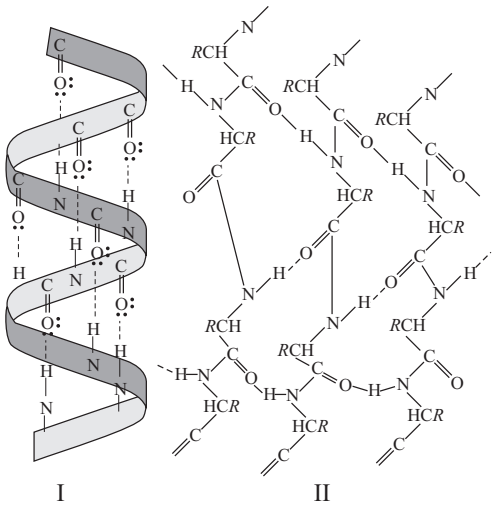
Name the type of protein which favours the above information.

(a) Fibrous protein (b) Globular protein
(c) Primary protein (d) Tertiary protein

61. Which of the following statements is incorrect about the secondary structure of protein?

(a) It refers to the shape in which long polypeptide chain can exist
(b) It exists in two different type of structures, i.e. α-helix and β-pleated sheet structure
(c) Its structure arises due to regular folding of the backbone of the polypeptide chain
(d) There is the covalent bonding between $>C=O$ and —NH groups of the peptide bond

62.



I II

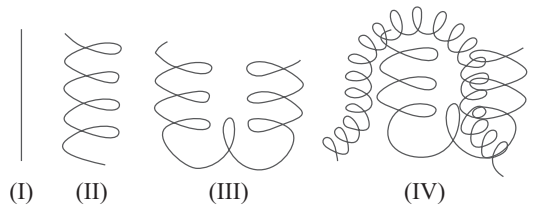
Identify I and II in the given figure.

	I	II
(a)	α-helix structure of protein	β-pleated sheet structure of protein
(b)	α-helix structure of DNA	β-pleated sheet structure of protein
(c)	α-helix structure of protein	β-pleated structure of DNA
(d)	2-helix strucure of DNA	β-pleated structure of DNA

63. The spatial arrangement of the two or more polypeptide chains with respect to each other is known as

(a) primary structure
(b) secondary structure
(c) tertiary structure
(d) quaternary structure

64. Diagrammatic represenations of protein structures are given below.



(I) (II) (III) (IV)

Identify I, II, III and IV in the above representation and choose the correct option.

	I	II	III	IV
(a)	Primary structure	Secondary structure	Tertiary structure	Quaternary structure
(b)	Primary structure	Tertiary structure	Secondary structure	Quaternary structure
(c)	Primary structure	Secondary structure	Quaternary structure	Tertiary structure
(d)	Quaternary structure	Tertiary structure	Secondary structure	Primary structure

65. Pick up the correct statement abount the denaturation of protein.

(a) During denaturation 1° and 2°structures of proteins are destroyed but 3° structure remains intact
(b) During denaturation 2° and 3°structures of proteins are destroyed but 1° structure remains intact
(c) During denaturation 1° and 3°structures of proteins are destroyed but 2° structure remains intact
(d) During denaturation 1° and 4°structures of proteins are destroyed but 3° structure remains intact

66. Which of the following is/are example(s) of denaturation of protein?

(a) Coagulation of egg white (b) Clotting of blood
(c) Curdling of milk (d) Both (a) and (c)

Topic 3
Enzymes and Vitamin

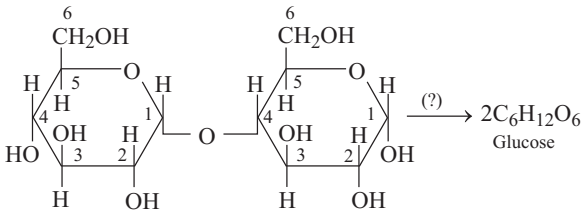
67. Which one of the following statements is incorrect about enzyme catalysts? **(CBSE AIPMT 2012)**

(a) Enzymes are mostly protein as in nature
(b) Enzyme action is specific
(c) Enzymes are denatured by ultraviolet rays and at high temperature
(d) Enzymes are least reactive at optimum temperature

68. Which of the following vitamins given below is water soluble? **(JEE Main 2015)**

(a) Vitamin C (b) Vitamin D
(c) Vitamin E (d) Vitamin K

69. Name the enzyme that catalyses the reaction given below.



(a) Talose (b) Lactose
(c) Pepsin (d) Maltase

70. What is the common name given to the enzyme which catalyse the oxidation of one substrate with simultaneous reduction of another substrate?
(a) Reductioxidase (b) Oxidonductase
(c) Oxidoreductase (d) Reductoxides

71. Which of the following is a fat soluble vitamin?
(a) Vitamin A (b) Vitamin B_6
(c) Vitamin C (d) Vitamin B_2

72. Why vitamin-C must be supplied regularly in diet?
(a) It is fat soluble vitamin hence stored in the body and cannot be used in regular basis
(b) It is water soluble vitamin hence excreted in urine and cannot be stored in the body
(c) It is required in a large amount by the body hence supplied regularly
(d) It is a water soluble vitamin hence used by the body on daily basis and is to be supplied regularly

73. Pyridoxin is also known as
(a) vitamin B_2 (b) vitamin B_6
(c) vitamin B_{12} (d) vitamin B_1

74. Which of the following is most common source of vitamin C?
(a) Amla and green leaf of vegetables
(b) Fish liver oil
(c) Milk
(d) Butter

75.

S.N.	Name of vitamins	Sources	Deficiency diseases
1.	Vitamin A	Fish liver oil, carrots, butter and milk	III
2.	I	Yeast, milk, green vegetables and cereals	Beri-beri (loss of appetite, retarded growth)
3.	II	Milk, egg white, liver, kidney	Cheilosis (fissuring at corners of mouth and lips), digestive disorders and burning sensation of the skin.
4.	Vitamin B_6 (pyridoxine)	Yeast, milk, egg yolk, cereals and grams	IV

Complete the blanks given in the table.

Codes

	I	II	III	IV
(a)	Vitamin B_1 (Thiamine)	Vitamin B_2 (Riboflavin)	Xerophthalmia	Convulsions
(b)	Vitamin B_2 (Riboflavin)	Vitamin B_1 (Thiamine)	Xerophthalmia	Convulsions
(c)	Vitamin B_1 (Thiamine)	Vitamin B_2 (Riboflavin)	Convulsions	Xerophthalmia
(d)	Vitamin B_2 (Riboflavin)	Vitamin B_1 (Thiamine)	Convulsions	Xeroph thalmia

76. Which of the following disease is caused by the deficiency of vitamin E?
(a) Beri-beri (b) Rickets
(c) Scurvy (d) Muscular weakness

Topic 4
Nucleic Acids

77. Name the particles in the nucleus of the cell responsible for heredity.
(a) Chromosomes (b) Mitrochondria
(c) Ribosomes (d) None of these

78. Which of the following statements is/are correct?
(a) The particles in nucleus of the cell, responsible for heredity are called chromosomes
(b) Chromosomes are made up of proteins and nucleic acids
(c) Nucleic acids are also called nucleosides
(d) Both (a) and (b)

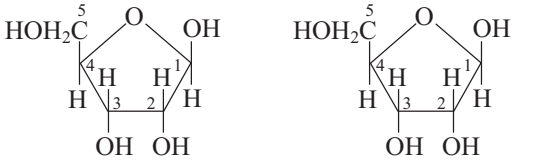
79. DNA and RNA are examples of
(a) Nucleosides
(b) Nucleotides
(c) Nucleic acids
(d) polypeptides

80. Which of the following was discovered by the J D Watson and F Crick?
(a) Chromosome is made up of protein and nucleic acid
(b) DNA is responsible for hereditory transmission
(c) DNA has double helix structure
(d) All of the above

81. The full forms of DNA and RNA are respectively.
(a) Deoxyribonucleic acid and ribonucleic acid
(b) Deribonucleic acid and ribonucleic acid
(c) Deoxyribonucleotidic acid and ribonucleotidic acid
(d) Deoxyribonucleosidic acid and ribonucleosidic acid

82. Which of the following match is correct between nucleic acid and its respective sugar base?
(a) DNA $\rightarrow$ β-D-3-deoxyribose
(b) DNA $\rightarrow$ β-D-1-deoxyribose
(c) RNA $\rightarrow$ β-D-ribose
(d) RNA $\rightarrow$ β-D-3-deoxyribose

83. Consider the following structures.



β-D-ribose (I) β-D-2-deoxyribose (II)

Identify structure I and II and choose the correct option.

	I	II
(a)	β-D-ribose	β-D-2-deoxyribose
(b)	α-D-ribose	β-D-3-deoxyribose
(c)	β-D-deoxyribose	β-D-ribose
(d)	β-D-deoxyribose	α-D-ribose

84. Which one of the following bases is not present in DNA? **(JEE Main 2015)**

(a) Quinoline (b) Adenine
(c) Cytosine (d) Thymine

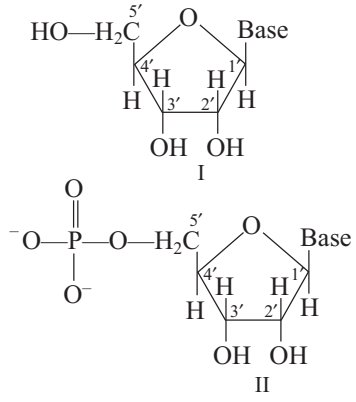
85. Select the base which is not common between DNA and RNA.

(a) Adenine (A) (b) Guanine (G)
(c) Cytosine (C) (d) Uracil (U)

86. What will be the sequence of complementary strand of DNA, if the one strand of DNA has the sequence of TATGACTG?

(a) ATACACTC (b) ACGTTGAC
(c) ATACTGAC (d) ATACTGCA

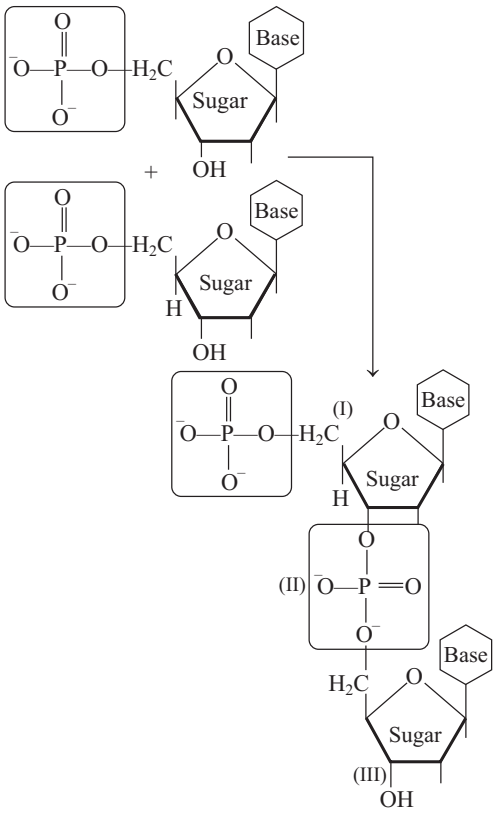
87. Consider the following structures



Identify I and II in the above structure and mark the correct option.

	I	II
(a)	Nucleoside;	Nucleotide
(b)	Nucleotide;	Nucleosite
(c)	Nucleoside;	Nucleotide
(d)	Nucleotide;	Nucleoside

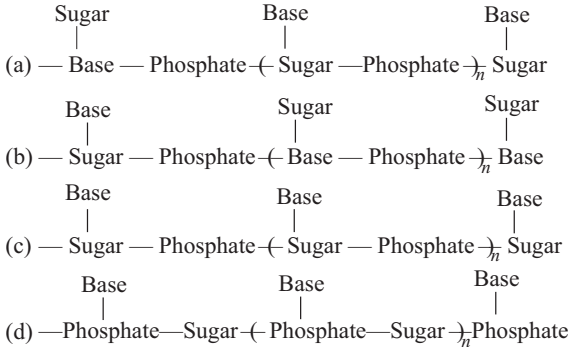
88. Consider the following reaction,



Identify I, II and III in the above figure and mark the correct option

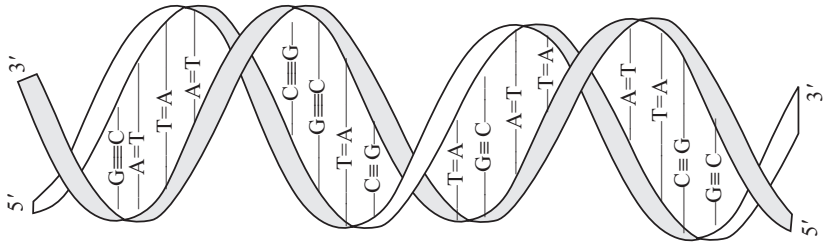
(a) I → 3′ end of chain II → Phosphodiester linkage
III → 5′ end of chain
(b) I → 3′ end of chain II → Phosphate linkage
III → 5′ end of chain
(c) I → 5′ end of chain II → Phosphodiester linkage
III → 3′ end of chain
(d) I → 5′ end of chain II → Phosphate linkage
III → 3′ end of chain

89. Select the correct and simplified version of nucleic acid chain from the following chains given in the options.



90. Complete hydrolysis of DNA/RNA yields
(a) a pentose sugar
(b) phosphoric acid
(c) base (nitrogen containing heterocyclic compounds)
(d) All of these

91. Choose the appropriate statement about the given figure.



(a) It is the double strand helix structure of DNA
(b) It is the double strand helix structure of RNA
(c) It is the β-pleated structure of DNA
(d) It is the β-pleated structure of RNA

92. Which one of the following does not constitute the nucleic acid?
(a) Uracil (b) Ribose sugar (c) Phosphoric acid (d) Guanidine

93. Which of the following statements is/are true?
(a) Every individual has unique fingerprints and it occur at the tips of fingers
(b) A sequence of bases on DNA is also unique for a person and information regarding this is called fingerprinting
(c) Fingerprints can be altered by the surgery
(d) All of the above

94. Which of the following is/are the application(s) of the DNA fingerprinting?
(a) in forensic laboratories for the identification of criminals
(b) to identify radical groups to rewrite biological evolution
(c) to determine paternity of an individual
(d) All of the above

Special Format Questions

I. More Than One Correct Option

95. Which of the following are reducing sugar?
(a) Glucose (b) Fructose
(c) Mannose (d) Sucrose

96. Which of the following statements are correct?
(a) The natural glucose and fructose are D-forms
(b) Glucose and fructose both are monosaccharides
(c) The solution having equal molecules of D-glucose and D-fructose is termed as invert sugar
(d) Aldohexoses exists in 2^6 optical forms

97. Pick up the correct statements from the following.
(a) Glucose exists in two different crystalline forms, α-D-glucose and β-D-glucose
(b) α-D-glucose and β-D-glucose are enantiomers
(c) Cellulose is a straight chain polysaccharide made up of only β-glucose units
(d) Cyclic structure of α-D-glucose and β-D-glucose is called pyranose structure

98. Which of the following carbohydrates are branched polymer of glucose?
(a) Amylopectin (b) Cellulose
(c) Amylose (d) Glycogen

99. Which of the following amino acids cannot be synthesised in the body?
(a) Valine (b) Leucine (c) Lysine (d) Glycine

100. Which of the following are basic amino acids?
(a) Lysine (b) Asparagine
(c) Arginine (d) Glutanic acid

101. Pick up the correct statements.
(a) There are 20 essential amino acids
(b) L-amino acids are represented by writing the —NH_2 group on the left side
(c) Only α-amino acids are obtained on hydrolysis of proteins
(d) The amino acids which are synthesised in the body are known as non-essential amino acids

102. Which of the following amino acids are obtained during the hydrolysis of aspartame?

(a) Aspartic acid (b) Phenylalanine
(c) Lysine (d) Glutamine

103. Which of the following statements are correct about amino acids?

(a) They are colourless, crystalline solids
(b) They are water soluble
(c) The behave like salts rather than simple amines or carboxylic acids
(d) They have high melting solids

104. Which of the following are true about amino acids?

(a) Glycine is the only naturally occurring amino acid which is optically inactive
(b) Most of naturally occurring amino acids have D-configuration
(c) Alanine having one amino and one carboxylic group
(d) Amino acids are the constituents of all proteins

105. Which of the following statements are correct about globular proteins?

(a) Globular proteins are usually soluble in water
(b) In these proteins, chains of polypeptides coil around each other to give a spherical shape
(c) Insulin is an example of globular protein
(d) Albumins is an example of globular protein

106. The main forces, which stabilise the 2° and 3° structures of proteins is/are

(a) hydrogen bond
(b) disulphide bond
(c) van der Waals' forces
(d) electrostatic forces of attraction

107. Mark the correct statements about denaturation of proteins.

(a) After denaturation, the biological activity of the protein is destroyed
(b) The primary structure of the protein does not change
(c) Fibrous proteins are converted into globular proteins
(d) Curdling of milk is an example of denaturation of protein

108. Which of the following are purine bases?

(a) Guanine (b) Adenine
(c) Thymine (d) Uracil

II. Statement Based Questions

109. Consider the following statements.

I. Carbohydrates, proteins, nucleic acids and lipids all are biomolecules.
II. Biomolecules are the organic compounds.
III. Plants and animals are made up of biomolecules.

Select the correct statements and mark the correct option.

(a) Only I (b) Only II (c) Only III (d) I, II and III

110. Which of the following statement(s) is/are false about carbohydrates?

I. It has general formula, $C_x(H_2O)_y$.
II. They are hydrates of carbon.
III. The molecular formula of glucose is $C_6H_{12}O_6$ and general formula is $C_6(H_2O)_6$.

Choose the correct option.

(a) Only I (b) Only II (c) II and III (d) Only III

111. Consider the following statements.

I. About 20 monosaccharides are known to occur in nature.
II. Glucose, fructose, ribose are the common examples of oligosaccharide.
III. Fructose is a ketoxerose.

Select the correct statements and mark the correct option.

(a) Only I (b) II and III (c) I and II (d) I and III

112. Consider the following statements regarding glucose.

I. Glucose occur freely in nature.
II. Glucose occur in the combined form.
III. Glucose present in sweet fruits and honey.
IV. Ripe grapes contain glucose in large amounts.

Select the correct statement(s) and choose the most appropriate option.

(a) I and III (b) II and III
(c) IV and I (d) I, II, III and IV

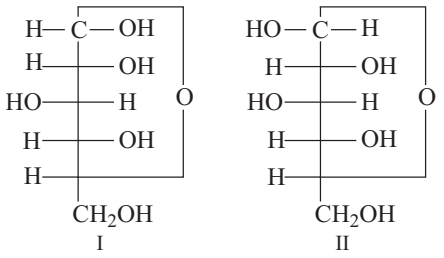
113. Consider the following statements.

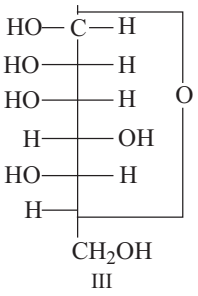
I. Pyran is a cyclic organic compound with one oxygen atom and five carbon atom.
II. The cyclic structure of glucose is correctly represented by Haworth structure.
III. Five membered cyclic structure of glucose is called pyranose structure.

Which of the following statement(s) is/are true? Choose the correct option.

(a) I and III (b) I and II (c) Only III (d) I, II and III

114. Three cyclic structures of monosaccharides are given below





III

Which of these are anomers?

(a) I and II (b) II and III
(c) I and III (d) III is anomer of I and II

115. Consider the following statements.

I. Polysaccharides contain a large number of aligosaccharides units, joined by glystatic linkage.
II. Starch is the main storage polysaccharide of plants. It is mainly found in cereals.

Select the correct and mark the correct option.

(a) Only I (b) Only II
(c) I and II both (d) None of these

116. Consider the following statements.

I. Disaccharides on hydrolysis with dilute acid gives three molecules of same or different monosaccharides.
II. Disaccharide are formed by the loss of water and have an oxide linkage.

Choose the incorrect statement about disaccharide and select the most appropriate option.

(a) Only I (b) Both I and II
(c) Only II (d) None of these

117. Consider the following statments about the amino acids

I. Glycine is so named because of its sweet taste.
II. Amino acids can be represented by 3-letter symbol.
III. In zwitter ionic form amino acids shows the amphoteric behaviour.

Choose the correct statements and mark the correct option.

(a) Only I (b) Both II and III
(c) Both I and III (d) All statements are correct

118. Consider the following amino acids.

I. Histidine II. Proline
III. Threonine IV. Aspartic acid

Select the essential amino acid(s) from the above amino acid and choose the appropriate option.

(a) II and III (b) I and IV
(c) I and III (d) I and II

119. Consider the following amino acids.

I. $(CH_3)_2CH—\underset{\displaystyle NH_2}{\underset{|}{CH}}—COOH$

II. $HOOC—CH_2—CH_2—\underset{\displaystyle NH_2}{\underset{|}{CH}}—COOH$

III. $H_2N—CH_2—CH_2—CH_2—COOH$

IV. $HOOC—CH_2—\underset{\displaystyle NH_2}{\underset{|}{CH}}—COOH$

Which of the following are acidic amino acid among the above one? Choose the correct option.

(a) I and II (b) II and III
(c) III and I (d) II and IV

120. Consider the following statements.

I. Proteins are the polymers of α-amino acids and they are connected to each other by glycosidic linkage.
II. In globular proteins, chains of polypeptides coil around each other to give a spherical shape.
III. Structure and shape of globular protein can be studied at three different level.

Select the correct statement(s) and mark the correct option.

(a) Only I (b) Only II
(c) Both II and III (d) All statements are correct

121. Proteins can be classified into two types on the basis of their molecular shape i.e. fibrous proteins and globular proteins. Examples of fibrous proteins are

I. insulin II. keratin
III. albumin IV. myosin

Select the correct option.

(a) I and II (b) II and IV
(c) III and I (d) I and III

122. Lysine, $H_2N—(CH_2)_4—\underset{\displaystyle NH_2}{\underset{|}{CH}}—COOH$ is ……

I. α-amino acid
II. basic amino acid
III. amino acid synthesised in body
IV. β-amino acid

Select the option with correct properties about lysine.

(a) I and II (b) II and III
(c) III and IV (d) IV and I

123. Consider the following statements.

I. Tripeptide contains three amino acids linked by three peptide linkage.

II. In β-pleated sheet structure all peptide chain after maximum extension laid side by side and are held together by intramolecular H-bonds.

III. The tertiary structure of proteins arises due to further folding of the secondary structure.

Select the correct statements and mark the correct option.

(a) Only I (b) Only III
(c) II and III (d) None of these

124. Consider the following statements regarding vitamins.

I. Vitamins are the organic compounds required in small amounts in the diet but their deficiency causes specific disease.

II. Vitamins cannot be synthesised by plant but our body can synthesise them.

III. Vitamins are necessary to perform the specific biological functions for the normal maintenance of optimum growth and health of the organism.

Select the false statement about the vitamins and choose the correct option.

(a) Only I (b) Only II
(c) I and II (d) II and III

III. Assertion-Reason Type Questions

■ **Directions** (Q. Nos. 125-148) *In the following questions a statement of Assertion* (A) *followed by a statement of Reason* (R) *is given. Choose the correct answer out of the following choices.*

(a) Both A and R are correct; R is the correct explanation of A.
(b) Both A and R are correct; R is not the correct explanation of A.
(c) A is correct but R is incorrect.
(d) R is correct but A is incorrect.

125. **Assertion** (A) Acetic acid is a carbohydrate.

Reason (R) Acetic acid fits into general formula of carbohydrate, i.e. $C_x(H_2O)_y$.

126. **Assertion** (A) Rhamnose is not a carbohydrate.

Reason (R) Rhamnose does not fit into the general formula of carbohydrate i.e., $C_x(H_2O)_y$.

127. **Assertion** (A) Oligosaccharides are classified as disaccharides, trisaccharides, tetrasaccharides.

Reason (R) It depends upon the number of monosaccharides produced on hydrolysis.

128. **Assertion** (A) Glucose on acetylation gives pentaacetate.

Reason (R) It contains five —OH group.

129. **Assertion** (A) Glucose does not form the hydrogen bisulphite addition product.

Reason (R) Glucose is not so reactive to form the product with $NaHSO_3$.

130. **Assertion** (A) D-(+)-glucose is dextrorotatory in nature.

Reason (R) 'D' represents its dextrorotatory nature.

131. **Assertion** (A) Sucrose is laevorotatory.

Reason (R) Sucrose on hydrolysis gives dextrorotatory glucose (+52.5°) and laevorotation of fructose (– 92.4°).

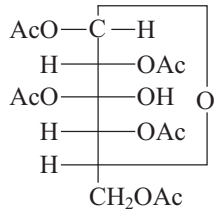
132. **Assertion** (A) Sucrose is called an invert sugar.

Reason (R) On hydrolysis, sucrose bring the change in the sign of rotation from dextro (+) to laevo (–).

133. **Assertion** (A) β-glycosidic linkage is present in maltose.

Reason (R) Maltose is composed of two glucose units in which C-1 of one glucose unit is linked to C-4 of another glucose unit.

134. **Assertion** (A)



This compound does not form oxime.

Reason (R) Glucose pentaacetate doesn't have a free —OH group at C1 and so can't be converted to the open chain form to give —CHO group and hence doesn't form the oxime.

135. **Assertion** (A) Cellulose is not digestable in the human body.

Reason (R) The human system contain cellulose enzyme which hydrolyse cellulose into glucose.

136. **Assertion** (A) Amino acids react with acid and base both.

Reason (R) In Zwitter ionic form, amino acids show the amphoteric behaviour.

137. **Assertion** (A) All naturally occurring α-amino acids except glycine are optically active.

Reason (R) Most naturally occurring amino acids have L-configuration.

138. **Assertion** (A) α-helix structure of proteins is in the shape of right handed screw.

Reason (R) There is hydrogen bond between the >NH group of each amino acid to the >==O of an adjacent turn of the helix.

139. Assertion (A) There is the coagulation of egg white on boiling.

Reason (R) Denaturation of protein is occur when its native form is subjected to physical change or chemical change.

140. Assertion (A) Activation energy for the acid catalysed hydrolysis of sucrose is 6.22 kJ mol^{-1}, while the activation energy is only 2.15 kJ mol^{-1}. When hydrolysis is catalysed by the enzyme sucrose.

Reason (R) Enzymes the biocatalysts, reduce the magnitude of activation energy by providing the alternative path. In the hydrolysis of sucrose the enzyme sucrose reduces the activation energy from 6.22 kJ mol^{-1} to 2.15 kJ mol^{-1}.

141. Assertion (A) In the presence of enzyme, substrate molecule can be attacked by the reagent effectively.

Reason (R) Active sites of enzymes hold the substrate molecule in a suitable position.

142. Assertion (A) The term vitamine is replaced by vitamin now a days.

Reason (R) Vitamine came from the word, vital + amine and it was identified that most of them did not contain amino groups.

143. Assertion (A) Vitamins A, D, E and K are stored in liver and adipose tissue.

Reason (R) Vitamins A, D, E and K are soluble in fats and oils.

144. Assertion (A) Vitamins B and C must be supplied regularly in the diet.

Reason (R) Vitamins B and C are soluble in water which are readily excreted through urine and cannot be stored (except vitamin B_{12}) in our body.

145. Assertion (A) The two strands of DNA are complementary to each others.

Reason (R) Adenine forms hydrogen bonds with guanine and thymine forms hydrogen bonds with cytosine.

146. Assertion (A) When RNA is hydrolysed, there is no relationship among the quantities of different bases obtained.

Reason (R) RNA molecules are of three types and they perform different functions.

147. Assertion (A) DNA is responsible for maintaining the identity of different species of organisms over millions of years.

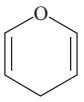
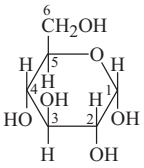
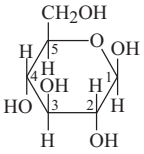
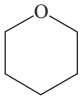
Reason (R) DNA molecule is capable of self duplication during cell division and identical DNA strands are transferred to daughter cell.

148. Assertion (A) Fresh tomatoes are better source of vitamin C than those which have been stored for sometime.

Reason (R) On prolonged exposure to air, vitamin C is destroyed due to aerial oxidation.

IV. Matching Type Questions

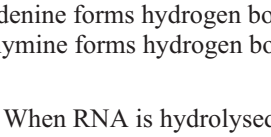
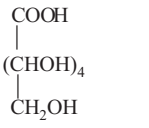
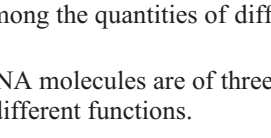
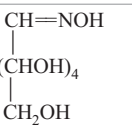
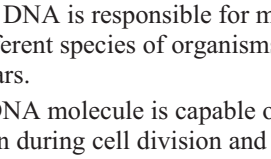
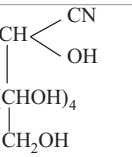
149. Match the Column I with their names given in the Column II and select the correct option from the codes given below.

Column I		Column II
A.	α- D - (+)-glucopyranose	1. 
B.	β- D - (+)-glucopyranose	2. 
C.	Pyran	3. 
		4. 

Codes

	A	B	C		A	B	C
(a)	2	3	1	(b)	3	2	4
(c)	2	3	4	(d)	3	2	1

150. Match the following Column I with product given in the Column II and select the correct option from the codes given below.

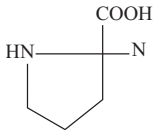
Column I		Column II
A.		1. 
B.		2. 
C.		3. 

Codes

	A	B	C
(a)	1	2	3
(c)	2	3	1

	A	B	C
(b)	1	3	2
(d)	2	1	3

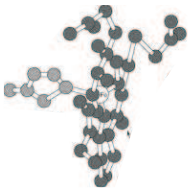
151. Match the following amino acid in Column I with their characteristic feature of side chain given in the Column II and select the appropriate option from the codes given below.

Column I		Column II	
A.	Asparagine (Asn, N)	1.	
B.	Proline (Pro, P)	2.	$HOOC—CH_2—CH_2—$
C.	Glutamic acid (Glu, E)	3.	$HO—CH_2—$
D.	Serine (Ser, S)	4.	$H_2N—COCH_2—$

Codes

	A	B	C	D
(a)	4	1	2	3
(b)	4	2	1	3
(c)	4	3	1	2
(d)	4	1	3	2

152. Match the following structure of haemoglobin given in the Column I with their names specified in Column II and select the option from the codes given below.

Column I		Column II	
A.		1.	Primary structure
B.		2.	Secondary structure
C.		3.	Tertiary structure
D.		4.	Quaternary structure

Codes

	A	B	C	D
(a)	1	3	2	4
(b)	2	3	1	4
(c)	1	2	3	4
(d)	2	1	3	4

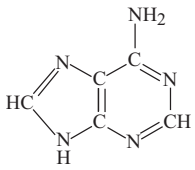
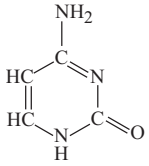
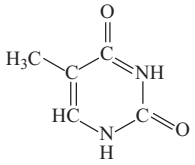
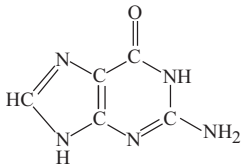
153. Match the following enzymes given in Column I with the reactions they catalyse given in Column II and select the correct option from the codes given below.

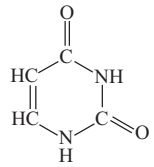
Column I (Enzymes)		Column II (Reactions)	
A.	Invertase	1.	Decomposition of urea into NH_3 and CO_2.
B.	Maltase	2.	Conversion of glucose into ethyl alcohol.
C.	Pepsin	3.	Hydrolysis of maltose into glucose.
D.	Urease	4.	Hydrolysis of cane sugar.
E.	Zymase	5.	Hydrolysis of proteins into peptides.

Codes

	A	B	C	D	E
(a)	4	1	5	3	2
(b)	4	3	5	1	2
(c)	4	1	3	5	2
(d)	4	5	1	3	2

154. Match the following structure of base given in Column I with their name given in the Column II and select the correct option from the codes given below.

Column I		Column II	
A.		1.	Thymine (T)
B.		2.	Guanine (G)
C.		3.	Cytosine (C)
D.		4.	Uracil (U)

E.  5. Adenine (A)

Codes

	A	B	C	D	E
(a)	5	3	2	4	1
(b)	5	1	2	4	3
(c)	2	3	1	5	4
(d)	5	3	1	2	4

155. Match the vitamins given in Column I with their deficiency disease given in Column II and select the correct option from the codes given below.

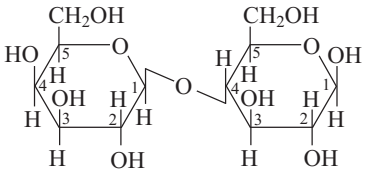
Column I (Vitamins)		**Column II** (Diseases)	
A.	Vitamin B_{12}	1.	Increased blood clotting time
B.	Vitamin C	2.	Pernicious anaemia
C.	Vitamin D	3.	Increased fragility of RBCs and muscular weakness
D.	Vitamin E	4.	Scurvy
E.	Vitamin K	5.	Rickets and Osteomalacia

Codes

	A	B	C	D	E
(a)	1	2	4	3	5
(b)	2	4	5	3	1
(c)	2	5	3	4	1
(d)	1	2	3	4	5

V. Passage Based Questions

■ **Directions** (Q. Nos. 156-157) *The structure of a disaccharide is given below.*

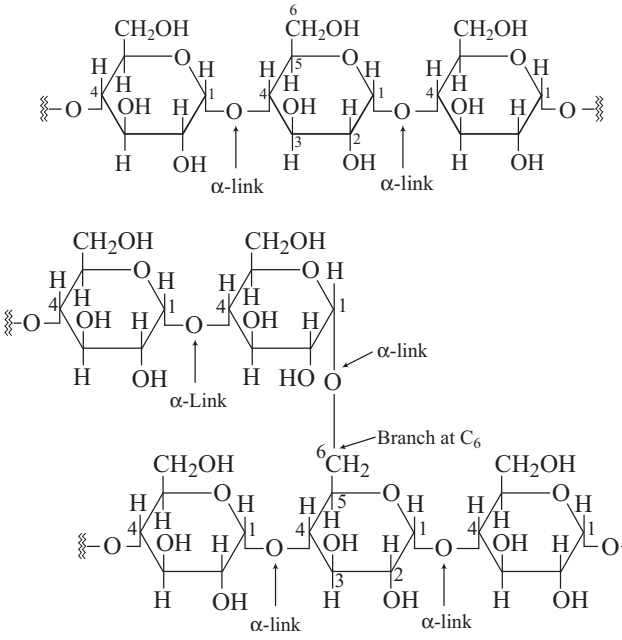


The following questions are based upon above structure. Study the structure carefully and then mark the correct option of followed questions

156. What is the name of the above disaccharide?
(a) Sucrose (b) Maltose
(c) Lactose (d) Talose

157. Identify the correct statement for the above disaccharide.
(a) C-1 of β-D- galactose is linked with C-4 of β-D-glucose
(b) C-1 of β-D-galactose is linked with C-4 of α-D-glucose
(c) C-1 of α-D-glucose is linked with C-4 of β-D-glactose
(d) C-1 of β-D-glucose is linked with C-4 of β-D-glucose

■ **Directions** (Q. Nos. 158-161) *Consider the following two structures carefully.*



Following questions are based upon above structures. Study the structure carefully and then mark the correct option of followed questions.

158. The given structures of polysacchride I and II respectively are
(a) amylose and amylopectin
(b) amylose and cellulose
(c) cellulose and amylopectin
(d) amylopectin and glycogen

159. Name the components that constitutes the starch.
(a) Amylose and amylopectin (b) Maltose and amylose
(c) Maltose and amylopectin (d) Only amylose

160. Which of the following statements is/are correct about given structure I?
(a) It is soluble in water
(b) It constitutes about 15-20% of starch
(c) In the given structure α –D-(+)-glucose units are held by C-1-C-4-glycosidic linkage
(d) All statements are correct

161. Which of the following statements is/are correct about given structure II?
(a) It is branched chain polymer of α-D- glucose unit in which chain is formed by C1-C4 glycosidic linkage, whereas branching occurs by C1-C6 glycosidic linkage
(b) It constitute 85% of starch
(c) The above polysaccharide is amylopectin
(d) All of the above

NCERT & NCERT Exemplar Questions

NCERT

162. Classify the following into monosaccharides and disaccharides.

Ribose, 2-deoxyribose, maltose, galactose, fructose and lactose.

(a) **Monosaccharides** Maltose, ribose, galactose, fructose
Disaccharides Lactose, 2-deoxyribose

(b) **Monosaccharides** Ribose, 2-deoxyribose, galactose, fructose
Disaccharides Maltose and lactose

(c) **Monosaccharides** Ribose and fructose
Disaccharides 2-deoxyribose, galactose, maltose and lactose

(d) **Monosaccharides**:-Ribose, lactose and fructose
Disaccharides 2-deoxyribose, galactose and maltose

163. What are the hydrolysis products of (i) sucrose and (ii) lactose?

(a) (i) D-(+)-glucose ; (ii) β-D-galactose

(b) (i) D-(−)-fructose ; (ii) β-D-glucose

(c) (i) D-(+)- glucose and D-(−) fructose
(ii) β-D-galactose and β-D-glucose

(d) (i) D-(+)-galactose and D-(−) fructose
(ii) β-D-glucose and β-D-glucose

164. What do you understand by the term glycosidic linkage?

(a) It is a linkage between two monosaccharide units through oxygen atom

(b) It is a linkage between two disaccharide units through sulphur atom

(c) It is a linkage between two monosaccharide units through carbon atom

(d) It is a linkage between two disaccharide units through carbon atom

165. What is the basic structural difference between starch and cellulose?

(a) Both have different nature of glucose molecules

(b) Both have different nature of fructose molecules

(c) Starch consist of glucose molecules and cellulose consists of fructose molecules

(d) Starch consist of fructose molecules and cellulose consists of glucose molecules

166. What are the two common types of secondary?

(a) α-helix and β-pleated structure

(b) β-helix and α-pleated structure

(c) Fibrous and globular structure

(d) Fibrous and non-fibrous structure

167. What type of bonding helps in stabilising the α-helix structure of proteins?

(a) Intramolecular hydrogen bonding between > C═O and > N—H groups of specific pair of bases

(b) Intramolecular hydrogen bonding between > C ═ O and > N—H groups

(c) Intramolecular hydrogen bonding between > C═O and > N—H groups of any pair of bases

(d) None of the above

168. What are the different types of RNA found in the cell?

(a) Primary RNA, secondary RNA, tertiary RNA

(b) Messenger RNA, ribosomal RNA, transfer RNA

(c) Cytosine RNA, nucleoside RNA, nucleotide RNA

(d) Messenger RNA, translational RNA, structural RNA

NCERT Exemplar

169. Glycogen is a branched chain polymer of α-D-glucose units in which chain is formed by Cl-C4 glycosidic linkage, where as branching occurs by the formation of C1-C6 glycosidic linkage. Structure of glycogen is similar to

(a) amylose

(b) amylopectin

(c) cellulose

(d) glucose

170. Which of the following polymer is stored in the liver of animals?

(a) Amylose

(b) Cellulose

(c) Amylopectin

(d) Glycogen

171. Which of the following statements is not true about glucose?

(a) It is an aldohexose

(b) On heating with HI it forms *n*-hexane

(c) It is present in furanose form

(d) It does not give 2, 4-DNP test

172. Which of the following reactions of glucose can be explained only by its cyclic structure?

(a) Glucose forms pentaacetate

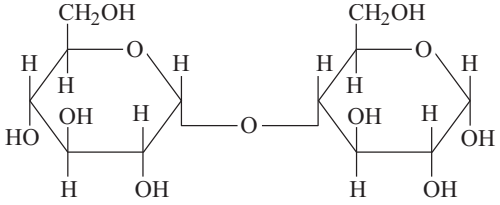
(b) Glucose reacts with hydroxylamine to form an oxime

(c) Pentaacetate of glucose does not react with hydroxyl amine

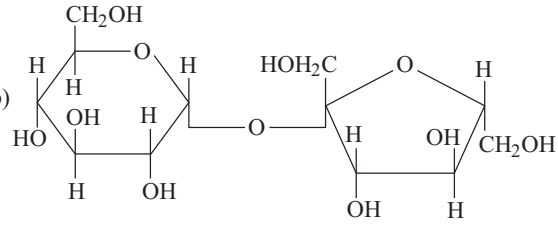
(d) Glucose is oxidised by nitric acid to gluconic acid

173. In disaccharides, if the reducing groups of monosaccharides, i.e. aldehydic or ketonic groups are bonded, these are non-reducing sugars. Which of the following disaccharide is a non-reducing sugar?

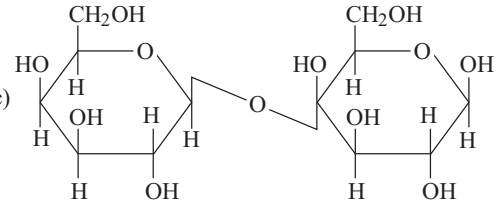
(a)



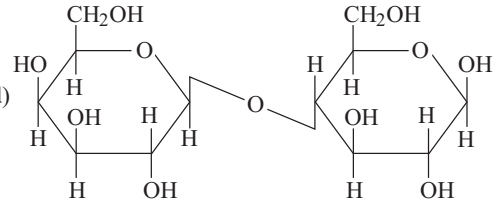
(b)



(c)

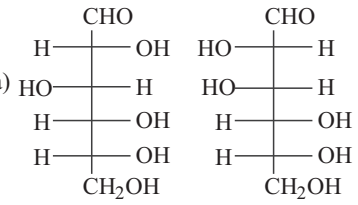


(d)

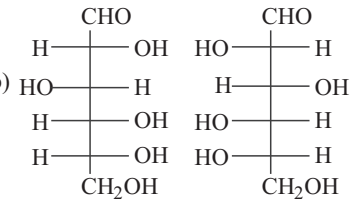


174. Which of the following pairs represents anomers?

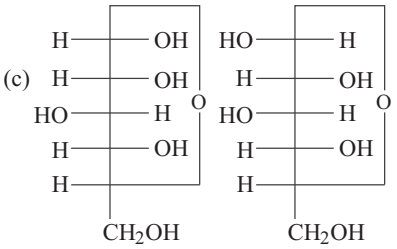
(a)



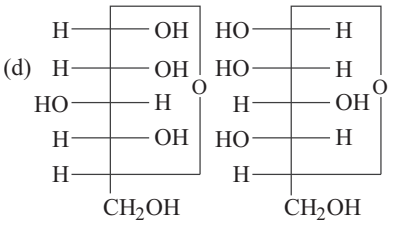
(b)



(c)



(d)



175. Sucrose (cane sugar) is a disaccharide. One molecule of sucrose on hydrolysis gives

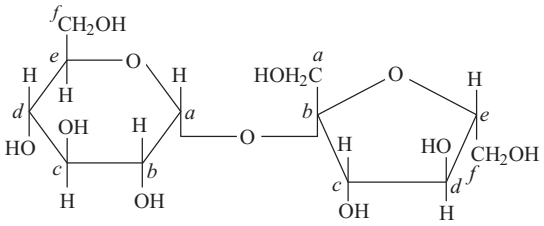
(a) 2 molecules of glucose

(b) 2 molecules of glucose + 1 molecule of fructose

(c) 1 molecule of glucose +1 molecule of fructose

(d) 2 molecules of fructose

176. 18 structure of disaccharide formed by glucose and fructose is given below. Identify anomeric carbon atoms in monosaccharide units.



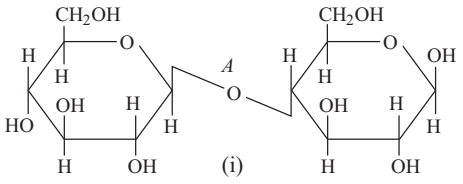
(a) *a* carbon of glucose and *a* carbon of fructose

(b) *a* carbon of glucose and *e* carbon of fructose

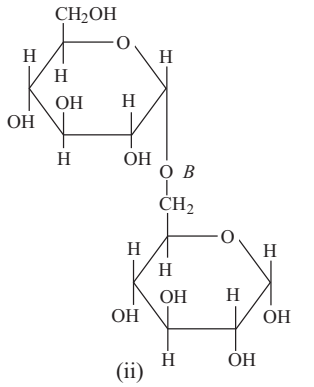
(c) *a* carbon of glucose and *b* carbon of fructose

(d) *f* carbon of glucose and *f* carbon of fructose

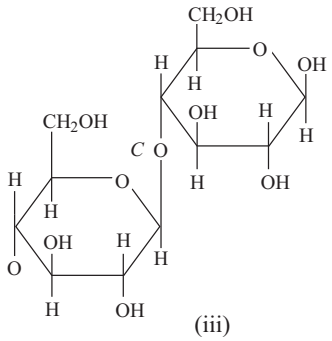
177. Three structures are given below in which two glucose units are linked. Which of these linkages between glucose units are between C_1 and C_4 and which linkages are between C_1 and C_6?



(i)



(ii)



(iii)

(a) *A* is between C1 and C4, *B* and *C* are between C1 and C6
(b) *A* and *B* are between C1 and C4, *C* is between C1 and C6
(c) *A* and *C* are between C1 and C4, *B* is between C1 and C6
(d) *A* and *C* are between C1 and C6, *B* is between C_1 and C_4

178. Proteins are found to have two different types of secondary structures *viz* α-helix and β-pleated sheet structure. α-helix structure of protein is stabilised by
(a) peptide bonds (b) van der Waals' forces
(c) hydrogen bonds (d) dipole-dipole interactions

179. Each polypeptide in a protein has amino acids linked with each other in a specific sequence. This sequence of amino acids is said to be
(a) primary structure of proteins
(b) secondary structure of proteins
(c) tertiary structure of proteins
(d) quaternary structure of proteins

180. Which of the following acids is a vitamin?
(a) Aspartic acid (b) Ascorbic acid
(c) Adipic acid (d) Saccharic acid

181. Which of the following B group vitamins can be stored in our body?
(a) Vitamin B_1 (b) Vitamin B_2
(c) Vitamin B_6 (d) Vitamin B_{12}

182. DNA and RNA contain four bases each. Which of the following bases is not present in RNA?
(a) Adenine (b) Uracil
(c) Thymine (d) Cytosine

183. Which of the following bases is not present in DNA?
(a) Adenine (b) Thymine
(c) Cytosine (d) Uracil

Answers

1.	(d)	**2.**	(b)	**3.**	(b)	**4.**	(b)	**5.**	(a)	**6.**	(d)	**7.**	(b)	**8.**	(c)	**9.**	(b)	**10.**	(d)	**11.**	(d)	**12.**	(a)	**13.**	(d)	**14.**	(b)	**15.**	(d)
16.	(d)	**17.**	(b)	**18.**	(c)	**19.**	(b)	**20.**	(c)	**21.**	(b)	**22.**	(d)	**23.**	(a)	**24.**	(a)	**25.**	(b)	**26.**	(c)	**27.**	(b)	**28.**	(b)	**29.**	(c)	**30.**	(a)
31.	(d)	**32.**	(b)	**33.**	(b)	**34.**	(a)	**35.**	(b)	**36.**	(d)	**37.**	(d)	**38.**	(b)	**39.**	(a)	**40.**	(b)	**41.**	(b)	**42.**	(d)	**43.**	(b)	**44.**	(b)	**45.**	(d)
46.	(d)	**47.**	(c)	**48.**	(c)	**49.**	(a)	**50.**	(b)	**51.**	(b)	**52.**	(b)	**53.**	(c)	**54.**	(a)	**55.**	(a)	**56.**	(c)	**57.**	(b)	**58.**	(d)	**59.**	(b)	**60.**	(a)
61.	(d)	**62.**	(a)	**63.**	(d)	**64.**	(a)	**65.**	(b)	**66.**	(d)	**67.**	(d)	**68.**	(a)	**69.**	(d)	**70.**	(c)	**71.**	(a)	**72.**	(b)	**73.**	(b)	**74.**	(a)	**75.**	(a)
76.	(d)	**77.**	(a)	**78.**	(d)	**79.**	(c)	**80.**	(c)	**81.**	(a)	**82.**	(c)	**83.**	(a)	**84.**	(a)	**85.**	(d)	**86.**	(c)	**87.**	(c)	**88.**	(c)	**89.**	(c)	**90.**	(d)
91.	(a)	**92.**	(d)	**93.**	(d)	**94.**	(d)	**95.**	(abc)	**96.**	(abc)	**97.**	(acd)	**98.**	(cd)	**99.**	abc	**100.**	(ab)	**101.**	(bd)	**102.**	(ab)	**103.**	(ac)	**104.**	(ad)	**105.**	(ab)
106.	(ad)	**107.**	(ab)	**108.**	(ab)	**109.**	(d)	**110.**	(d)	**111.**	(d)	**112.**	(d)	**113.**	(b)	**114.**	(a)	**115.**	(b)	**116.**	(a)	**117.**	(d)	**118.**	(d)	**119.**	(d)	**120.**	(b)
121.	(b)	**122.**	(a)	**123.**	(b)	**124.**	(b)	**125.**	(d)	**126.**	(d)	**127.**	(a)	**128.**	(a)	**129.**	(c)	**130.**	(c)	**131.**	(d)	**132.**	(a)	**133.**	(d)	**134.**	(a)	**135.**	(c)
136.	(a)	**137.**	(b)	**138.**	(a)	**139.**	(a)	**140.**	(a)	**141.**	(a)	**142.**	(a)	**143.**	(b)	**144.**	(a)	**145.**	(c)	**146.**	(b)	**147.**	(a)	**148.**	(a)	**149.**	(a)	**150.**	(c)
151.	(a)	**152.**	(a)	**153.**	(b)	**154.**	(d)	**155.**	(b)	**156.**	(c)	**157.**	(a)	**158.**	(a)	**159.**	(a)	**160.**	(d)	**161.**	(d)	**162.**	(b)	**163.**	(c)	**164.**	(a)	**165.**	(a)
166.	(a)	**167.**	(a)	**168.**	(d)	**169.**	(b)	**170.**	(d)	**171.**	(c)	**172.**	(c)	**173.**	(b)	**174.**	(c)	**175.**	(c)	**176.**	(c)	**177.**	(c)	**178.**	(c)	**179.**	(a)	**180.**	(b)
181.	(d)	**182.**	(c)	**183.**	(d)																								

Hints & Explanations

3

1. (*d*) Living systems are made up of various complex molecules like carbohydrates, proteins, nucleic acids, lipids etc.

2. (*b*) Protein and carbohydrates are the essential constituents of our foods.

3. (*b*) Some of the carbohydrates which are sweet in taste are called sugars. The sugar used in our home is called sucrose and sugar present in milk is called lactose. Carbohydrates are also called saccharides (*Sakcharon* means sugar).

4. (*b*) Carbohydrates are classified on the basis of their behaviour on hydrolysis.They have been broadly divided into three groups, i.e. monosaccharides, oligosaccharides and polysaccharides.

5. (*a*) A carbohydrate that cannot be hydrolysed further to give simpler unit of polyhydroxy aldehyde or ketone is called monosaccharide.

6. (*d*) 20 monosaccharides are known to occur in nature.

7. (*b*) Carbohydrates made up of 2-10 monosaccharides are called oligosaccharides.

8. (*c*) Sucrose on hydrolysis gives one molecule each of glucose and fructose. Maltose give two molecules of glucose only.

9. (*b*) Carbohydrates which yield a large number of monosaccharide units on hydrolysis are called polysaccharide. Some common examples are starch, cellulose, glycogen, gums etc.

Polysaccharide are not sweet in taste hence, they are called non-sugars. They are classified as either reducing or non-reducing sugar. All those carbohydrates which reduce Fehling's solution and Tollen's reagent are referred to as reducing sugars. All monosaccharides whether aldose or ketose are reducing sugars.

10. (*d*) In disaccharides if the reducing groups of monosaccharides, i.e. aldehydic or ketonic groups are bonded, these are non-reducing sugars, e.g. sucrose. The sugar in which these functional groups are free, are called reducing sugar, for example maltose and lactose.

11. (*d*) Monosaccharides are classified on the basis of number of C-atoms and the functional group present in them.

12. (*a*) **Sucrose** (cane sugar) If sucrose is boiled with dilute HCl or H_2SO_4 in alcoholic solution glucose and fructose are obtained in equal amounts.

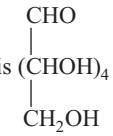
$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

Starch commercially glucose is obtained by the hydrolysis of starch by boiling it with dilute H_2SO_4 at 393 K under pressure.

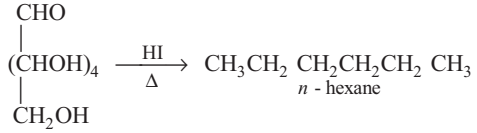
$$\underset{\text{Starch or cellulose}}{(C_6H_{10}O_5)_n} + nH_2O \xrightarrow[393\text{ K, 2-3 atm}]{H^{\oplus}} nC_6H_{12}O_6$$

13. (*d*) Glucose is an aldohexose and is also known as dextrose. It is the monomer of many of the larger carbohydrates namely starch, cellulose. Its molecular formula was found to be $C_6H_{12}O_6$.

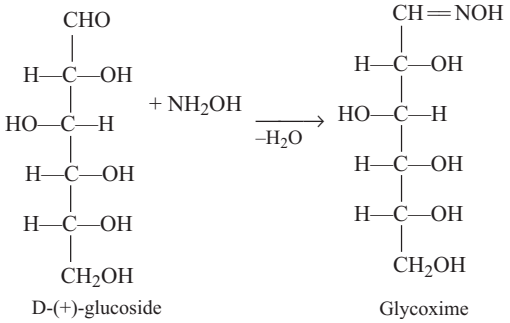
14. (*b*) Structure of glucose is



15. (*d*) On prolonged heating with HI, glucose forms hexane, suggesting that all 6 C-atoms are linked in straight chain.

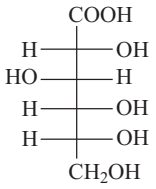


16. (*d*) D – (+) - glucose contains aldehydic group which reacts with NH_2OH to yield an oxime.



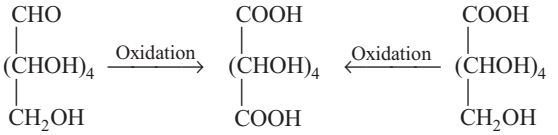
D-(+)-glucoside Glycoxime

17. (*b*)



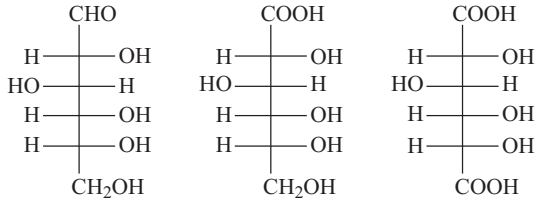
18. (*c*) Pentaacetyl derivative of glucose shows the evidence for the open chain structure.

19. (*b*) Glucose and gluconic acid, both on the oxidation yield a dicarboxylic acid, saccharic acid. This indicates the presence of primary alcohol (OH) group in glucose.



Saccharic acid Gluconic acid

20. (*c*) The exact spatial arrangement of different —OH groups was given by Fischer. Its configuration is correctly represented as



I Glucose II Gluconic acid III Saccharic acid

21. (*b*) Glucose is correctly named as D(+)-glucose. 'D' before the name of glucose represents the configuration whereas '(+)' represents dextrorotatory nature of the molecule. It may be remembered that 'D' and 'L' have no relation with an optical activity of the compound.

22. (*d*) The letter 'D' or 'L' before the name of any compound indicate the relative configuration of particular stereoisomer. This refers to the relation with particular isomer of glyceraldehyde. Glyceraldehyde contains one asymmetric carbon atom and exists in two enantiomeric forms.

(+)-glyceraldehyde (–)-glyceraldehyde

All those compounds which can be chemically correlated to (+) isomer of glyceraldehyde are said to have D-configuration whereas those which can be correlated to (–) isomer of glyceraldehyde are said to have L-configuration.

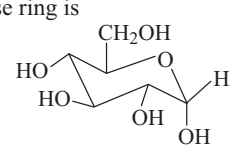
23. (*a*) In (+) glucose, —OH on the lowest asymmetric carbon is on the right side which is comparable to (+) glyceraldehyde so it is assigned as D-configuration. The most oxidised carbon is at the top in the structure.

24. (*a*) L-(–)-glucose is an enantiomer of D-(+)-glucose with hydroxy group on left of vertical at C-5(L-configuration).

25. (*b*) It is obtained by the crystallisation from concentrated solution of glucose at 303 K.

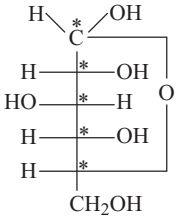
26. (*c*) Melting point of α-glucose → 419 K and of β-glucose is 423 K.

27. (*b*) β-pyranose ring is



28. (*b*) Glucose and mannose are classified as anomers.

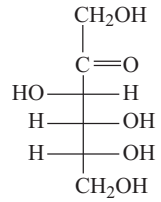
29. (*c*)



α-D-glucose
Chiral carbon atoms = 5

30. (*a*) They are anomers.

31. (*d*) Structure of D-(–) - fructose.



OH is at right side mean D.

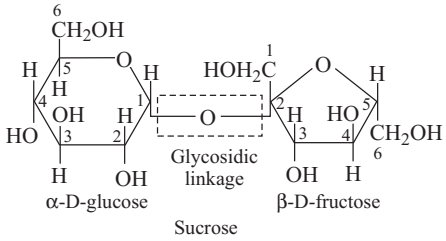
32. (*b*) Fructose has the molecular formula $C_6H_{12}O_6$. It belongs to D-series and is laevorotatory compound. It also exists in two cyclic forms which are obtained by the addition of —OH

at C–5 to the $\left(\rangle C{=}O\right)$ group. The ring thus formed is a five membered ring and is named as furanose with analogy to the compound furan. Furan is a five membered cyclic compound with one oxygen and four carbon atoms.

33. (*b*) I, III → α-D-(–)-fructofuranose
II, IV → β-D-(–)-fructofuranose

34. (*a*) One of the common disaccharides is sucrose which on hydrolysis gives equimolar mixture of D-(+)-glucose and D-(–)-fructose.

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \longrightarrow \underset{\text{D-(+)-glucose}}{C_6H_{12}O_6} + \underset{\text{D-(–)-fructose}}{C_6H_{12}O_6}$$



35. (*b*) Ring I is pyranose with α-glycosidic linkage and ring (II) is furanose with β-glycosidic linkage.

36. (*d*) (+)-lactose is a reducing sugar and it exhibits mutarotation.

37. (*d*) Maltose is composed of two α-D-glucose units in which C-1 of one glucose is linked to C-4 of another glucose unit.

38. (*b*) In maltose, free aldehyde group can be produced at C-1 of second glucose in solution and it shows reducing properties so it is a reducing sugar.
Lactose is composed of β-D-galactose and β-D-glucose. The linkage is between C-1 of galactose and C-4 of glucose. Hence, it is also a reducing sugar.

39. (*a*) Cellulose is a predominant constituent of cell wall in the plant cells.

40. (*b*) Cellulose is a straight chain of polysaccharide composed only of β-D-glucose units which are joined by the glycosidic linkage between C-1 of one glucose unit and C-4 of the next glucose unit.

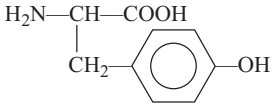
41. (*b*) β-linkage is present in the cellulose.

42. (*d*) Proteins occur in every part of the body and form the fundamental basis of structure and functions of life. They are also required for growth and maintenance of body.
The word protein is derived from greek word "*proteios*" which means primary or of prime importance. All proteins are the polymers of α-amino acids.

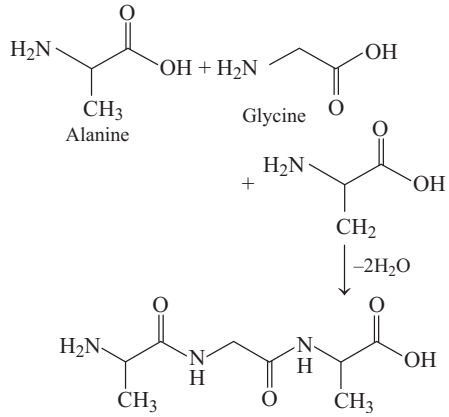
43. (*b*) On the basis of the relative position of amino group with respect to carboxyl group, the amino acids can be classified as α, β, γ, δ and so on.

44. (*b*) Only α-amino acids are obtained on the hydrolysis of proteins.

45. (*d*) Tyrosine has phenyl —OH group

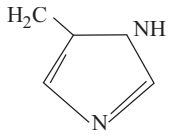


46. (*d*)



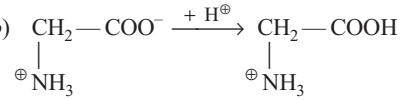
47. (*c*) Ninhydrin test is highly specific for the primary amines. All α-amino acids give a blue-purple colour with ninhydrin except proline being a secondary amine which gives a yellow orange colour.

48. (*c*) Structure of histidine is as follows



49. (*a*) In aqueous solution, the carboxyl group can lose a proton and amino group can accept a proton, giving rise to a dipolar ion known as Zwitter ion. lt contains both positive and negative charges, but due to cancellation of charge it appears neutral.

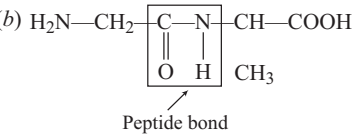
50. (*b*)



Zwitter ion of glycine

51. (*b*) Except glycine (Gly), all the other naturally occurring α-amino acids are optically active.

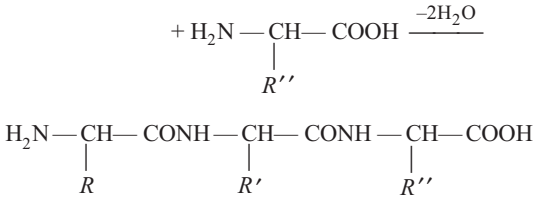
52. (*b*)



53. (*c*) There is the elimination of a water molecule and formation of a peptide bond (—CONH—).

54. (*a*) Naturally occurring amino acids are 20.
Number of possible tripeptides = $20^3 = 8000$.

55. (*a*)

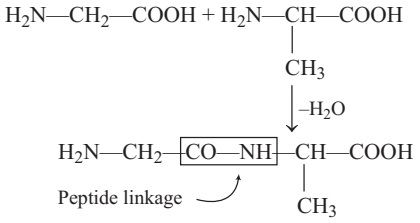


If n molecules of amino acids are used in the formation of polypeptide then $(n-1)$ H_2O molecules are eliminated.

56. (*c*) The numbers of the peptides can be obtained are 6.

Tyr-Gly-Val	Gly-Tyr-Val
Val-Gly-Tyr	Tyr-Val-Gly
Gly-Val-Tyr	Val- Tyr-Gly

57. (*b*) When carboxyl group of glycine combines with the amino group of alanine we get dipeptide, glycylalanine.



Glycylalanine (Gly-Ala)

58. (*d*) When four, five or six amino acids are linked, the respective products are known as tetrapeptide, pentapeptide or hexapeptide respectively. When the number of such amino acids is more than ten, then the products are called polypeptides. A polypeptide with more than hundred amino acid residues, having molecular mass higher than 10000 u is called a protein.

The distinction between a polypeptide and a protein is not very sharp. Polypeptides with amino acids are likely to be called proteins if they ordinarily have a well defined conformation of a protein such as insulin which contains 51 amino acids.

59. (*b*) Proteins can be classified into two types, i.e. fibrous and globular proteins on the basis of their molecular shape.

60. (*a*) **Fibrous proteins** When the polypeptide chains run parallel and are held together by hydrogen and disulphide bonds, then fibre-like structure is formed. Such proteins are generally insoluble in water.

61. (*d*) The secondary structure of proteins refers to the shape in which a long polypeptide chain can exist. They are found to exist in two different types of structures, i.e. α-helix and β-pleated sheet structure. These structures arise due to the regular folding of the backbone of the polypeptide chain due to hydrogen bonding between  and —NH group of the peptide bond.

62. (*a*) I → α-helix structure of protein
II → β-pleated sheet structure of protein.

63. (*d*) Some of the proteins are composed of two or more polypeptide chains referred to as subunits.

The spatial arrangement of these subunits with respect to each other is known as quaternary structure.

64. (*a*) I → Primary structure
II → Secondary structure
III → Tertiary structure
IV → Quaternary structure

65. (*b*) During denaturation 2° and 3° structures of proteins are destroyed but 1° structure remains intact.

66. (*d*) Coagulation of egg white, caused by heating and curdling of milk, caused by the acidity (of lactic acid) are examples of denaturation of protein. Clotting of blood is not a kind of denaturation of protein.

67. (*d*) Most of the enzymes have proteinous nature. They are highly specific and get denatured at high temperature or by UV-rays. At optimum temperature which is generally in between 25°C-35°C, enzyme activity is maximum.

68. (*a*) Vitamins B complex and C are water soluble while vitamins A,D,E and K are fat soluble.

69. (*d*) The enzyme that catalyses, the hydrolysis of maltose into glucose is named as maltase.

$$\underset{\text{Maltose}}{C_{12}H_{22}O_{11}} \xrightarrow{\text{Maltase}} \underset{\text{Glucose}}{2C_6H_{12}O_6}$$

70. (*c*) Enzymes which catalyse the oxidation of one substrate with simultaneous reduction of another substrate are named as oxidoreductase enzymes. The ending of the name of an enzyme is -ase.

71. (*a*) Vitamin A

72. (*b*) Vitamin C is water soluble, hence excreted in urine and cannot be stored in the body. Thus, is must be supplied on regular basis

73. (*b*) Pyridoxin is also known as vitamin B_6.

74. (*a*) Vitamin-C is present in amla, citrus fruits and green leafy vegetables.

75. (*a*) I- Vitamin B_1 (Thiamine)
II-Vitamin B_2 (Riboflavin)
III-Xerophthalmia
IV- Convulsions

76. (*d*) Muscular weakness.

77. (*a*) Chromosomes

78. (*d*) Both Statements (a) and (b) are correct.

79. (*c*) DNA and RNA are the two types of nucleic acids.

80. (*c*) Watson and Crick discovered the DNA has a double helix structure that resembles with a twisted cadder.

81. (*a*) DNA → Deoxyribonucleic acid
RNA → Ribonucleic acid

82. (*c*) In DNA molecules, the sugar moiety is β-D-2-deoxyribose whereas in RNA molecule, it is β-D-ribose.

83. (*a*) I → β-D-ribose II → β-D-2-deoxyribose

84. (*a*) DNA has four nitrogenous bases, namely adenine, guanine, cytosine and thymine. Quinoline is an alkanoid, it is not present in DNA.

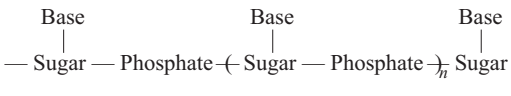
85. (*d*) DNA contains four bases, i.e. Adenine (A), Guanine (G) Cytosine (C) and Thymine (T). RNA also contains four bases, the first three bases are same as in DNA, but the fourth one is uracil (U).

86. (*c*) Complementry strand of DNA is ATACTGAC.

87. (*c*) A unit formed by the attachment of a base to 1′ position of sugar is known as nucleoside. In nucleosides the sugar carbons are numbered as 1′, 2′, 3′ etc., in order to distinguish these from the bases. When nucleoside is linked to phosphoric acid at 5′-position of sugar moiety, we get a nucleotide.

88. (*c*) Nucleotides are joined together by phosphodiester linkage between 5 and 3 C-atoms of the pentose sugar.

89. (*c*) The simplified version of nucleic acid chain is



90. (*d*) Complete hydrolysis of DNA (or RNA) yields a pentose sugar, phosphoric acid and nitrogen containing heterocyclic compounds (called bases).

91. (*a*) It is the double strand helix structure of DNA.

92. (*d*) Guanidine does not constitute the nucleic acid.

93. (*d*) Every individual has unique fingerprints. These occur at the tips of fingers and have been used for identification for long time but these are altered by surgery. A sequence of bases on DNA is also unique for person and information regarding this is called DNA fingerprinting.

94. (*d*) DNA fingerprinting is now used

(i) in forensic laboratories for the identification of criminals.
(ii) to determine the paternity of an individual.
(iii) to identify the dead bodies in any accident by comparing the DNA's of parents or children.
(iv) to identify racial groups to rewrite biological evolution.

95. (*a, b, c*) Glucose, fructose and mannose are reducing sugar while sucrose is not a reducing sugar.

96. (*a, b, c*) Statements (a), (b) and (c) are correct. Aldohexoses exist in $2^4 = 16$ optical forms.

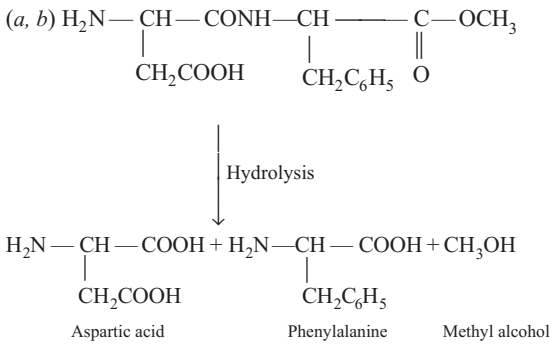
97. (*a, c, d*) Statements (a), (c) and (d) are correct. Statement (b) is incorrect because α-D-glucose and β-D-glucose are anomers not the enantiomers.

99. (*a, b, c*) Valine, leucine and lysine are among the amino acids that cannot be synthesised in our body.

100. (*a, b*) Lysine, asparagine and arginine are basic amino acids. Glutanic acids is acidic amino acids. This behaviour is due to the presence of both acidic (carboxyl group) and basic (amino group) groups in the same molecule.

101. (*b, d*) There are 10 essential amino acids.

102. (*a, b*)



104. (*a, d*) Most of the naturally occurring amino acids have L-configuration.

106. (*a, d*) The main forces which stabilises the 2° and 3° structures of protein are hydrogen bond, disulphide bond, van der Waals' forces and electrostatic forces of attraction.

107. (*a, b*) When a protein in its nature form, is subjected to physical change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological acitivity. This is called denaturation of protein. During denaturation 2° and 3° structures are destroyed but 1° structure remain intact.

108. (*a, b*) Guanine and adenine are purine bases.

109. (*d*) All statements are correct.

110. (*d*) The general formula of carbohydrates is $C_x(H_2O)_y$ and these were considered as the hydrates of carbon. Molecular formula of glucose ($C_6H_{12}O_6$) fits into this general formula $C_6(H_2O)_6$.

111. (*d*) Statements I and III are correct. Glucose, fructose and ribose are monosaccharides.

112. (*d*) Glucose occur freely in nature as well as in the combined form. It is present in sweet fruits and honey. Ripe grapes also contain glucose in large amounts.

113. (*b*) The six membered cyclic structure of glucose is called pyranose structure (α or β), in analogy with pyran. Pyran is a cyclic organic compound with one oxygen atom and five carbon atoms in the ring.The cyclic structure of glucose is correctly represented by Haworth structure.

114. (*a*) Structures (I and II) differ only in the position of OH at C-1 and hence are anomers.

115. (*b*) Polysaccharides contain a large number of monosaccharides units joined by glycosidic linkage.

116. (*a*) Disaccharides on hydrolysis with dilute acids or enzymes yield two molecules of either the same or different monosaccharides.

117. (*d*) All given statements are correct. In Zwiter ionic form, amino acids show amphoteric behaviour as they react with both acids and bases.

118. (*d*) Statements I and II amino acids are essential amino acids.

119. (*d*) Amino acids are classified as acidic, basic or neutral depending upon the relative number of amino and carboxyl groups in their molecules. Equal number of amino and carboxyl groups make it neutral, more number of amino than carboxyl groups makes it basic and more carboxyl groups as compared to amino groups makes it acidic.

120. (*b*) I. Protein are the polymers of α-amino acids and they are connected to each other by peptide bond.

III. Structure and shape of globular protein can be studied at four different levels, i.e. primary, secondary, tertiary and quaternary.

121. (*b*) Some common examples of fibrous proteins are keratin (present in hair, wool, silk), myosin (present in muscles).

122. (*a*) It is α-amino acid and basic amino acid.

123. (*b*) I. Tripeptide contains three amino acids linked by two peptide linkages.

II. In β-pleated sheet structure all peptide chain after maximum extension laid side by side and are held together by intermolecular H-bonds.

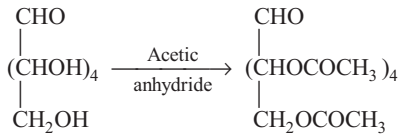
124. (*b*) Certain organic compounds are required in the small amounts in our diet but their deficiency cause specific diseases. These compounds are called vitamins. Most of the vitamins cannot be synthesised in our body but plants can synthesised almost all of them.

125. (*d*) Acetic acid (CH_3COOH) fits into the general formula $C_x(H_2O)_y$ is but not classified as carbohydrate.

126. (*d*) Rhamnose ($C_6H_{12}O_5$) is a carbohydrate but does not fit into the definition of carbohydrate. Carbohydrates may be defined as optically active polyhydroxy aldehydes or ketones or compounds which produce such units on hydrolysis.

127. (*a*) Oligosaccharides are classified as disaccharide, trisaccharides, tetrasaccharides etc., depending upon the number of monosaccharides they provide on hydrolysis.

128. (*a*) Acetylation of glucose with acetic anhydride gives glucosepentaacetate which confirms the presence of five —OH groups. Since, it exists as a stable compound, five —OH groups should be attached to different carbon atoms.



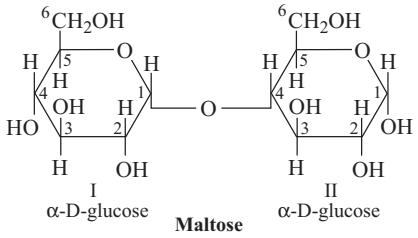
129. (*c*) The correct reason is that glucose has cyclic structure in which —CHO group is not free to react.

130. (*c*) D(+)-glucose is dextrorotatory in nature and D-suggests that the configuration of the —OH at the penultimate carbon is towards right.

131. (*d*) Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since, the laevorotation of fructose (–92.4°) is more than dextrorotation of glucose (+52.5°),the mixture is laevorotatory.

132. (*a*) The hydrolysis of sucrose brings about a change in the sign of rotation from dextro (+) to laevo (–) and the product is named as invert sugar.

133. (*d*) Assertion is wrong statement and Reason is correct statement, α-glycosidic linkage is present in maltose. Maltose is compound of two α-D-glucose units in which C-1 of one glucose is linked to C-4 of another glucose unit.



134. (*a*) Glucose pentaacetate does not form oxime because it does not have free —OH group at C-1 and cannot be converted to open chain form to give —CHO group and does not form oxime.

135. (*c*) Human system does not contain cellulose enzyme which hydrolyse the cellulose into glucose thats why cellulose is not digestable in the human body.

136. (*a*) In Zwiter ionic form, amino acids show amphoteric behaviour as they react with both acids and bases.

137. (*b*) Except glycine, all other naturally occurring α-amino acids are optically active, since the α-carbon atom is a asymmetric. These exist both in 'D' and 'L' forms. Most naturally occurring amino acids have L-configuration. L-amino acids are represented by writing NH_2 group on left hand side.

138. (*a*) α-helix is one of the most common ways in which a polypeptide chain forms all possible hydrogen bonds by twisting into right handed screw (helix) with the —NH group of each amino acid residue hydrogen bonded to the >C=O of an adjacent turn of the helix.

139. (*a*) When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed.

Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein. The coagulation of egg white on boiling is the common example of denaturation.

140. (*a*) Enzymes are said to reduce the magnitude of activation energy. Activation energy for acid hydrolysis of sucrose is 6.22 kJ mol^{-1}, while the activation energy is only 2.15 kJ mol^{-1} when hydrolysed by the enzyme sucrose.

141. (*a*) In the presence of an enzyme, substrate molecule can be attacked by the reagent effectively because active sites of enzymes hold the substrate molecule in a suitable position.

142. (*a*) The term vitamine was coined from word vital + amine since the earlier identified compounds had amino groups. Later work showed that most of them did not contain amino groups, so the letter 'e' was dropped and the term vitamin is used these days.

143. (*b*) Vitamins which are soluble in fat and oils but insoluble in water are kept in this group. These are vitamins A, D, E and K. They are stored in liver and adipose (fat storing) tissues.

144. (*a*) Vitamin B group and vitamin C are soluble in water so they are grouped together. Water soluble vitamins must be supplied regularly in diet because they are readily excreted through urine and cannot be stored (except vitamin B_{12}) in our body.

145. (*c*) Two strands of DNA are complementary to each other because the hydrogen bonds are formed between specific pairs of bases. Adenine forms hydrogen bonds with thymine whereas cytosine forms hydrogen bonds with guanine.

146. (*b*) RNA molecules are of three types and they perform different functions. They are named as messenger RNA (*m*-RNA), ribosomal RNA (*r*-RNA) and transfer RNA (*t*-RNA).

147. (*a*) DNA is the chemical basis of heredity and may be regarded as the reserve of genetic information. DNA is exclusively responsible for maintaining the identity of different species of organisms over millions of years. A DNA molecule is capable of self duplication during cell division and identical DNA strands are transferred to the daughter cells.

148. (*a*) Vitamin C present in tomatoes, is destroyed due to aerial oxidation.

149. (*a*) A → 2; B → 3; C → 1

150. (*c*) A → 2; B → 3; C → 1

151. (*a*) A → 4; B → 1; C → 2; D → 3

152. (*a*) A → 1; B → 3; C → 2; D → 4

153. (*b*) A → 4; B → 3; C → 5; D → 1; E → 2

154. (*d*) A → 5; B → 3; C → 1; D → 2; E → 4

155. (*b*) A → 2; B → 4; C → 5; D → 3 ; E → 1

156. (*c*) The given disaccharide is lactose.

157. (*a*) C-1 of β-D-galactose is linked with C-4 of β-D-glucose (Refer Ans 38).

158. (*a*) Structure I→Amylose
Structure II→Amylopectine

159. (*a*) Components of starch are amylose and amylopectin.

160. (*d*) All statements are correct.

161. (*d*) All of the given statement are correct.

162. (*b*) **Monosaccharides** Ribose, 2-deoxyribose, galactose and fructose.

Disaccharides Maltose and lactose.

163. (*c*) Sucrose is dextrorotatory but after hydrolysis produces dextrorotatory glucose and laevorotatory fructose.

$$\underset{\text{Sucrose}\atop\text{(invert sugar)}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{Invertase}} \underset{\text{D-(+)-glucose}}{C_6H_{12}O_6} + \underset{\text{D-(−)-glucose}}{C_6H_{12}O_6}$$

Since, the laevorotation of fructose (−92.4°) is more than dextrorotation of glucose (+52.5°) , the mixture is laevorotatory and it is known as invert sugar.

Lactose on hydrolysis produces β-D-galactose and β-D-glucose.

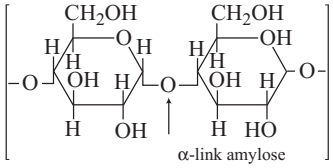
$$\underset{\text{Lactose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{Lactose}} \underset{\beta\text{-D-galactose}}{C_6H_{12}O_6} + \underset{\beta\text{-D-glucose}}{C_6H_{12}O_6}$$

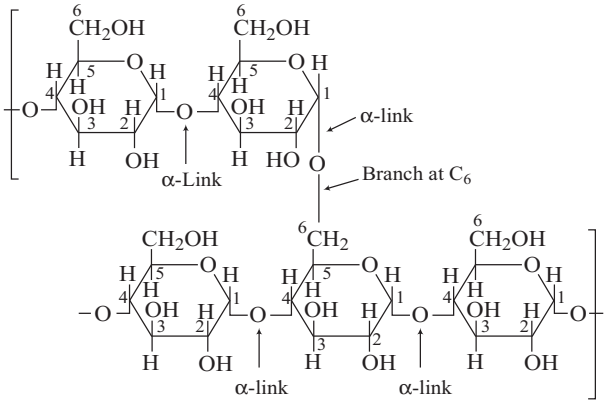
164. (*a*) The linkage between two monosaccharide units through oxygen atom is called glycosidic linkage. Disaccharides and polysaccharides are formed by this linkage.

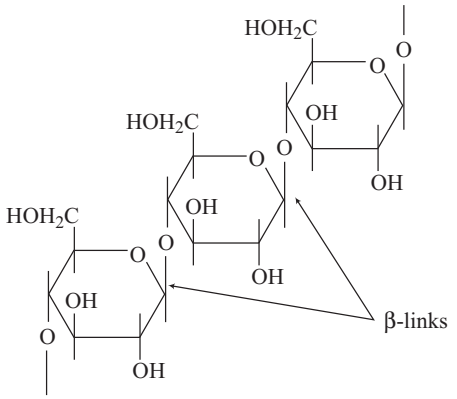
165. (*a*) The basic difference between starch and cellulose is due to the difference in the nature of glucose molecules.

Starch consists of amylose and amylopectin, both made up of α-D(+)-glucose units. Amylose consists of linear chains of glucose linked in $C_1 - C_4$ manner. Amylopectin consists of these linear chains further linked in $C_1 - C_6$ manner.

In cellulose, only β-D(+)-glucose molecules are linked to each other in $C_1 - C_4$ manner.







166. (*a*) α-helix and β-pleated structure.

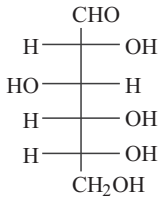
167. (*a*) The α-helix structure of proteins is stabilised by intramolecular hydrogen bonding between $>C{=}O$ and $>N{=}H$ groups of specific pair of bases.

168. (*d*) The different types of RNA found in the cell are messenger RNA, translational RNA, structural RNA.

169. (*b*) Amylopectine

170. (*d*) Glycogen is a polymer of α-D-glucose stored in the liver, brain and muscles of animals, also known as animal starch.

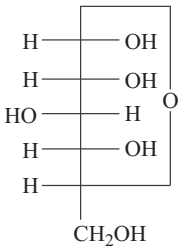
171. (*c*) Glucose is a aldohexose having structural formula.



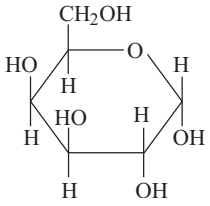
Glucose on heating with HI produces *n*-hexane.

$$C_6H_{12}O_6 \xrightarrow{HI} C_6H_{14}$$

Glucose does not give 2, 4, DNP test due to its existence as cyclic structure shown below



It is present in pyranose form, as shown below

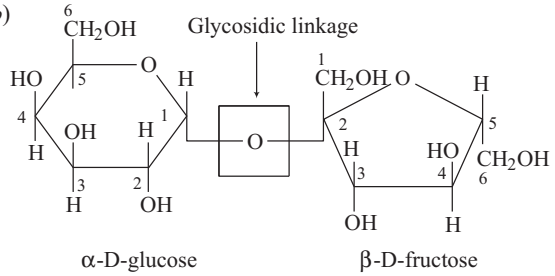


Pyranose means pyran (membered ring containing oxygen) like structure.

172. (*c*) ''Pentaacetate of glucose does not react with hydroxylamine'' showing absence of free —CHO group. This cannot be explained by open structure of glucose. While all other properties are easily explained by open structure of glucose.

Hence, option (c) is the correct choice.

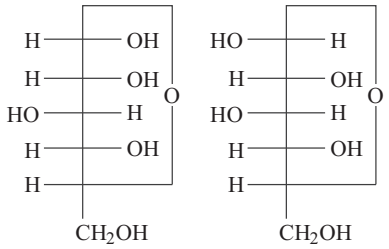
173. (*b*)



α-D-glucose β-D-fructose

This structure represents sucrose in which α–D glucose and β-D- fructose is attached to each other by C_1 — C_2 glycosidic linkage. Since, reducing groups of glucose and fructose are involved in glycosidic bond formation, this is considered as non-reducing sugar.

174. (*c*) Anomers have different configuration at C-1. If OH is present at right side anomeric carbon is known as α-form and if —OH group is present at left side of anomeric carbon is known as β - form



α-D- form β-D- form

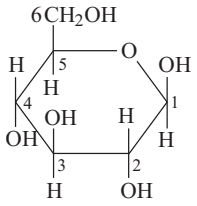
175. (*c*) Sucrose (cane sugar) is a disaccharide. One molecule of sucrose on hydrolysis gives one molecule of glucose and one molecule of fructose.

$$\underset{\text{Cane sugar}}{C_{12}H_{22}O_{11}} \xrightarrow[H^+]{H_2O} \underset{\text{D (+) glucose}}{C_6H_{12}O_6} + \underset{\text{D (−) fructose}}{C_6H_{12}O_6}$$

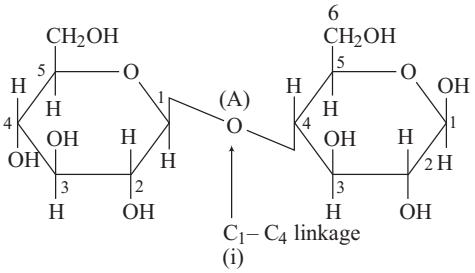
Note Sucrose is a *dextro-rotatory* sugar on hydrolysis produces a laevorotatory mixture so, known as invert sugar. Sucrose is a non-reducing sugar while maltose and lactose are reducing sugar.

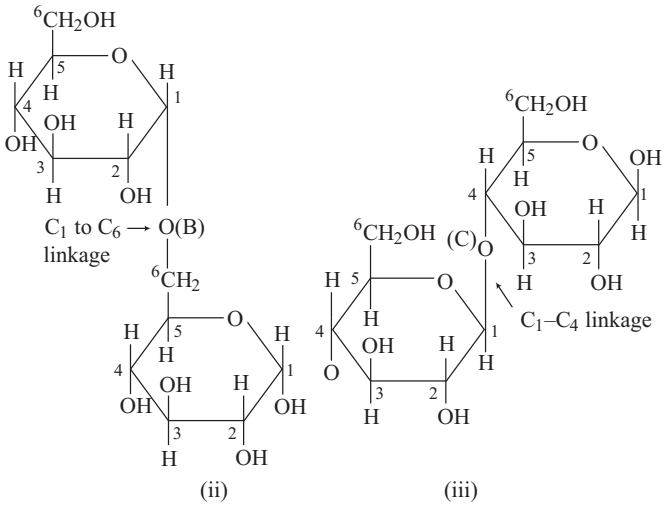
176. (*c*) Carbon adjacent to oxygen atom in the cyclic structure of glucose or fructose is known as anomeric carbon. As shown in the structure above 'a' and 'b' are present at adjacent to oxygen atom. Both carbons differ in configurations of the hydroxyl group.

177. (*c*) Numbering of glucose starts from adjacent carbon of O-atom to the other carbon atom ending at last CH_2OH group as shown below.



In this way, numbering for the disaccharides can be done as





178. (*c*) Secondary structures of protein denotes the shape in which a long polypeptide chain exists. The secondary structure exist in two type of structure α-helix and β- pleated structure.

In α-helix structure, a polypeptide chain forms all possible hydrogen bonds by twisting into a right handed screw with — NH group of each amino acid rest hydrogen bonded to $>C=O$ of adjacent amino acid, which form a helix.

179. (*a*) In primary structure of proteins when each polypeptide in a protein has amino acids linked with each other in a specific sequence. This type of structure is known as primary structure of proteins.

180. (*b*) Ascorbic acid is the chemical name of vitamin C. While others are not vitamins. Aspartic acid is an amino acid. Adipic acid is a dicarboxylic acid having 8 carbon chain. Saccharic acid is a dicarboxylic acid obtained by oxidation of glucose using HNO_3.

181. (*d*) Vitamin B_{12} can be stored in our body because it is not water solute.

182. (*c*) DNA contain four bases adenine, guanine, thymine and cytosine. While RNA contain four bases adenine, uracil, guanine and cytosine. Thus, RNA does not contain thymine. Hence, statement (c) is the correct choice.

183. (*d*) DNA contains following four bases

(i) adenine (A) (ii) thymine (T)

(iii) guanine (G) (iv) cytosine (C)

It does not contain uracil.